

Document Title	Specification of Manifest
Document Owner	AUTOSAR
Document Responsibility	AUTOSAR
Document Identification No	713

Document Status	published
Part of AUTOSAR Standard	Adaptive Platform
Part of Standard Release	R22-11

Document Change History			
Date	Release	Changed by	Description
2022-11-24	R22-11	AUTOSAR Release Management	<ul style="list-style-type: none"> • Support for MACsec • Support for firewall • Modeled State Management • Support for Service-oriented Vehicle Diagnostic • minor corrections / clarifications / editorial changes
2021-11-25	R21-11	AUTOSAR Release Management	<ul style="list-style-type: none"> • Removal of REST support • Rework of signal-to-service conversion • Rework of raw data stream configuration • Rework of diagnostic mapping • minor corrections / clarifications / editorial changes
2020-11-30	R20-11	AUTOSAR Release Management	<ul style="list-style-type: none"> • Remodeling of Phm contribution • Reporting of Security Events • Support for cryptographic Operations • Remodeling of Diagnostic Mapping • minor corrections / clarifications / editorial changes

2019-11-28	R19-11	AUTOSAR Release Management	<ul style="list-style-type: none"> • Overhaul of Signal-to-Service Translation • Support for Raw Data Streams • Support for Vehicle Package • Support for Service Versioning • Changed Document Status from Final to published
2019-03-29	19-03	AUTOSAR Release Management	<ul style="list-style-type: none"> • Introduction of Diagnostic Port Interfaces • Overhaul of Software Cluster and introduction of Software Package • Support for Identity and Access Management • Network Management Configuration
2018-10-31	18-10	AUTOSAR Release Management	<ul style="list-style-type: none"> • Finish introduction of CppImplementationDataType • Support for optional elements in structures • Rework configuration of adaptive platform modules
2018-03-29	18-03	AUTOSAR Release Management	<ul style="list-style-type: none"> • Time Synchronization • DDS Deployment
2017-10-27	17-10	AUTOSAR Release Management	<ul style="list-style-type: none"> • Optional elements in Service Interfaces • Interaction with web services • Secure Communication • Support for interaction with crypto and persistency • Signal-to-Service translation • Support for E2E communication • Platform Health Management • Uploadable Software Package
2017-03-31	17-03	AUTOSAR Release Management	<ul style="list-style-type: none"> • Initial release



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1 Introduction

This document contains the specification of the so-called the *Manifest* on the *AUTOSAR adaptive platform*. A description of the overall modeling approach can be found in section 1.1. A reference to the definition of the term *service* is given in section 1.2.

The term *Manifest* is used in this specification in the meaning of a formal specification of configuration content. Please find a more detailed description of the term and the implications for the *AUTOSAR adaptive platform* in section 2.

Please note that the content of the document (despite the name) extends to the description of design elements necessary to develop software for the *AUTOSAR adaptive platform*.

The design-related modeling mainly is focused on the development of application software on the *AUTOSAR adaptive platform* as well as the connection between application and diagnostics and is described in detail¹ in section 3 and section 4.

Section 6, in particular, describes the big picture of *AUTOSAR classic platform* and *AUTOSAR adaptive platform* communicating via service-oriented communication.

Section 9 describes the options for configuring a machine by means of a *manifest*.

Section 8 represents that counterpart to section 3 on deployment level, it describes the content of the so-called *execution manifest*.

Section 10 contains a string of sub-sections that explain the manifest content of platform module functionality.

Section 11 provides a detailed description of how service-oriented communication shall be configured on *manifest* level.

Section 12 describes the deployment modeling for raw data stream communication.

Section 13 explains how signal-based communication can be transformed into service-oriented communication and vice versa in order to participate in the communication between ECUs on the *AUTOSAR classic platform*.

Section 14 explains the modeling of interactions among functional clusters in the AUTOSAR stack.

Section 15 describes the idea behind and the configuration of the concept of an up-loadable software package.

Finally, section 16 makes some remarks about the interaction of the *AUTOSAR adaptive platform* with software on the *AUTOSAR adaptive platform*.

¹The description of the design elements may be moved to other model-related documents in the future. But for the time being, there is a coexistence of manifest-related and design-related model elements in this document.

1.1 Modeling Approach

1.1.1 General Considerations

The *AUTOSAR adaptive platform* has been introduced when the *AUTOSAR classic platform* was already a stable and well-established standard in the automotive domain.

And yet, the *AUTOSAR adaptive platform* is no successor of the *AUTOSAR classic platform*. Both platforms complement each other for specific use cases that can be better implemented by one or the other platform.

In this situation, two possible approaches for modeling on the *AUTOSAR adaptive platform* could have been taken:

- The *AUTOSAR adaptive platform* is based on different principles than the *AUTOSAR classic platform*, and hence the modeling approach could also **decouple from the canon of the AUTOSAR classic platform as much as possible** to advertise the fact that the two platforms have different purposes.

Consequentially, even if specific model elements have clear counterparts in the respective other platform, use a different terminology to not confuse the users of both platforms.

- Despite the undeniable differences between the two platforms, there is still a significant number of striking similarities that strongly encourage the **usage of existing modeling concepts** from the *AUTOSAR classic platform*, especially from the specification of the AUTOSAR Software-Component Template [1], as much as possible.

Consequentially, the conclusion is to use the identical meta-classes for similar purposes on both platforms. It will then be necessary to extend some of the affected meta-classes platform specific where applicable and add constraints that clarify the platform-specific usage of the mentioned extensions.

Without further ado, the modeling approach for the *AUTOSAR adaptive platform* follows the second alternative.

This means, for example, that a piece of application software on the *AUTOSAR adaptive platform* shall be represented by an `SwComponentType`. This includes the definition of `CompositionSwComponentTypes` that in turn aggregate `SwComponentPrototypes` typed by e.g. (in case of the *AUTOSAR adaptive platform*) `AdaptiveApplicationSwComponentTypes`.

The reuse of existing model-elements for the definition of the meta-model for the *AUTOSAR adaptive platform* has the side effect that the descriptions of existing model elements may contain references to technical details that only make sense on the *AUTOSAR classic platform*.

After all, the model elements were created when only the *AUTOSAR classic platform* existed.

These references shall be taken with a grain of salt. It is expected that readers can abstract from those details and extract the aspects of these model elements that create relevance for the description of the *AUTOSAR adaptive platform*.

1.1.2 Modeling of Diagnostic Configuration

The configuration of the “external behavior” of the AUTOSAR diagnostic stack is done by means of the so-called `Diagnostic Extract`. The `Diagnostic Extract` in general extends to both the *AUTOSAR classic platform* and the *AUTOSAR adaptive platform*.

In particular, some parts of the `Diagnostic Extract` apply only for the *AUTOSAR classic platform*, some parts are shared between the *AUTOSAR classic platform* and the *AUTOSAR adaptive platform*, and some parts apply only for the *AUTOSAR adaptive platform*.

The parts that are specific to the *AUTOSAR classic platform*, and the parts that apply to both the *AUTOSAR classic platform* and the *AUTOSAR adaptive platform* are documented in the deliverable “TPS Diagnostic Extract Template” [2].

For technical reasons, the parts that apply to the *AUTOSAR adaptive platform* cannot be included in the document “TPS Diagnostic Extract Template” and are consequently documented in this document, “TPS Manifest Specification”.

The parts about the configuration of Diagnostic Management, as described in this document, fit seamlessly into the same modeling framework that is used on the *AUTOSAR classic platform*. This means that the specific parts for the *AUTOSAR adaptive platform* utilize the shared parts that are described in the “TPS Diagnostic Extract Template”.

In other words, readers who want to focus on `Diagnostic Extract` specifically for application on the *AUTOSAR classic platform* may concentrate on reading the “TPS Diagnostic Extract Template”.

On the other hand, readers who'd like to understand how the `Diagnostic Extract` works on the *AUTOSAR adaptive platform* will have to read the diagnostics-related chapters of the “TPS Manifest Specification”, plus the relevant parts of the “TPS Diagnostic Extract Template”.

1.2 The Term Service

It is essential to keep in mind that the term *service* is frequently used within this document in particular and the *AUTOSAR adaptive platform* in general.

This usage has its reasons despite the fact that the meaning of the term *service* on the *AUTOSAR adaptive platform* collides with other meanings used within AUTOSAR.

In summary, the following meaning of the term *service* exist in the scope of AUTOSAR:

- The Term *service* is used in the layered software architecture [3] to denote the highest layer of the AUTOSAR software architecture that interacts with the application. In this context, model elements like *ServiceSwComponentType*, *Swc-ServiceDependency*, *ServiceNeeds*, or *PortInterface.isService* have been created on the *AUTOSAR classic platform*.
- The term *service* is used to express that information is related or required in a workshop where a car is **serviced**. In this context, *service-only diagnostic trouble codes* (DTC) are defined.
- The term *service* is used to describe the handling of **diagnostic services**, e.g. UDS service *ReadDataByIdentifier*, for the communication between a diagnostic tester and a diagnostic stack on an (AUTOSAR) ECU.
- the term *service* is used in the meaning defined by the **service-oriented architecture** (SOA) [4]. This meaning has the strongest relation to the usage of the term *service* on the *AUTOSAR adaptive platform*.

1.3 Terms and Abbreviations

The main list of terms and abbreviations are defined in [5]. The following table contains the list of terms and abbreviations used in the scope of this document which are not already defined in [5] along with the spelled-out meaning of each of the abbreviations.

<i>Abbreviation</i>	<i>Meaning</i>
AES	Advanced Encryption Standard
ATP	AUTOSAR Template Profile
ARXML	AUTOSAR XML
CTM	Counter Mode
DDS	Data Distribution Service
DES	Data Encryption Standard
DM	Diagnostic Manager
DNS	Domain Name System
DTC	Diagnostic Trouble Code
ECB	Electronic Code Book
ECC	Elliptic Curve Cryptography
ECDSA	Elliptic Curve Digital Signature Algorithm
ECIES	Elliptic Curve Integrated Encryption Scheme
EDDSA	Edwards-Curve Digital Signature Algorithm
FQDN	Fully-Qualified Domain Name
GCM	Galios/Counter Mode





<i>Abbreviation</i>	<i>Meaning</i>
HMAC	Hash-based Message Authentication Code
HTTP	Hypertext Transport Protocol
IANA	Internet Assigned Numbers Authority
ICV	MACsec Integrity Check Value
ID	Identifier
IP	Internet Protocol
ISO	International Standardization Organization
JSON	JavaScript Object Notation
KaY	MACsec Key Agreement Entity
LAN	Local Area Network
MAC	Media Access Control
MAC	Message Authentication Code
MACsec	Media Access Control security
MD	Message Digest
MTU	Maximum Transmission Unit
mDNS	Multicast DNS
NM	Network Management
NV	Non-Volatile
PAE	MACsec Port Access Entity
PHM	Platform Health Management
PKCS	Public Key Cryptography Standards
POSIX	Portable Operating System Interface
PSK	Pre-Shared Key
ROM	Read-Only Memory
RSA	Cryptographic approach according to Rivest, Shamir, and Adleman
SAK	MACsec Secure Association key
SD	Service Discovery
SDG	Special Data Group
SecY	MACsec Security Entity
SHA	Secure Hash Algorithm
SOME/IP	Scalable service-Oriented MiddlewarE over IP
SOVD	Service-Oriented Vehicle Diagnostics
SWC	Software Component
TLS	Transport Layer Security
TLV	Tag Length Value





<i>Abbreviation</i>	<i>Meaning</i>
TTL	Time to Live
UDS	Unified Diagnostic Services
UML	Unified Modeling Language
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UUID	Universally Unique Identifier
VLAN	Virtual Local Area Network
VSA	Variable Size Array

Table 1.1: Terms and Abbreviations used in the scope of this Document

1.4 Document Conventions

Technical terms are typeset in mono spaced font, e.g. `PortPrototype`. As a general rule, plural forms of technical terms are created by adding "s" to the singular form, e.g. `PortPrototypes`. By this means the document resembles terminology used in the AUTOSAR XML Schema.

This document contains constraints in textual form that are distinguished from the rest of the text by a unique numerical constraint ID, a headline, and the actual constraint text starting after the `[` character and terminated by the `]` character.

The purpose of these constraints is to literally constrain the interpretation of the AUTOSAR meta-model such that it is possible to detect violations of the standardized behavior implemented in an instance of the meta-model (i.e. on M1 level).

Makers of AUTOSAR tools are encouraged to add the numerical ID of a constraint that corresponds to an M1 modeling issue as part of the diagnostic message issued by the tool.

The attributes of the classes introduced in this document are listed in form of class tables. They have the form shown in the example of the top-level element AUTOSAR:

Please note that constraints are not supposed to be enforceable at any given time in an AUTOSAR workflow. During the development of a model, constraints may legitimately be violated because an incomplete model will obviously show inconsistencies.

However, at specific points in the workflow, constraints shall be enforced as a safeguard against misconfiguration.

The points in the workflow where constraints shall be enforced, sometimes also known as the "binding time" of the constraint, are different for each model category, e.g. on the classic platform, the constraints defined for software-components are typically enforced

prior to the generation of the RTE while the constraints against the definition of an Ecu extract shall be applied when the Ecu configuration for the Com stack is created.

For each document, possible binding times of constraints are defined and the binding times are typically mentioned in the constraint themselves to give a proper orientation for implementers of AUTOSAR authoring tools.

Let [AUTOSAR](#) be an example of a typical class table. The first rows in the table have the following meaning:

Class: The name of the class as defined in the UML model.

Package: The UML package the class is defined in. This is only listed to help locating the class in the overall meta model.

Note: The comment the modeler gave for the class (class note). Stereotypes and UML tags of the class are also denoted here.

Base Classes: If applicable, the list of direct base classes.

The headers in the table have the following meaning:

Attribute: The name of an attribute of the class. Note that AUTOSAR does not distinguish between class attributes and owned association ends.

Type: The type of an attribute of the class.

Mul.: The assigned multiplicity of the attribute, i.e. how many instances of the given data type are associated with the attribute.

Kind: Specifies, whether the attribute is aggregated in the class (`aggr` aggregation), an UML attribute in the class (`attr` primitive attribute), or just referenced by it (`ref` reference). Instance references are also indicated (`iref` instance reference) in this field.

Note: The comment the modeler gave for the class attribute (role note). Stereotypes and UML tags of the class are also denoted here.

Please note that the chapters that start with a letter instead of a numerical value represent the appendix of the document. The purpose of the appendix is to support the explanation of certain aspects of the document and does not represent binding conventions of the standard.

The verbal forms for the expression of obligation specified in [TPS_STDT_00053] shall be used to indicate requirements, see Standardization Template, chapter Support for Traceability ([6]).

The representation of requirements in AUTOSAR documents follows the table specified in [TPS_STDT_00078], see Standardization Template, chapter Support for Traceability ([6]).

1.5 Imposition Times of Constraints

The constraints formulated in this document have different *actual* imposition times which denote the steps in the workflow when the respective constraint has to be imposed.

The imposition times that are considered applicable in the scope of this document² are listed in Table 1.2.

Please note that the imposition times are intentionally rendered as technical terms such that it is possible to link back from each constraint to the definition of the affected imposition time in Table 1.2.

This document has been created to apply primarily for the *AUTOSAR adaptive platform* and therefore the discussed imposition times also apply exclusively to the *AUTOSAR adaptive platform*.

Imposition Time	Description
at the time before the generation of the ara API starts	This imposition time is aimed at the time when a software-component is ready for generating the header files such that the implementation of the software-component can be started.
at the time when the design of the Executable is complete	This imposition time is aimed at the time when an Executable is finished, i.e. it shall be used in constraints that target the consistency of the modeling of Executable .
at the time when the ProcessDesign is complete	This imposition time is aimed at the time when a ProcessDesign is finished, i.e. it shall be used in constraints that target the consistency of the modeling of ProcessDesign .
at the time when the GrantDesign is complete	This imposition time is aimed at the time when a GrantDesign is finished, i.e. it shall be used in constraints that target the consistency of the modeling of GrantDesign .
at the time when the system design is complete	This imposition time denotes the step in the workflow, where the system design is about to be finished.
at the time when the sub-system design is complete	This imposition time denotes the step in the workflow, where the system design is about to be finished.
at the time when the diagnostic design is complete	This imposition time denotes the step in the workflow, where the diagnostic design is about to be finished.



²Different imposition times may be defined in the context of other AUTOSAR standard documents



<p>at the time when the creation of the manifest is finished</p>	<p>This imposition time denotes the step in the workflow, where the manifest is considered complete such that the installation on a target platform can be started.</p>
<p>at any time in the workflow</p>	<p>This means that the constraint is invariant of the imposition time and therefore universally applicable.</p> <p>Some model configurations <i>never</i> make sense and therefore need to be restricted as early as possible in order to avoid the situation where obviously non-sensical model content is unjustifiably tolerated until some step in the workflow.</p> <p>And then (considerable) effort has to be spent for cleaning up the model.</p>

Table 1.2: Imposition Times considered in the scope of this document

1.6 Requirements Tracing

Requirements against this document are exclusively stated in the corresponding requirements document.

The following table 1.3 references the requirements specified in the corresponding requirements document and provides information about individual specification items that fulfill a given requirement.

Requirement	Description	Satisfied by
[RS_MANI_00001]	Adaptive AUTOSAR Application	[TPS_MANI_01001] [TPS_MANI_01010] [TPS_MANI_01370] [TPS_MANI_01383]
[RS_MANI_00002]	Declaration of provided and required services in an application	[TPS_MANI_01039] [TPS_MANI_01040] [TPS_MANI_01053] [TPS_MANI_01057] [TPS_MANI_01190] [TPS_MANI_03210] [TPS_MANI_03211] [TPS_MANI_03212]
[RS_MANI_00003]	Specification of service interfaces	[TPS_MANI_01001] [TPS_MANI_01004] [TPS_MANI_01005] [TPS_MANI_01006] [TPS_MANI_01007] [TPS_MANI_01033] [TPS_MANI_01034] [TPS_MANI_01035] [TPS_MANI_01064] [TPS_MANI_03118] [TPS_MANI_03119] [TPS_MANI_03223] [TPS_MANI_03291] [TPS_MANI_03628]
[RS_MANI_00004]	Support of application design	[TPS_MANI_01010] [TPS_MANI_01228] [TPS_MANI_01229]
[RS_MANI_00005]	Configuration of diagnostic capabilities of an application	[TPS_MANI_01048] [TPS_MANI_01049] [TPS_MANI_01050] [TPS_MANI_01230] [TPS_MANI_01259] [TPS_MANI_01260] [TPS_MANI_01261] [TPS_MANI_01262] [TPS_MANI_01263] [TPS_MANI_01326] [TPS_MANI_01350] [TPS_MANI_01351] [TPS_MANI_01352] [TPS_MANI_01358] [TPS_MANI_01360] [TPS_MANI_01361] [TPS_MANI_01362] [TPS_MANI_01372] [TPS_MANI_01396] [TPS_MANI_01397] [TPS_MANI_01398] [TPS_MANI_01405]
[RS_MANI_00006]	Support of application deployment	[TPS_MANI_01011] [TPS_MANI_01308] [TPS_MANI_01337] [TPS_MANI_03147]





Requirement	Description	Satisfied by
[RS_MANI_00007]	Configuration of application startup behavior	[TPS_MANI_01012] [TPS_MANI_01013] [TPS_MANI_01017] [TPS_MANI_01041] [TPS_MANI_01046] [TPS_MANI_01061] [TPS_MANI_01188] [TPS_MANI_01209] [TPS_MANI_01277] [TPS_MANI_01278] [TPS_MANI_01328] [TPS_MANI_01334] [TPS_MANI_03151]
[RS_MANI_00008]	Service interface deployment to a transport layer mechanism	[TPS_MANI_01136] [TPS_MANI_01137] [TPS_MANI_01210] [TPS_MANI_03036] [TPS_MANI_03037] [TPS_MANI_03038] [TPS_MANI_03039] [TPS_MANI_03070] [TPS_MANI_03071] [TPS_MANI_03072] [TPS_MANI_03073] [TPS_MANI_03074] [TPS_MANI_03101] [TPS_MANI_03103] [TPS_MANI_03104] [TPS_MANI_03105] [TPS_MANI_03106] [TPS_MANI_03107] [TPS_MANI_03108] [TPS_MANI_03116] [TPS_MANI_03117] [TPS_MANI_03217] [TPS_MANI_03235] [TPS_MANI_03278] [TPS_MANI_03288]
[RS_MANI_00009]	Service instance configuration on the network-level	[TPS_MANI_01316] [TPS_MANI_01317] [TPS_MANI_03001] [TPS_MANI_03002] [TPS_MANI_03003] [TPS_MANI_03004] [TPS_MANI_03005] [TPS_MANI_03006] [TPS_MANI_03007] [TPS_MANI_03008] [TPS_MANI_03009] [TPS_MANI_03010] [TPS_MANI_03022] [TPS_MANI_03023] [TPS_MANI_03024] [TPS_MANI_03049] [TPS_MANI_03061] [TPS_MANI_03236] [TPS_MANI_03237] [TPS_MANI_03292] [TPS_MANI_03293] [TPS_MANI_03554] [TPS_MANI_03555] [TPS_MANI_03619]
[RS_MANI_00011]	Instantiation of provided and required services in an application	[TPS_MANI_01275] [TPS_MANI_01276] [TPS_MANI_01282] [TPS_MANI_03000]
[RS_MANI_00014]	User defined transport layer mechanisms	[TPS_MANI_01165] [TPS_MANI_03032] [TPS_MANI_03045] [TPS_MANI_03046] [TPS_MANI_03047] [TPS_MANI_03048] [TPS_MANI_03102] [TPS_MANI_03280] [TPS_MANI_03281]
[RS_MANI_00015]	Definition of the nature of a manifest	[TPS_MANI_01000] [TPS_MANI_01019] [TPS_MANI_01020] [TPS_MANI_01021]
[RS_MANI_00016]	Usage of data types specifically on the AUTOSAR adaptive platform	[TPS_MANI_01016] [TPS_MANI_01027] [TPS_MANI_01047] [TPS_MANI_01309]
[RS_MANI_00017]	Specification of the mapping of Service Interfaces	[TPS_MANI_01002] [TPS_MANI_01003] [TPS_MANI_01022] [TPS_MANI_01024] [TPS_MANI_01025] [TPS_MANI_01026] [TPS_MANI_01032] [TPS_MANI_03277] [TPS_MANI_03289]
[RS_MANI_00018]	Network connections of the machine	[TPS_MANI_03052] [TPS_MANI_03053]
[RS_MANI_00019]	Service discovery message exchange configuration	[TPS_MANI_03064]
[RS_MANI_00020]	Hardware resources of the machine	[TPS_MANI_01269] [TPS_MANI_03035] [TPS_MANI_03148]
[RS_MANI_00021]	Description of machine states	[TPS_MANI_01330] [TPS_MANI_03035]
[RS_MANI_00022]	Adaptive Platform configuration	[TPS_MANI_01208] [TPS_MANI_01273] [TPS_MANI_03035]
[RS_MANI_00023]	Adaptive Module configuration	[TPS_MANI_01208] [TPS_MANI_01226] [TPS_MANI_01227] [TPS_MANI_01279] [TPS_MANI_01343] [TPS_MANI_01365] [TPS_MANI_01366] [TPS_MANI_01367] [TPS_MANI_01370] [TPS_MANI_01374] [TPS_MANI_01375] [TPS_MANI_01376] [TPS_MANI_01377] [TPS_MANI_01379] [TPS_MANI_01383] [TPS_MANI_01384] [TPS_MANI_01387] [TPS_MANI_01388] [TPS_MANI_01389] [TPS_MANI_01390] [TPS_MANI_01391] [TPS_MANI_01392] [TPS_MANI_01399] [TPS_MANI_01400] [TPS_MANI_01401] [TPS_MANI_01402] [TPS_MANI_01403] [TPS_MANI_01404] [TPS_MANI_01409] [TPS_MANI_01836] [TPS_MANI_02384] [TPS_MANI_02385] [TPS_MANI_02386] [TPS_MANI_02387] [TPS_MANI_02388] [TPS_MANI_03035] [TPS_MANI_03056] [TPS_MANI_03096] [TPS_MANI_03098] [TPS_MANI_03162] [TPS_MANI_03163] [TPS_MANI_03164] [TPS_MANI_03165] [TPS_MANI_03166] [TPS_MANI_03167] [TPS_MANI_03218] [TPS_MANI_03219] [TPS_MANI_03220] [TPS_MANI_03221] [TPS_MANI_03222] [TPS_MANI_03226]





Requirement	Description	Satisfied by
		<p style="text-align: center;">△</p> <p>[TPS_MANI_03260] [TPS_MANI_03261] [TPS_MANI_03262] [TPS_MANI_03263] [TPS_MANI_03264] [TPS_MANI_03265] [TPS_MANI_03266] [TPS_MANI_03267] [TPS_MANI_03268] [TPS_MANI_03269] [TPS_MANI_03270] [TPS_MANI_03271] [TPS_MANI_03272] [TPS_MANI_03273] [TPS_MANI_03274] [TPS_MANI_03276] [TPS_MANI_03279] [TPS_MANI_03282] [TPS_MANI_03283] [TPS_MANI_03285] [TPS_MANI_03286] [TPS_MANI_03294] [TPS_MANI_03502] [TPS_MANI_03503] [TPS_MANI_03505] [TPS_MANI_03508] [TPS_MANI_03509] [TPS_MANI_03510] [TPS_MANI_03511] [TPS_MANI_03512] [TPS_MANI_03513] [TPS_MANI_03514] [TPS_MANI_03515] [TPS_MANI_03516] [TPS_MANI_03517] [TPS_MANI_03544] [TPS_MANI_03545] [TPS_MANI_03546] [TPS_MANI_03553] [TPS_MANI_03573] [TPS_MANI_03574] [TPS_MANI_03575] [TPS_MANI_03576] [TPS_MANI_03625] [TPS_MANI_03626] [TPS_MANI_03633] [TPS_MANI_03651] [TPS_MANI_03670] [TPS_MANI_03672] [TPS_MANI_03673]</p>
[RS_MANI_00024]	SOME/IP transport layer mechanisms	<p>[TPS_MANI_01136] [TPS_MANI_01137] [TPS_MANI_03002] [TPS_MANI_03003] [TPS_MANI_03004] [TPS_MANI_03005] [TPS_MANI_03006] [TPS_MANI_03007] [TPS_MANI_03008] [TPS_MANI_03009] [TPS_MANI_03010] [TPS_MANI_03011] [TPS_MANI_03012] [TPS_MANI_03013] [TPS_MANI_03014] [TPS_MANI_03015] [TPS_MANI_03016] [TPS_MANI_03017] [TPS_MANI_03018] [TPS_MANI_03020] [TPS_MANI_03021] [TPS_MANI_03022] [TPS_MANI_03023] [TPS_MANI_03024] [TPS_MANI_03025] [TPS_MANI_03026] [TPS_MANI_03027] [TPS_MANI_03029] [TPS_MANI_03030] [TPS_MANI_03031] [TPS_MANI_03040] [TPS_MANI_03041] [TPS_MANI_03042] [TPS_MANI_03043] [TPS_MANI_03044] [TPS_MANI_03049] [TPS_MANI_03050] [TPS_MANI_03051] [TPS_MANI_03057] [TPS_MANI_03059] [TPS_MANI_03061] [TPS_MANI_03067] [TPS_MANI_03068] [TPS_MANI_03069] [TPS_MANI_03070] [TPS_MANI_03071] [TPS_MANI_03072] [TPS_MANI_03073] [TPS_MANI_03074] [TPS_MANI_03116] [TPS_MANI_03154] [TPS_MANI_03155] [TPS_MANI_03156] [TPS_MANI_03157] [TPS_MANI_03158] [TPS_MANI_03159] [TPS_MANI_03168] [TPS_MANI_03217] [TPS_MANI_03227] [TPS_MANI_03230] [TPS_MANI_03231] [TPS_MANI_03235] [TPS_MANI_03237] [TPS_MANI_03278] [TPS_MANI_03554] [TPS_MANI_03555]</p>
[RS_MANI_00025]	Definition and configuration of serialization	<p>[TPS_MANI_01210] [TPS_MANI_03101] [TPS_MANI_03102] [TPS_MANI_03103] [TPS_MANI_03104] [TPS_MANI_03105] [TPS_MANI_03106] [TPS_MANI_03107] [TPS_MANI_03108] [TPS_MANI_03109] [TPS_MANI_03117] [TPS_MANI_03288]</p>
[RS_MANI_00026]	Software Component System Design	<p>[TPS_MANI_01191] [TPS_MANI_01192] [TPS_MANI_01198] [TPS_MANI_01274] [TPS_MANI_01863] [TPS_MANI_03110] [TPS_MANI_03111] [TPS_MANI_03112] [TPS_MANI_03113] [TPS_MANI_03114] [TPS_MANI_03115]</p>





Requirement	Description	Satisfied by
[RS_MANI_00027]	Support for access to persistent data	[TPS_MANI_01065] [TPS_MANI_01067] [TPS_MANI_01068] [TPS_MANI_01073] [TPS_MANI_01078] [TPS_MANI_01079] [TPS_MANI_01080] [TPS_MANI_01081] [TPS_MANI_01135] [TPS_MANI_01138] [TPS_MANI_01139] [TPS_MANI_01140] [TPS_MANI_01142] [TPS_MANI_01144] [TPS_MANI_01146] [TPS_MANI_01147] [TPS_MANI_01148] [TPS_MANI_01149] [TPS_MANI_01150] [TPS_MANI_01155] [TPS_MANI_01156] [TPS_MANI_01157] [TPS_MANI_01159] [TPS_MANI_01160] [TPS_MANI_01179] [TPS_MANI_01180] [TPS_MANI_01182] [TPS_MANI_01187] [TPS_MANI_01194] [TPS_MANI_01196] [TPS_MANI_01197] [TPS_MANI_01204] [TPS_MANI_01205] [TPS_MANI_01206] [TPS_MANI_01207] [TPS_MANI_01313] [TPS_MANI_01314] [TPS_MANI_01315] [TPS_MANI_01319] [TPS_MANI_01320] [TPS_MANI_01321] [TPS_MANI_01322] [TPS_MANI_01323] [TPS_MANI_01371] [TPS_MANI_01378] [TPS_MANI_01380]
[RS_MANI_00028]	Configuration of Safety protection	[TPS_MANI_01324] [TPS_MANI_01325] [TPS_MANI_01327] [TPS_MANI_03127] [TPS_MANI_03128] [TPS_MANI_03129] [TPS_MANI_03130] [TPS_MANI_03131] [TPS_MANI_03132] [TPS_MANI_03228] [TPS_MANI_03229] [TPS_MANI_03252]
[RS_MANI_00029]	Mapping description between Signal-based communication and Service-Oriented communication	[TPS_MANI_03124] [TPS_MANI_03125] [TPS_MANI_03627] [TPS_MANI_03629] [TPS_MANI_03635] [TPS_MANI_03665]
[RS_MANI_00030]	Definition of optional elements in composite data structures	[TPS_MANI_01097] [TPS_MANI_01184] [TPS_MANI_01185] [TPS_MANI_01186] [TPS_MANI_01270] [TPS_MANI_01333]
[RS_MANI_00031]	Interaction with Crypto Software	[TPS_MANI_03253] [TPS_MANI_03254] [TPS_MANI_03255] [TPS_MANI_03256] [TPS_MANI_03257] [TPS_MANI_03258] [TPS_MANI_03259]
[RS_MANI_00032]	Support for platform health management	[TPS_MANI_01280] [TPS_MANI_03500] [TPS_MANI_03502] [TPS_MANI_03503] [TPS_MANI_03505] [TPS_MANI_03508] [TPS_MANI_03509] [TPS_MANI_03510] [TPS_MANI_03511] [TPS_MANI_03512] [TPS_MANI_03513] [TPS_MANI_03514] [TPS_MANI_03515] [TPS_MANI_03516] [TPS_MANI_03517] [TPS_MANI_03534] [TPS_MANI_03544] [TPS_MANI_03545] [TPS_MANI_03546] [TPS_MANI_03553] [TPS_MANI_03573] [TPS_MANI_03574] [TPS_MANI_03575] [TPS_MANI_03576] [TPS_MANI_03624] [TPS_MANI_03625] [TPS_MANI_03626] [TPS_MANI_03630] [TPS_MANI_03631] [TPS_MANI_03633] [TPS_MANI_03651] [TPS_MANI_03670] [TPS_MANI_03672] [TPS_MANI_03673]
[RS_MANI_00034]	Specification of intents	[TPS_MANI_01106] [TPS_MANI_01107] [TPS_MANI_01108] [TPS_MANI_03209]
[RS_MANI_00035]	Definition of an uploadable software package	[TPS_MANI_01109] [TPS_MANI_01110] [TPS_MANI_01111] [TPS_MANI_01112] [TPS_MANI_01114] [TPS_MANI_01115] [TPS_MANI_01116] [TPS_MANI_01117] [TPS_MANI_01118] [TPS_MANI_01119] [TPS_MANI_01164] [TPS_MANI_01189] [TPS_MANI_01202] [TPS_MANI_01211] [TPS_MANI_01213] [TPS_MANI_01214] [TPS_MANI_01215] [TPS_MANI_01216] [TPS_MANI_01217] [TPS_MANI_01218] [TPS_MANI_01219] [TPS_MANI_01220] [TPS_MANI_01221] [TPS_MANI_01222] [TPS_MANI_01223] [TPS_MANI_01225] [TPS_MANI_01290] [TPS_MANI_01291] [TPS_MANI_01292] [TPS_MANI_01294] [TPS_MANI_01295] [TPS_MANI_01296] [TPS_MANI_01297] [TPS_MANI_01298] [TPS_MANI_01299] [TPS_MANI_01300] [TPS_MANI_01301] [TPS_MANI_01302] [TPS_MANI_01306] [TPS_MANI_01329] [TPS_MANI_01331] [TPS_MANI_01344] [TPS_MANI_01345] [TPS_MANI_01346] [TPS_MANI_01349] [TPS_MANI_01369] [TPS_MANI_01410]





Requirement	Description	Satisfied by
[RS_MANI_00036]	Configuration of security protection	[TPS_MANI_03133] [TPS_MANI_03134] [TPS_MANI_03137] [TPS_MANI_03138] [TPS_MANI_03139] [TPS_MANI_03140] [TPS_MANI_03199] [TPS_MANI_03200] [TPS_MANI_03203] [TPS_MANI_03204] [TPS_MANI_03205] [TPS_MANI_03206] [TPS_MANI_03207] [TPS_MANI_03208] [TPS_MANI_03213] [TPS_MANI_03214] [TPS_MANI_03215] [TPS_MANI_03216] [TPS_MANI_03232] [TPS_MANI_03233] [TPS_MANI_03234] [TPS_MANI_03240] [TPS_MANI_03241] [TPS_MANI_03242] [TPS_MANI_03317] [TPS_MANI_03318] [TPS_MANI_03319] [TPS_MANI_03320] [TPS_MANI_03661] [TPS_MANI_03664]
[RS_MANI_00037]	Configuration of logging and tracing	[TPS_MANI_03284]
[RS_MANI_00038]	DDS transport layer mechanisms	[TPS_MANI_03525] [TPS_MANI_03526] [TPS_MANI_03527] [TPS_MANI_03528] [TPS_MANI_03529] [TPS_MANI_03530] [TPS_MANI_03531] [TPS_MANI_03532] [TPS_MANI_03533] [TPS_MANI_03556] [TPS_MANI_03557] [TPS_MANI_03558] [TPS_MANI_03561] [TPS_MANI_03562] [TPS_MANI_03567] [TPS_MANI_03568] [TPS_MANI_03622] [TPS_MANI_03650] [TPS_MANI_03662]
[RS_MANI_00039]	Usage of implementation specific data types	[TPS_MANI_01166] [TPS_MANI_01167] [TPS_MANI_01168] [TPS_MANI_01169] [TPS_MANI_01171] [TPS_MANI_01172] [TPS_MANI_01173] [TPS_MANI_01174] [TPS_MANI_01175] [TPS_MANI_01176] [TPS_MANI_01177] [TPS_MANI_01201] [TPS_MANI_01212] [TPS_MANI_01393] [TPS_MANI_03169] [TPS_MANI_03170] [TPS_MANI_03171] [TPS_MANI_03172] [TPS_MANI_03173] [TPS_MANI_03174] [TPS_MANI_03175] [TPS_MANI_03176] [TPS_MANI_03177] [TPS_MANI_03178] [TPS_MANI_03179] [TPS_MANI_03180] [TPS_MANI_03181] [TPS_MANI_03183] [TPS_MANI_03184] [TPS_MANI_03185] [TPS_MANI_03186] [TPS_MANI_03187] [TPS_MANI_03188] [TPS_MANI_03189] [TPS_MANI_03190] [TPS_MANI_03191] [TPS_MANI_03192] [TPS_MANI_03193] [TPS_MANI_03196] [TPS_MANI_03197] [TPS_MANI_03198] [TPS_MANI_03201] [TPS_MANI_03202]
[RS_MANI_00040]	Support for access to synchronized time	[TPS_MANI_03535] [TPS_MANI_03536] [TPS_MANI_03537] [TPS_MANI_03539] [TPS_MANI_03541] [TPS_MANI_03542] [TPS_MANI_03543] [TPS_MANI_03547] [TPS_MANI_03548] [TPS_MANI_03549] [TPS_MANI_03551] [TPS_MANI_03632] [TPS_MANI_03671]
[RS_MANI_00041]	Configuration of function groups	[TPS_MANI_01330] [TPS_MANI_03145] [TPS_MANI_03152] [TPS_MANI_03194] [TPS_MANI_03195]
[RS_MANI_00050]	Support of Deterministic Client	[TPS_MANI_01199] [TPS_MANI_01200] [TPS_MANI_01203] [TPS_MANI_01406] [TPS_MANI_01407] [TPS_MANI_01408]
[RS_MANI_00060]	Support of Identity and Access Management	[TPS_MANI_01231] [TPS_MANI_01232] [TPS_MANI_01233] [TPS_MANI_01234] [TPS_MANI_01235] [TPS_MANI_01236] [TPS_MANI_01237] [TPS_MANI_01238] [TPS_MANI_01239] [TPS_MANI_01240] [TPS_MANI_01241] [TPS_MANI_01284] [TPS_MANI_01307] [TPS_MANI_03238] [TPS_MANI_03239] [TPS_MANI_03240] [TPS_MANI_03241] [TPS_MANI_03242] [TPS_MANI_03244] [TPS_MANI_03245] [TPS_MANI_03246] [TPS_MANI_03247] [TPS_MANI_03248] [TPS_MANI_03249] [TPS_MANI_03250] [TPS_MANI_03251] [TPS_MANI_03290]





Requirement	Description	Satisfied by
[RS_MANI_00061]	Support of Diagnostic Interfaces	[TPS_MANI_01048] [TPS_MANI_01049] [TPS_MANI_01050] [TPS_MANI_01242] [TPS_MANI_01243] [TPS_MANI_01244] [TPS_MANI_01245] [TPS_MANI_01246] [TPS_MANI_01247] [TPS_MANI_01248] [TPS_MANI_01249] [TPS_MANI_01250] [TPS_MANI_01251] [TPS_MANI_01252] [TPS_MANI_01253] [TPS_MANI_01254] [TPS_MANI_01255] [TPS_MANI_01259] [TPS_MANI_01260] [TPS_MANI_01261] [TPS_MANI_01262] [TPS_MANI_01263] [TPS_MANI_01265] [TPS_MANI_01326] [TPS_MANI_01332] [TPS_MANI_01347] [TPS_MANI_01348] [TPS_MANI_01351] [TPS_MANI_01352] [TPS_MANI_01353] [TPS_MANI_01359] [TPS_MANI_01360] [TPS_MANI_01361] [TPS_MANI_01362] [TPS_MANI_01363] [TPS_MANI_01373] [TPS_MANI_01394] [TPS_MANI_01395]
[RS_MANI_00062]	Support for Partial Networking	[TPS_MANI_03224] [TPS_MANI_03225]
[RS_MANI_00063]	The Manifest specification shall support the translation between signal-based and service-oriented communication	[TPS_MANI_03287] [TPS_MANI_03577] [TPS_MANI_03578] [TPS_MANI_03579] [TPS_MANI_03580] [TPS_MANI_03581] [TPS_MANI_03582] [TPS_MANI_03583] [TPS_MANI_03585] [TPS_MANI_03589] [TPS_MANI_03590] [TPS_MANI_03591] [TPS_MANI_03592] [TPS_MANI_03593] [TPS_MANI_03594] [TPS_MANI_03595] [TPS_MANI_03597] [TPS_MANI_03598] [TPS_MANI_03599] [TPS_MANI_03600] [TPS_MANI_03601] [TPS_MANI_03602] [TPS_MANI_03603] [TPS_MANI_03604] [TPS_MANI_03605] [TPS_MANI_03606] [TPS_MANI_03607] [TPS_MANI_03608] [TPS_MANI_03609] [TPS_MANI_03610] [TPS_MANI_03611] [TPS_MANI_03612] [TPS_MANI_03614] [TPS_MANI_03615] [TPS_MANI_03620] [TPS_MANI_03621] [TPS_MANI_03636] [TPS_MANI_03637] [TPS_MANI_03638] [TPS_MANI_03639] [TPS_MANI_03640] [TPS_MANI_03641] [TPS_MANI_03642] [TPS_MANI_03643] [TPS_MANI_03644] [TPS_MANI_03645] [TPS_MANI_03646] [TPS_MANI_03647] [TPS_MANI_03648] [TPS_MANI_03649] [TPS_MANI_03652] [TPS_MANI_03653] [TPS_MANI_03654] [TPS_MANI_03655] [TPS_MANI_03656] [TPS_MANI_03657] [TPS_MANI_03658] [TPS_MANI_03659] [TPS_MANI_03660] [TPS_MANI_03663] [TPS_MANI_03666] [TPS_MANI_03667]
[RS_MANI_00064]	Service contract version for a service interface	[TPS_MANI_03616]
[RS_MANI_00065]	Service contract versioning for all Transport Deployment Protocols	[TPS_MANI_03617]
[RS_MANI_00066]	Service Versioning Blocklist	[TPS_MANI_03618]
[RS_MANI_00067]	Raw data stream deployment	[TPS_MANI_01285] [TPS_MANI_01287] [TPS_MANI_01307] [TPS_MANI_01354] [TPS_MANI_01355] [TPS_MANI_01356] [TPS_MANI_01357]
[RS_MANI_00068]	Support for security event reporting interface definitions	[TPS_MANI_01338] [TPS_MANI_01339] [TPS_MANI_01340]
[RS_MANI_00069]	Support for deployment definition of the Intrusion Detection System Manager	[TPS_MANI_01341] [TPS_MANI_01342]
[RS_MANI_00070]	Support for SOVD	[TPS_MANI_01394] [TPS_MANI_01395] [TPS_MANI_01396] [TPS_MANI_01397] [TPS_MANI_01398] [TPS_MANI_01399] [TPS_MANI_01400] [TPS_MANI_01401] [TPS_MANI_01402] [TPS_MANI_01403] [TPS_MANI_01404] [TPS_MANI_01405]

Table 1.3: RequirementsTracing

2 Big Picture of Manifest Definition

2.1 Design vs. Deployment

2.1.1 Overview

Despite the name, this document contains the description of model elements that are clearly bound to a *design* workflow **and** model elements that have a strong relation to the *deployment* aspect.

Model elements discussed in this document are either related to *design* or *deployment*, there is no overlap between the two groups.

Model elements that are related to *deployment* will be used in models that are uploaded to a target platform, see [TPS_MANI_01000]. These model elements are mainly described in sections of this document where the term “Manifest” is part of the section title.

2.1.2 Relation between Design and Deployment Models

Please note that in many cases the part of the meta-model related to *deployment* reflects a similar modeling in the *design* domain, e.g. the definition of E2E profile parameters.

There is currently no clearly defined preference about how the relation between *design* and *deployment* may impact a concrete development project. The following scenarios for the example of *E2E properties* might occur:

- An OEM delivers the description of `AdaptivePlatformServiceInstances` including the definition of *E2E properties*.

It is safe to assume that subsequent processing of the model shall take the *E2E properties* as granted and develop the software with respect to the given properties.

- Software exists that has defined *E2E properties* by means of `ComSpecs`. For various reasons, it may happen that the software cannot be updated and therefore takes the “lead” in terms of the definition of *E2E properties*.

The definition of `AdaptivePlatformServiceInstances` may then have to respect the existing modeling on the software side.

- It could also happen that existing definitions can be **partly** overwritten by engineers who **really** know what they are doing.

In addition, it should be noted that some model elements are used in both design and deployment steps of the workflow, which is another indication that the border between design and deployment is not as easily defined as on the *AUTOSAR classic platform*.

In contrast, other model elements described in this document that are part of the content that gets uploaded to the target platform have direct counterparts on the design level.

One example for such a relation is the definition of [ProcessDesign](#) and [Process](#). In these cases it would be easier to draw the line between design and deployment aspects of the model.

A consequence of the (at least intended) separation between design and deployment model elements is that content that is primarily related to design objects needs to be duplicated on the deployment level as a measure to keep the actual manifest content as lean as possible.

For example, if a deployment element needs to refer to a [PortPrototype](#) and information from e.g. the `ComSpec` attached to the [PortPrototype](#) is required in the manifest to properly define the intended semantics, then the owner of the [PortPrototype](#) (i.e. a [SwComponentPrototype](#) typed by an [SwComponentType](#)) would also have to appear in the manifest.

It is obvious that, this way, the entire software model would make it into the manifest and inflate the manifest content unnecessarily.

However, in such a situation, there is a tendency to duplicate model content from the design domain in the deployment to at least keep the manifest content as compact as possible.

There are cases, however, where the mere existence of a reference into the design model is already representing valuable information. References that expose this capability are decorated with the stereotype `<<atpUriDef>>`.

Specifically, it is possible for the software on the platform to derive the value of an `InstanceSpecifier` from the content of an `instanceRef` decorated with `<<atpUriDef>>`. This is a very important mechanism for the platform software to interact with the application layer.

Another example is the definition of the [checkpointId](#) in the context of the configuration of the Platform Health Manager.

The modeling of the PHM interaction on the application layer involves the definition of the value of the [PhmCheckpoint.checkpointId](#) and the [PortPrototype](#) where a specific [PhmCheckpoint.checkpointId](#) is used is identified by means of a reference stereotyped as `<<atpUriDef>>`.

And because the target of the reference is not necessarily existing on the platform, the [SupervisionCheckpoint.checkpointId](#) is replicated in the manifest model so that the platform software has access to this important piece of information (this aspect is also explained in [Figure 10.9](#)).

2.1.3 Structure of the document

The structure of the document maps to the division between *design* and *deployment* such that the *design* aspect is mostly described in sections 3, 4, 6, 7, and most of 13.

In contrast, chapters 9, 8, 10, 11, 13.3, 14, and 15 focus on *deployment*-related content.

2.2 About Manifest

This chapter shall clarify the definition of the term [Manifest](#) in the context of the *AUTOSAR adaptive platform*.

[TPS_MANI_01000]{DRAFT} Definition of the term [Manifest](#) [A [Manifest](#) represents a piece of AUTOSAR model description that is created to support the configuration of an *AUTOSAR adaptive platform* product and which is uploaded to the *AUTOSAR adaptive platform* product, potentially in combination with other artifacts (like binary files) that contain executable code to which the [Manifest](#) applies.] ([RS_MANI_00015](#))

It is important to stress the fact that the usage of a [Manifest](#) is indeed strictly limited to the *AUTOSAR adaptive platform* and that there is no use case to port the concept to the *AUTOSAR classic platform*.

2.3 Serialization Format

One aspect that the definition of a [Manifest](#) has in common with other AUTOSAR model content is the standardized serialization format.

[TPS_MANI_01020]{DRAFT} Serialization format of the [Manifest](#) in AUTOSAR [The standardized serialization format of [Manifest](#) content in AUTOSAR is ARXML.

Consequently, [Manifest](#) model content can be validated against the AUTOSAR XML Schema.] ([RS_MANI_00015](#))

An important consequence of [\[TPS_MANI_01020\]](#) is that there is no limitation to just one “manifest file” a.k.a. “the manifest”.

Content may be distributed among several physical files according to the rules given in the specification of the AUTOSAR Generic Structure Template [\[7\]](#).

[TPS_MANI_01021]{DRAFT} Serialization format of [Manifest](#) content on a machine [The serialization format used to actually upload a manifest on a machine may be freely chosen by a platform supplier.

However, the content and semantics of the original ARXML [Manifest](#) needs to be **fully preserved.**] ([RS_MANI_00015](#))

It can be expected that in many cases the best option for the upload of the [Manifest](#) will still be ARXML because a custom format obviously has to support the full complexity of the [Manifest](#) meta-model.

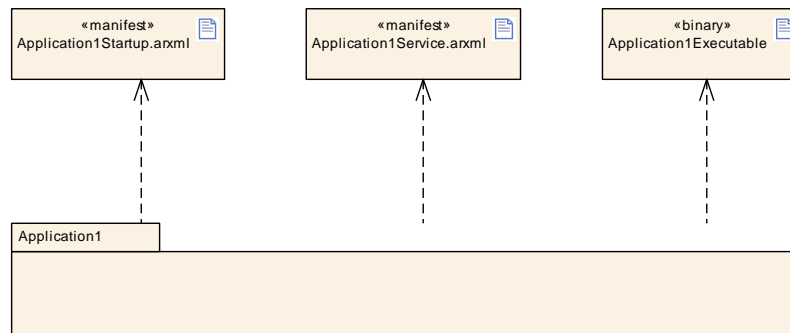


Figure 2.1: Example usage of several manifest files within one software delivery

Please note that the meta-model foresees the existence of references from manifest-related meta-classes to design-related meta-classes.

These references are created for the sake of clarity but it is not mandatory that the content of the reference actually needs to be resolvable.

In terms of the AUTOSAR modeling approach, this translates to a decoration of these references with the stereotype `<<atpUriDef>>`. More information can be found in [7].

If the referenced meta-classes contain information that is relevant for the manifest level then this information is replicated on the manifest level (such that the manifest-level model does not have to rely on the availability of design-level information).

2.4 Scope

As mentioned before, the usage of a [Manifest](#) is limited to the *AUTOSAR adaptive platform*. This does not mean, however, that all ARXML produced in a development project that targets the *AUTOSAR adaptive platform* is automatically considered a [Manifest](#).

In fact, the *AUTOSAR adaptive platform* is usually not exclusively used in a vehicle project.

A typical vehicle will most likely be also equipped with a number of ECUs developed on the *AUTOSAR classic platform* and the system design for the entire vehicle will therefore have to cover both ECUs built on top of the *AUTOSAR classic platform* and those created on top of the *AUTOSAR adaptive platform*.

[TPS_MANI_01019]{DRAFT} [Manifest](#) content may apply to different aspects of the *AUTOSAR adaptive platform* [[Manifest](#) content can apply to different aspects of the model. At the moment, [Manifest](#) content can roughly be divided into three focus areas:

- Application-related [Manifest](#) content describes all aspects of the deployment of an application, including - but not limited to - the startup configuration and the configuration of service-oriented communication endpoints on application level.
- Machine-related [Manifest](#) content describes the deployment of just a machine, i.e. without any application (including platform modules) running on the machine.
- Service instance-related [Manifest](#) describes how service-oriented communication on transport layer level is bound to endpoints in the application and (in some cases) platform software.

]([RS_MANI_00015](#))

2.5 Manifests described in this Document

In principle, the term [Manifest](#) could be defined such that there is conceptually just one “manifest” and every deployment aspect would be handled in this context.

This does not seem appropriate because it became apparent that manifest-related model-elements exist that are relevant in entirely different phases of a typical development project.

This aspect is taken as the main motivation to subdivide the definition of the term [Manifest](#) in five different partitions:

Execution Manifest This kind of [Manifest](#) is used to specify the deployment-related information of applications running on the *AUTOSAR adaptive platform*.

An [Execution Manifest](#) is bundled with the actual executable code in order to support the integration of the executable code onto the machine.

Please find more information regarding this topic in section [8](#).

Service Instance Manifest This kind of [Manifest](#) is used to specify how service-oriented communication is configured in terms of the requirements of the underlying transport protocols.

A [Service Instance Manifest](#) is bundled with the actual executable code that implements the respective usage of service-oriented communication.

Please find more information regarding this topic in section [11](#).

Machine Manifest This kind of [Manifest](#) is supposed to describe deployment-related content that applies to the configuration of just the underlying machine (i.e. without any applications running on the machine) that runs an *AUTOSAR adaptive platform*.

A [Machine Manifest](#) is bundled with the software taken to establish an instance of the *AUTOSAR adaptive platform*.

Please find more information regarding this topic in sections [9](#) and [10](#).

Raw Data Stream Manifest This kind of [Manifest](#) describes the configuration of client and server for the purpose of communicating via raw data streams.

Software Distribution This kind of [Manifest](#) describes the packaging and logistics aspects of software on the *AUTOSAR adaptive platform*.

Please find more information regarding this topic in section [15](#).

The temporal division between the definition (and usage) of different kinds of [Manifest](#) leads to the conclusion that in most cases different physical files will be used to store the content of the different kinds of [Manifest](#).

However, as with all kinds of ARXML content, this is not a binding rule.

3 Application Design

3.1 Overview

This chapter describes all design-related modeling that applies to the creation of application software on the *AUTOSAR adaptive platform*.

There are also some extensions of existing modeling used on the *AUTOSAR classic platform* specifically for the usage on the *AUTOSAR adaptive platform*, e.g. the introduction of new values of the attribute `category`.

In particular, this section of the document focuses on the following aspects:

- Definition of a dedicated subclass of `SwComponentType` for the *AUTOSAR adaptive platform* (section 3.2)
- Definition of data types specifically for the *AUTOSAR adaptive platform* (section 3.3)
- Service interface as the pivotal element for service-oriented communication (section 3.4)
- Definition of domain-specific `PortInterfaces`, e.g. for diagnostics (section 3.11), PHM (section 3.10), persistency (section 3.8), crypto (section 3.12).
- Service interface mapping as a mediator between internal and external communication (section 3.5)
- Service interface **element** mapping as a mediator between internal and external communication (section 3.6)
- Aspects of the fine-grained configuration of interaction with the “outside world” from the perspective of the inside of a software-component (section 3.17)
- `Executable` as the design-level representation of the smallest executable unit (section 3.18)
- Handling of optional elements in data structures, see section 3.19
- Configuration of transformation properties (section 3.20)
- Description of how to front-load the configuration of a `Process` by means of `ProcessDesign`, see section 3.21.
- Description of the design-level IAM configuration by means of the `GrantDesign`, see section 3.22

3.2 Software Component

In principle, it would be possible to directly take over the definition of e.g. [ApplicationSwComponentType](#) for the usage on the *AUTOSAR adaptive platform*.

However, this would complicate the formulation of constraints regarding the existence of model elements (for example: data types, as explained in section 3.3) that are exclusive to the *AUTOSAR adaptive platform*.

Therefore, the [AdaptiveApplicationSwComponentType](#) is defined as a representation of software-components on the *AUTOSAR adaptive platform*.

The Existence of the [AdaptiveApplicationSwComponentType](#) allows for a convenient way (see [[constr_1492](#)]) to lock out most kinds of software-component defined for the *AUTOSAR classic platform* from the usage on the *AUTOSAR adaptive platform*.

The clarification of the opposite direction (i.e. an erroneous use of an [AdaptiveApplicationSwComponentType](#)) is less obvious.

In other words, it may be possible to use an [AdaptiveApplicationSwComponentType](#) within a [System](#) as some sort of overall design model for software on both the *AUTOSAR classic platform* **and** the *AUTOSAR adaptive platform*.

This aspect, however, is not clarified so far nor is a restriction in place that prohibits [AdaptiveApplicationSwComponentType](#) to appear in the context of a [System](#).

Later versions of this specification may fix the missing regulation.

Class	AdaptiveApplicationSwComponentType			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure			
Note	This meta-class represents the ability to support the formal modeling of application software on the AUTOSAR adaptive platform. Consequently, it shall only be used on the AUTOSAR adaptive platform. Tags: atp.recommendedPackage=AdaptiveApplicationSwComponentTypes			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , SwComponentType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
internalBehavior	AdaptiveSwcInternalBehavior	0..1	aggr	This aggregation represents the internal behavior of the AdaptiveApplicationSwComponentType for the AUTOSAR adaptive platform. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=internalBehavior.shortName, internalBehavior.variationPoint.shortLabel vh.latestBindingTime=preCompileTime

Table 3.1: AdaptiveApplicationSwComponentType

Class	AdaptiveSwcInternalBehavior			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::AdaptiveInternalBehavior			
Note	This meta-class represents the ability to define an internal behavior of an AtomicSwComponentType used on the AUTOSAR adaptive platform. Please note that the model of internal behavior in this case, in stark contrast to the situation of the AUTOSAR classic platform, is very minimal.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	AdaptiveApplicationSwComponentType.internalBehavior			
Attribute	Type	Mult.	Kind	Note
service Dependency	SwcService Dependency	*	aggr	This represents the collection of SwcService Dependencies owned by AdaptiveInternalBehavior.

Table 3.2: AdaptiveSwcInternalBehavior

3.3 Data Type

3.3.1 Overview

The specification of data types on the *AUTOSAR adaptive platform* follows the same pattern as the counterpart on the *AUTOSAR classic platform*: data types are defined on different levels of abstraction that complement each other.

In the context of this document, the focus is on the discussion of [ApplicationDataTypes](#) and [CppImplementationDataTypes](#).

In general, most of the concepts regarding the definition of data types can be taken over from the existing specifications on the *AUTOSAR classic platform*.

However, some aspects are specific to the *AUTOSAR adaptive platform* and are consequently discussed in the scope of this document rather than the specification of the AUTOSAR Software Component Template [1].

One of the aspects that could be taken over from the *AUTOSAR classic platform* is the definition of initial values.

Although the utility of initial values is certainly limited on the *AUTOSAR adaptive platform*, there is an opportunity to utilize the definition of initial values in the context of the so-called [Fields](#) (see [TPS_MANI_01034]).

3.3.2 ApplicationDataType

The full range of the modeling of [ApplicationDataTypes](#) that is supported on the *AUTOSAR classic platform* can directly be used on the *AUTOSAR adaptive platform* as well.

In addition to the [ApplicationDataTypes](#) supported on the *AUTOSAR classic platform*, there are further [ApplicationDataTypes](#) that – while in principle also available on the *AUTOSAR classic platform* – are primarily used on and designed for the *AUTOSAR adaptive platform*.

Class	ApplicationDataType (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	ApplicationDataType defines a data type from the application point of view. Especially it should be used whenever something "physical" is at stake. An ApplicationDataType represents a set of values as seen in the application model, such as measurement units. It does not consider implementation details such as bit-size, endianness, etc. It should be possible to model the application level aspects of a VFB system by using ApplicationDataTypes only.			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	ApplicationCompositeDataType , ApplicationPrimitiveDataType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.3: ApplicationDataType

3.3.2.1 String Data Type

While the handling of data types that represent textual strings is very similar with respect to the definition of [ApplicationDataTypes](#) on the *AUTOSAR classic platform* and the *AUTOSAR adaptive platform*, special regulations apply on the level of [CppImplementationDataTypes](#) on the *AUTOSAR adaptive platform*.

For more information about the modeling of string data types on the level of [CppImplementationDataType](#) please refer to section 3.3.3.4.

For the sake of consistency, this chapter summarizes the modeling of [Application-DataTypes](#) for the modeling of data types that represent textual strings as far as the *AUTOSAR adaptive platform* is concerned.

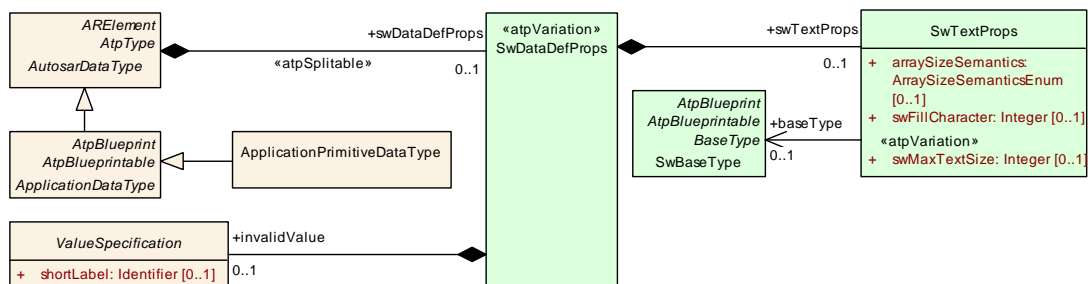


Figure 3.1: Specification of textual strings

The meta-classes used to define an [ApplicationPrimitiveDataType](#) of category *STRING* are summarized in Figure 3.1.

Please note that thanks to the usage of programming languages with richer data types than plain C, the implementation of an `ApplicationPrimitiveDataType` of category `STRING` on the *AUTOSAR adaptive platform* is predefined for a given *language binding*.

[TPS_MANI_01047]{DRAFT} **Existence of `SwRecordLayout` for an `ApplicationPrimitiveDataType` of category `STRING`** [For the usage of an `ApplicationPrimitiveDataType` of category `STRING` on the *AUTOSAR adaptive platform*, the existence of `ApplicationPrimitiveDataType.swDataDefProps.swRecordLayout` shall be ignored.](*RS_MANI_00016*)

Please note that [TPS_MANI_01047] intentionally does not forbid the existence of `SwRecordLayout` because the same `ApplicationPrimitiveDataType` of category `STRING` could rightfully be used **on both** the *AUTOSAR adaptive platform* and the *AUTOSAR classic platform*.

Class	<code>ApplicationPrimitiveDataType</code>			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	A primitive data type defines a set of allowed values. Tags: atp.recommendedPackage=ApplicationDataTypes			
Base	ARElement , ARObject , ApplicationDataType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.4: ApplicationPrimitiveDataType

Class	<code>SwTextProps</code>			
Package	M2::MSR::DataDictionary::DataDefProperties			
Note	This meta-class expresses particular properties applicable to strings in variables or calibration parameters.			
Base	ARObject			
Aggregated by	SwDataDefProps.swTextProps			
Attribute	Type	Mult.	Kind	Note
arraySize Semantics	ArraySizeSemanticsEnum	0..1	attr	This attribute controls the semantics of the arraysize for the array representing the string in an ImplementationDataType. It is there to support a safe conversion between <code>ApplicationDatatype</code> and <code>ImplementationDatatype</code> , even for variable length strings as required e.g. for Support of SAE J1939.
baseType	SwBaseType	0..1	ref	This is the base type of one character in the string. In particular this <code>baseType</code> denotes the intended encoding of the characters in the string on level of <code>ApplicationDataType</code> . Tags: xml.sequenceOffset=30





Class	SwTextProps			
swFillCharacter	Integer	0..1	attr	<p>Filler character for text parameter to pad up to the maximum length swMaxTextSize.</p> <p>The value will be interpreted according to the encoding specified in the associated base type of the data object, e.g. 0x30 (hex) represents the ASCII character zero as filler character and 0 (dec) represents an end of string as filler character.</p> <p>The usage of the fill character depends on the arraySize Semantics.</p> <p>Tags:xml.sequenceOffset=40</p>
swMaxTextSize	Integer	0..1	attr	<p>Specifies the maximum text size in characters. Note the size in bytes depends on the encoding in the corresponding baseType.</p> <p>Stereotypes: atpVariation</p> <p>Tags: vh.latestBindingTime=preCompileTime xml.sequenceOffset=20</p>

Table 3.5: SwTextProps

Enumeration	ArraySizeSemanticsEnum
Package	M2::AUTOSARTemplates::CommonStructure::ImplementationDataTypes
Note	This type controls how the information about the number of elements in an ApplicationArrayType is to be interpreted.
Aggregated by	ApplicationArrayElement.arraySizeSemantics , DiagnosticDataElement.arraySizeSemantics , ImplementationDataTypeElement.arraySizeSemantics , SwTextProps.arraySizeSemantics
Literal	Description
fixedSize	<p>This means that the ApplicationArrayType will always have a fixed number of elements.</p> <p>Tags:atp.EnumerationLiteralIndex=0</p>
variableSize	<p>This implies that the actual number of elements in the ApplicationArrayType might vary at run-time. The value of arraySize represents the maximum number of elements in the array.</p> <p>Tags:atp.EnumerationLiteralIndex=1</p>

Table 3.6: ArraySizeSemanticsEnum

Class	SwBaseType			
Package	M2::MSR::AsamHdo::BaseTypes			
Note	<p>This meta-class represents a base type used within ECU software.</p> <p>Tags:atp.recommendedPackage=BaseTypes</p>			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , BaseType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.7: SwBaseType

3.3.2.2 Associative Map Data Type

[TPS_MANI_01027]{DRAFT} **Semantics of `ApplicationAssocMapDataType`** [An `ApplicationAssocMapDataType` represents an associative data structure, i.e. a data structure where so-called *keys* (formalized as `ApplicationAssocMapDataType.key` that are in turn typed by an `ApplicationDataType`) are associated with *values* (formalized as `ApplicationAssocMapDataType.value` that are also in turn typed by an `ApplicationDataType`).] (*RS_MANI_00016*)

[constr_3349]{DRAFT} **Usage of `ApplicationAssocMapDataType` is limited** [The usage of an `ApplicationAssocMapDataType` is limited to the context of `AdaptiveApplicationSwComponentTypes` and `CompositionSwComponentTypes` defined in the context of an `Executable`, i.e. such a data type shall not be used on the *AUTOSAR classic platform*.] ()

[constr_3349] is a formal approach to express that an `ApplicationAssocMapDataType` shall only be used on the *AUTOSAR adaptive platform*.

[TPS_MANI_01016]{DRAFT} **Category of `ApplicationAssocMapDataType`** [The value `ApplicationAssocMapDataType.category` shall be set to `ASSOCIATIVE_MAP` for attribute.] (*RS_MANI_00016*)

Figure 3.2 depicts an example of the structure of an `ApplicationAssocMapDataType`.

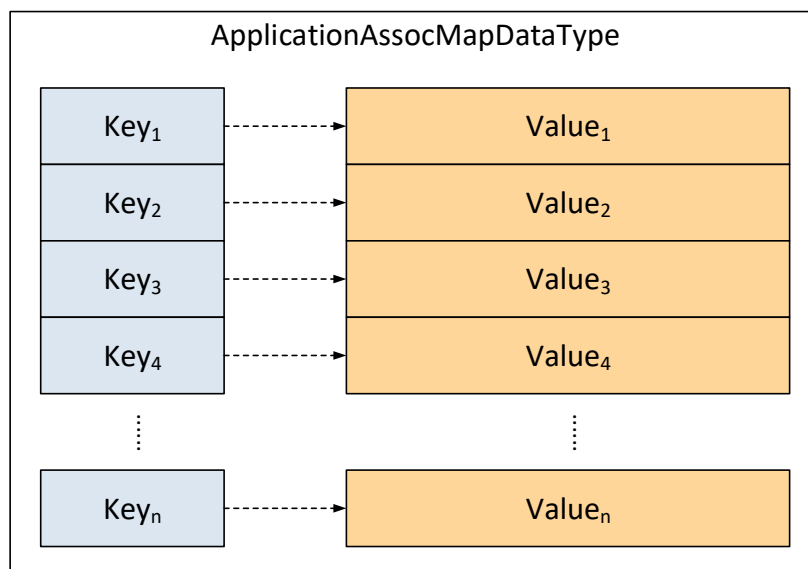


Figure 3.2: Example `ApplicationAssocMapDataType` on the *AUTOSAR adaptive platform*

As can be deduced from looking at Figure 3.2, the concept of an `ApplicationDataType` of category `MAP` shall not be confused with an `ApplicationAssocMapDataType`¹.

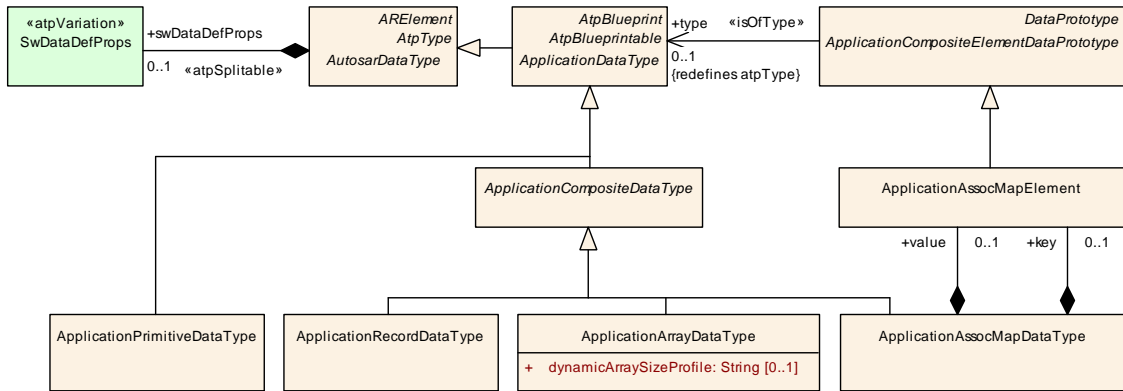


Figure 3.3: Formal model of `ApplicationAssocMapDataType`

There are a number of technical implications on the usage of an associative data structure at run-time, e.g. that the content of each `key` shall be unique within the context of the overall data structure.

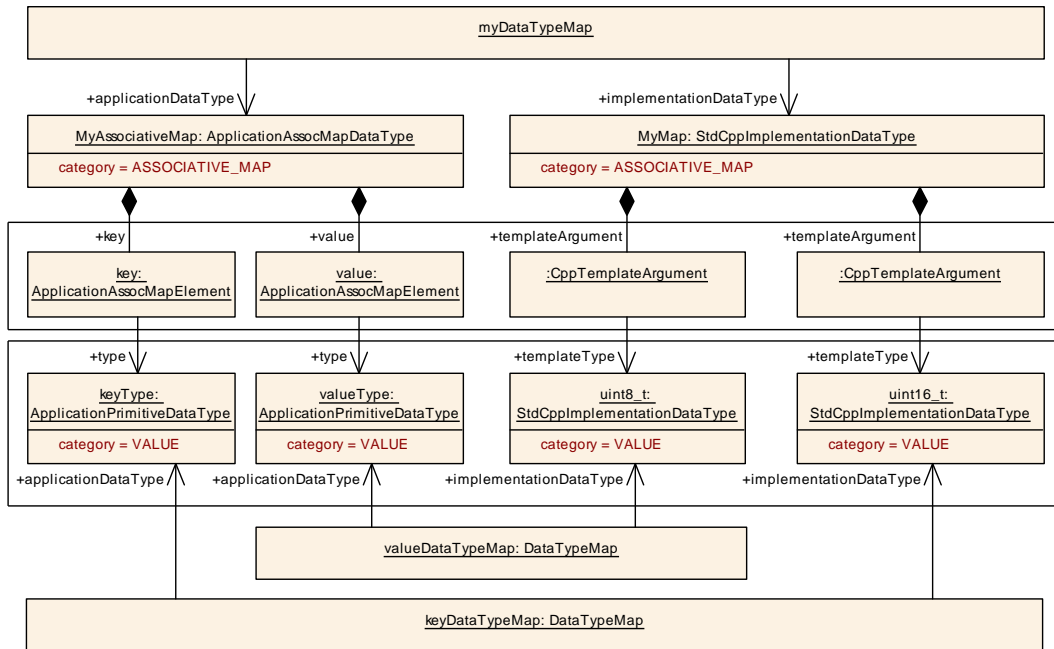


Figure 3.4: Example of the model of an associative map

On the other hand, it is totally no problem if content on the value-side contain duplicates, e.g. two unique `keys` are associated with `values` that have a completely identical content.

¹On the other hand, both concepts of a “map” are justified in their respective “community” and choosing to name one of these very different in order so reduce overall potential confusion would probably not be applicable

However, these aspects have no implication on the formal model of the `ApplicationAssocMapDataType` and are therefore not considered in this document.

The modeling of the `ApplicationAssocMapDataType` is somewhat minimalistic and motivated mainly by the fact that data types for both key and value need to be defined.

There is no assumption how the structure of an implementation of an associative map may look like. For example, in C++ (which is currently the only supported language binding on the *AUTOSAR adaptive platform*) the straightforward way to use an associative map is to utilize the container `ara::core::Map` (where the implementation is opaque to the client programmer).

Figure 3.4 contains a graphical representation of an example model for `ApplicationAssocMapDataType`.

Class	ApplicationAssocMapDataType			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationDataType			
Note	An application data type which is a map and consists of a key and a value Tags: atp.recommendedPackage=ApplicationDataTypes			
Base	ARElement , ARObject , ApplicationCompositeDataType , ApplicationDataType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
key	ApplicationAssocMapElement	0..1	aggr	Key element of the map that is used to uniquely identify the value of the map.
value	ApplicationAssocMapElement	0..1	aggr	Value element of the map that stores the content associated to a key.

Table 3.8: ApplicationAssocMapDataType

[constr_10124]{DRAFT} Multiplicity of attribute `ApplicationAssocMapDataType.key` [For each `ApplicationAssocMapDataType`, the attribute `key` shall exist **at the time before the generation of the ara API starts.**]()

[constr_10125]{DRAFT} Multiplicity of attribute `ApplicationAssocMapDataType.value` [For each `ApplicationAssocMapDataType`, the attribute `value` shall exist **at the time before the generation of the ara API starts.**]()

Class	ApplicationAssocMapElement			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationDataType			
Note	Describes the properties of the elements of an application map data type.			
Base	ARObject , ApplicationCompositeElementDataPrototype , AtpFeature , AtpPrototype , DataPrototype , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	ApplicationAssocMapDataType.key , ApplicationAssocMapDataType.value , AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.9: ApplicationAssocMapElement

Listing 3.1 provides the corresponding ARXML serialization of the example model of an `ApplicationAssocMapDataType` depicted in Figure 3.4.

```
<APPLICATION-ASSOC-MAP-DATA-TYPE>
  <SHORT-NAME>MyAssociativeMap</SHORT-NAME>
  <KEY>
    <SHORT-NAME>MyKey</SHORT-NAME>
    <TYPE-TREF DEST="APPLICATION-PRIMITIVE-DATA-TYPE">keyType</TYPE-TREF>
  </KEY>
  <VALUE>
    <SHORT-NAME>MyValue</SHORT-NAME>
    <TYPE-TREF DEST="APPLICATION-PRIMITIVE-DATA-TYPE">valueType</TYPE-TREF>
  </VALUE>
</APPLICATION-ASSOC-MAP-DATA-TYPE>

<APPLICATION-PRIMITIVE-DATA-TYPE>
  <SHORT-NAME>keyType</SHORT-NAME>
  <CATEGORY>VALUE</CATEGORY>
</APPLICATION-PRIMITIVE-DATA-TYPE>

<APPLICATION-PRIMITIVE-DATA-TYPE>
  <SHORT-NAME>valueType</SHORT-NAME>
  <CATEGORY>VALUE</CATEGORY>
</APPLICATION-PRIMITIVE-DATA-TYPE>
```

Listing 3.1: Example for the definition of an `ApplicationAssocMapDataType`

The initialization of an `ApplicationAssocMapDataType`, however, needs to be clarified because it would (using a combination of `RecordValueSpecification` and `ArrayValueSpecification`) in general be technically possible to define a number of differently structured `ValueSpecifications` that are semantically identical.

In order to keep this element of uncertainty out of the AUTOSAR standard, the initialization of a `DataPrototype` typed by `ApplicationAssocMapDataType` is clarified by means of [constr_1488].

[constr_1488]{DRAFT} Initialization of a `DataPrototype` typed by an `ApplicationAssocMapDataType` [A `DataPrototype` typed by an `ApplicationAssocMapDataType` shall only be initialized by an `ApplicationAssocMapValueSpecification`.]()

As already mentioned, there is a semantic requirement that the *key* elements of an *associative map* need to be unique in the context of one *associative map* container.

Obviously, the model has no influence on what happens at run-time. On the other hand, there is an implication onto the initialization of an `ApplicationAssocMapDataType`, see [constr_1489].

[constr_1489]{DRAFT} Uniqueness of `ApplicationAssocMapValueSpecification.mapElementTuple.key` [The value of all `mapElementTuple.key` elements in the context of a given `ApplicationAssocMapValueSpecification` shall be unique.]()

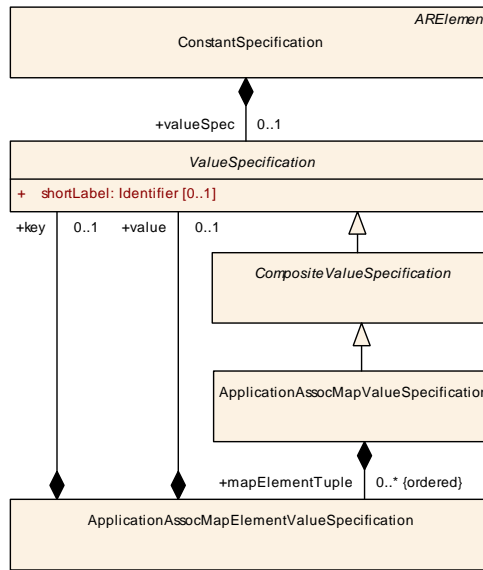


Figure 3.5: Formal model of the initialization of an **ApplicationAssocMapDataType**

Class	ApplicationAssocMapValueSpecification			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationDataType			
Note	This meta-class represents the ability to define the initialization of an ApplicationAssocMapDataType.			
Base	<i>ARObject</i> , <i>CompositeValueSpecification</i> , <i>ValueSpecification</i>			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , CalibrationParameterValue.applInitValue , CalibrationParameterValue.implInitValue , CompositeRuleBasedValueSpecification.argument , ConstantSpecification.valueSpec , CryptoServiceKey.developmentValue , DiagnosticEnvDataCondition.compareValue , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , ISignal.initValue , ISignal.timeoutSubstitutionValue , NonqueuedReceiverComSpec.initValue , NonqueuedReceiverComSpec.timeoutSubstitutionValue , NonqueuedSenderComSpec.initValue , NvProvideComSpec.ramBlockInitValue , NvProvideComSpec.romBlockInitValue , NvRequireComSpec.initValue , ParameterDataPrototype.initValue , ParameterProvideComSpec.initValue , ParameterRequireComSpec.initValue , PersistencyDataRequiredComSpec.initValue , PersistencyKeyValuePair.initValue , PortDefinedArgumentValue.value , PortPrototypeBlueprintInitValue.value , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , SwDataDefProps.invalidValue , VariableDataPrototype.initValue			
Attribute	Type	Mult.	Kind	Note
mapElement Tuple (ordered)	ApplicationAssocMapElementValueSpecification	*	aggr	This aggregation represents the initial values for the elements of the ApplicationAssocMapValueSpecification.

Table 3.10: ApplicationAssocMapValueSpecification

Class	ApplicationAssocMapElementValueSpecification			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationDataType			
Note	This meta-class represents the ability to define the initialization of the elements of an ApplicationAssocMapDataType.			
Base	<i>ARObject</i>			
Aggregated by	ApplicationAssocMapValueSpecification.mapElementTuple			
Attribute	Type	Mult.	Kind	Note
key	ValueSpecification	0..1	aggr	This aggregation represents the initialization of the key part of an AssociativeElementValueSpecification.
value	ValueSpecification	0..1	aggr	This aggregation represents the initialization of the value part of an AssociativeElementValueSpecification.

Table 3.11: ApplicationAssocMapElementValueSpecification

[constr_10126]{DRAFT} Multiplicity of attribute **ApplicationAssocMapElementValueSpecification.key** [For each **ApplicationAssocMapElementValueSpecification**, the attribute **key** shall exist **at the time before the generation of the ara API starts.**]()

[constr_10127]{DRAFT} Multiplicity of attribute **ApplicationAssocMapElementValueSpecification.value** [For each **ApplicationAssocMapElementValueSpecification**, the attribute **value** shall exist **at the time before the generation of the ara API starts.**]()

3.3.2.3 Attributes of SwDataDefProps

[constr_1478]{DRAFT} **SwDataDefProps** applicable to **ApplicationDataTypes** exclusive to the **AUTOSAR adaptive platform** [

Attributes of SwDataDefProps	Root Elem.		Attribute Existence per Category
	ApplicationAssocMapDataType	ApplicationAssocMapElement	
			ASSOCIATIVE_MAP
additionalNativeTypeQualifier			
annotation	x	x	*
baseType			
compuMethod			
dataConstr			
displayFormat	x	x	0..1
implementationDataType			
invalidValue			
stepSize			
swAddrMethod			
swAlignment			
swBitRepresentation			
swCalibrationAccess			
swCalprmAxisSet			
swComparisonVariable			
swDataDependency			
swHostVariable			
swImplPolicy			
swIntendedResolution			
swInterpolationMethod			





swIsVirtual			
swPointerTargetProps			
swRecordLayout			
swRefreshTiming			
swTextProps			
swValueBlockSize			
unit			
valueAxisDataType			
Other Attributes below the Root Element			
key: ApplicationAssocMapElement	x		1
value: ApplicationAssocMapElement	x		1

]()

A consequence of [constr_1478] is that the [constr_1478] shows only the values of *category* that are limited to the *AUTOSAR adaptive platform*. For all other values of *category* that are also supported on the *AUTOSAR classic platform* please refer to a similar table contained in the specification of the Software Component Template [1].

3.3.3 CppImplementationDataType

3.3.3.1 Overview

In the AUTOSAR standard, data types represent assets of paramount prominence for the entire development approach.

Therefore, AUTOSAR implements² a multi-level approach for the modeling of data types. One of the described levels, the so-called *Implementation Data Level* aims at a modeling on a level that could be described as “language binding” in the parlour of the *AUTOSAR adaptive platform*.

For the *AUTOSAR classic platform*, the *Implementation Data Level* has been addressed by the creation of the *ImplementationDataType* that specifically aims at covering the data type behavior of the C programming language.

In contrast to the *AUTOSAR classic platform*, the *AUTOSAR adaptive platform* currently does not foresee the usage of the C language and instead (at least for the foreseeable future) defines language binding to the C++ language.

It is therefore necessary to provide a modeling approach on the *Implementation Data Level* with a proper support for the capabilities of the C++ language.

²As explained in [1]

While it would technically be feasible to extend the semantics of `ImplementationDataType` for a support of a C++ language binding this would significantly water down the clarity and expressiveness of `ImplementationDataType`³.

It therefore seems reasonable to add a system of meta-classes that specifically supports the usage of data types with an intended binding to the C++ language.

[TPS_MANI_01166]{DRAFT} Semantics of `CppImplementationDataType` [The abstract meta-class `CppImplementationDataType` supports the modeling of data types specifically tailored towards a support for a C++ language binding.] (*RS_MANI_00039*)

[TPS_MANI_03197]{DRAFT} Semantics of `StdCppImplementationDataType` [Meta-class `StdCppImplementationDataType` supports the modeling of data types that will be mapped to C++ Standard Library features in the C++ language binding.] (*RS_MANI_00039*)

Please note that Structures (`category = STRUCTURE`) and type aliases (`category = TYPE_REFERENCE`) are also modeled as `StdCppImplementationDataTypes` for simplification reasons.

[TPS_MANI_03198]{DRAFT} Semantics of `CustomCppImplementationDataType` [Meta-class `CustomCppImplementationDataType` supports the modeling of data types that will mapped to a custom implementation in the C++ language binding that is declared in the `headerFile`.] (*RS_MANI_00039*)

Please note that the `category` values for a `CustomCppImplementationDataType` are restricted by `[constr_1578]`.

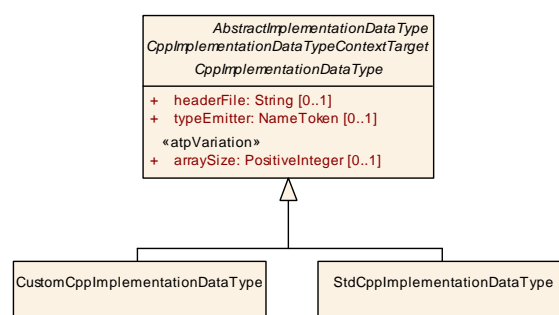


Figure 3.6: Specializations of `CppImplementationDataType`

This means that the modeling of primitive data types and strings is only possible with `StdCppImplementationDataTypes`. The reason is that the serialization rules that are defined in AUTOSAR for SOME/IP and DDS are based on the defined types of the standard library.

³And even if it were possible to extend `ImplementationDataType` towards a more or less clean support for C++ it may happen that further language bindings are added to the *AUTOSAR adaptive platform* for which further and further extensions of `ImplementationDataType` would be required.

[constr_1571]{DRAFT} **CppImplementationDataType** is limited [The usage of a `CppImplementationDataType` is limited to the context of `AdaptiveApplicationSwComponentTypes` and `CompositionSwComponentTypes` defined in the context of an `Executable`.]()

[TPS_MANI_01167]{DRAFT} **AbstractImplementationDataType** [Meta-class `CppImplementationDataType` inherits from abstract base class `AbstractImplementationDataType` in order to become a valid target for specific references from other meta-classes that want to refer to “`ImplementationDataType` in general”.] (*RS_MANI_00039*)

Class	CppImplementationDataType (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CppImplementationDataType			
Note	This meta-class represents the way to specify a reusable data type definition taken as a the basis for a C++ language binding			
Base	ARElement , ARObject , AbstractImplementationDataType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , CppImplementationDataTypeContextTarget , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	CustomCppImplementationDataType , StdCppImplementationDataType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
arraySize	PositiveInteger	0..1	attr	This attribute can be used to specify the array size if the enclosing <code>CppImplementationDataType</code> has array semantics. Stereotypes: <code>atpVariation</code> Tags: <code>vh.latestBindingTime=preCompileTime</code>
headerFile	String	0..1	attr	Configuration of the Header File with the custom class declaration.
namespace (ordered)	SymbolProps	*	aggr	This aggregation allows for the definition an own namespace for the enclosing <code>CppImplementationDataType</code> .
subElement (ordered)	CppImplementationDataTypeElement	*	aggr	This represents the collection of sub-elements of the enclosing <code>CppImplementationDataType</code>
template Argument (ordered)	CppTemplateArgument	*	aggr	This aggregation allows for the specification of properties of template arguments
typeEmitter	NameToken	0..1	attr	This attribute can be taken to control how the respective <code>CppImplementationDataType</code> is contributed to the language binding.
typeReference	CppImplementationDataType	0..1	ref	This reference shall be defined to define a type reference (a.k.a. typedef).

Table 3.13: CppImplementationDataType

Class	StdCppImplementationDataType
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CppImplementationDataType
Note	This meta-class represents the way to specify a data type definition that is taken as the basis for a C++ language binding to a C++ Standard Library feature. Tags: <code>atp.recommendedPackage=CppImplementationDataTypes</code>





Class	StdCpplImplementationDataType			
Base	ARElement , ARObject , AbstractImplementationDataType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , CpplImplementationDataType , CpplImplementationDataTypeContextTarget , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.14: StdCpplImplementationDataType

Class	CustomCpplImplementationDataType			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CpplImplementationDataType			
Note	This meta-class represents the way to specify a data type definition that is taken as the basis for a C++ language binding to a custom implementation that is declared in the configured header file. The Short Name of this CustomCpplImplementationDataType defines the Class-Name of the custom implementation. Tags: atp.recommendedPackage=CpplImplementationDataTypes			
Base	ARElement , ARObject , AbstractImplementationDataType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , CpplImplementationDataType , CpplImplementationDataTypeContextTarget , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.15: CustomCpplImplementationDataType

Class	AbstractImplementationDataType (abstract)			
Package	M2::AUTOSARTemplates::CommonStructure::ImplementationDataTypes			
Note	This meta-class represents an abstract base class for different flavors of ImplementationDataType.			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	CpplImplementationDataType , ImplementationDataType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.16: AbstractImplementationDataType

A prominent example for the idea of referring to “[ImplementationDataType](#) in general” can be found in meta-class [DataTypeMap](#). The intention behind the existence of [DataTypeMap](#) is to map an [ApplicationDataType](#) to either an [ImplementationDataType](#) or [CpplImplementationDataType](#).

By means of modeling the reference [DataTypeMap.implementationDataType](#) as a reference to [AbstractImplementationDataType](#) both options are possible in a single role.

In contrast to the C language, C++ supports the definition of namespaces in programs. This feature is also cleared for development on the *AUTOSAR adaptive platform* and therefore needs to be represented in the modeling approach.

[TPS_MANI_01168]{DRAFT} **Specification of a namespace for a `CppImplementationDataType`** [The ability to define a namespace for a `CppImplementationDataType` is expressed by means of the aggregation of `SymbolProps` at `CppImplementationDataType` in the role `namespace`.] ([RS_MANI_00039](#))

[constr_3443]{DRAFT} **Specification of a namespace for a `StdCppImplementationDataType`** [The definition of a `namespace` for a `StdCppImplementationDataType` of `category` `VALUE` is not allowed. For this value of `category` the `std` namespace is already assumed by the usage of the `StdCppImplementationDataType`.] ()

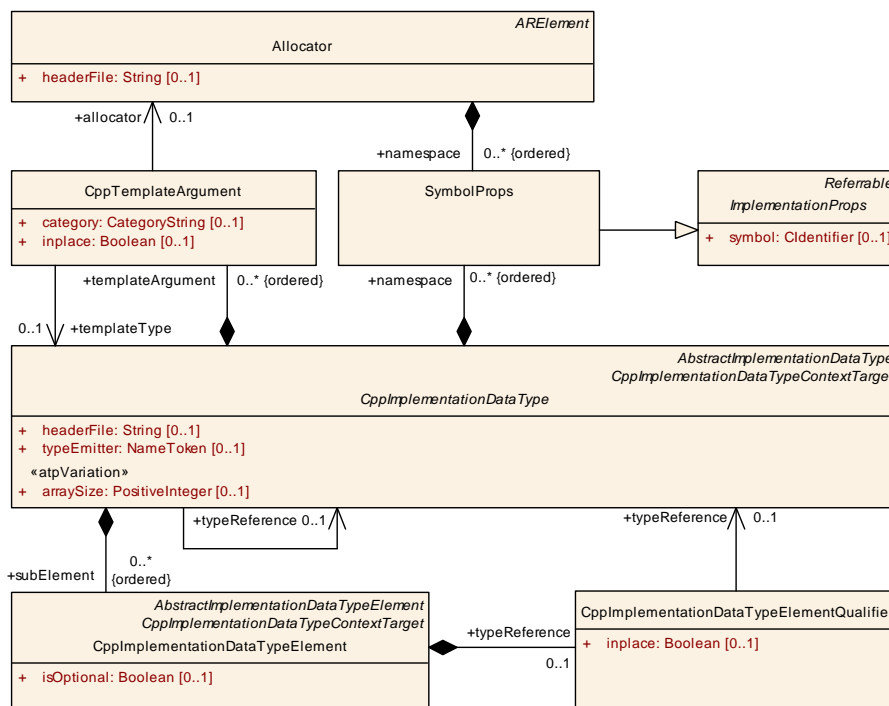


Figure 3.7: CppImplementationDataType overview

[TPS_MANI_01309]{DRAFT} **Semantics of attribute `CppImplementationDataType.headerFile`** [The attribute `CppImplementationDataType.headerFile` shall be used to specify the name of the corresponding header file in two cases:

- A `CustomCppImplementationDataType` shall set the value of the attribute to the name of the header file that defines the C++ code for the `CustomCppImplementationDataType`.
- A platform data type (modeled as a `StdCppImplementationDataType`) shall set the attribute to the name of the applicable header file (e.g. "cstdint") from the C++ standard library.

] ([RS_MANI_00016](#))

[[constr_1743](#)]{DRAFT} **CppImplementationDataType.headerFile vs. CppImplementationDataType.typeEmitter** [The two attributes `CppImplementationDataType.headerFile` and `CppImplementationDataType.typeEmitter` shall always be used mutually exclusive.

In other words, a subclass of `CppImplementationDataType` shall either use `headerFile` or `typeEmitter`. The simultaneous usage of both attributes is not supported.]([RS_MANI_00039](#))

[[TPS_MANI_01176](#)]{DRAFT} **Standardized value for attribute CppImplementationDataType.typeEmitter** [The AUTOSAR Standard reserves the following value for attribute `CppImplementationDataType.typeEmitter`:

- `TYPE_EMITTER_ARA`
- `FUNDAMENTAL_TYPE`: this value is only applicable for the platform types `bool`, `float`, and `double`.

]([RS_MANI_00039](#))

[[TPS_MANI_01177](#)]{DRAFT} **Semantics of attribute CppImplementationDataType.typeEmitter** [The following set of rules applies for the usage of the attribute `CppImplementationDataType.typeEmitter`:

- If the attribute `typeEmitter` is set to the value `TYPE_EMITTER_ARA`, the ARA generator shall generate the corresponding data type definition.
- If the attribute `typeEmitter` is set to any value other than `TYPE_EMITTER_ARA`, the ARA generator shall silently **not** generate the corresponding data type definition.

]([RS_MANI_00039](#))

In the context of [[TPS_MANI_01177](#)], [[TPS_MANI_01309](#)] and [[constr_1743](#)] apply.

[[TPS_MANI_01212](#)]{DRAFT} **Usage of attribute typeEmitter in the context of a CustomCppImplementationDataType** [Attribute `typeEmitter` does not have to be used in the context of a `CustomCppImplementationDataType`. If the `typeEmitter` is used regardless then the value of the attribute shall be set to the name of the header file that contains the language binding of the respective `CustomCppImplementationDataType`.]([RS_MANI_00039](#))

[[TPS_MANI_01169](#)]{DRAFT} **Support for template data types** [Meta-class `CppImplementationDataType` supports the usage of templates for the definition of data types in C++ programs by means of the reference `CppImplementationDataType.templateArgument`.

The order of arguments in templates is significant, therefore `templateArgument` is modeled as an **ordered** collection.]([RS_MANI_00039](#))

[TPS_MANI_01174]{DRAFT} **Semantics of reference in the role `CppTemplateArgument.templateType`** [Attribute `CppTemplateArgument.templateType` specifies the data type to be filled in the respective position of the template in the language binding.] ([RS_MANI_00039](#))

[TPS_MANI_01175]{DRAFT} **Semantics of reference in the role `CppTemplateArgument allocator`** [Attribute `CppTemplateArgument allocator` specifies the behavior of an allocator class to be filled in the respective position of the template in the language binding.] ([RS_MANI_00039](#))

[constr_1576]{DRAFT} **Existence of `CppTemplateArgument.templateType` vs. `CppTemplateArgument allocator`** [For any given `CppTemplateArgument`, **at most one of** the references

- `CppTemplateArgument.templateType` or
- `CppTemplateArgument allocator`

may exist.]()

[TPS_MANI_01201]{DRAFT} **Standardized values for attribute `CppTemplateArgument.category`** [AUTOSAR reserves the following values for attribute `CppTemplateArgument.category`:

ASSOC_MAP_KEY : the specific `CppTemplateArgument` represents the *key* data-type of an associative map.

ASSOC_MAP_VALUE : the specific `CppTemplateArgument` represents the *value* data-type of an associative map.

] ([RS_MANI_00039](#))

Class	CppTemplateArgument			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CplusplusImplementationDataType			
Note	This meta-class has the ability to define properties for template arguments.			
Base	ARObject			
Aggregated by	CplusplusImplementationDataType.templateArgument			
Attribute	Type	Mult.	Kind	Note
allocator	Allocator	0..1	ref	This reference identifies the applicable allocator.
category	CategoryString	0..1	attr	This attribute shall be used to contribute further clarification regarding the semantics of the enclosing CplusplusTemplateArgument.
inplace	Boolean	0..1	attr	This attribute specifies whether the shortName of the referenced templateType is used in the code generation and the type declaration is defined outside of the enclosing CplusplusImplementationDataType (true) or whether the type definition is embedded inside of the enclosing CplusplusImplementationDataType and the shortName is ignored (false).
templateType	CplusplusImplementationDataType	0..1	ref	This reference identifies the data type of the specific template argument required for the language binding.

Table 3.17: CplusplusTemplateArgument

[TPS_MANI_01171]{DRAFT} **Modeling of structured data types** [Meta-class `CppImplementationDataType` supports the creation of nested data types by means of the aggregation of `CppImplementationDataTypeElement` in the role `subElement`.

Because the order of sub-elements in a structured data type is significant the aggregation `subElement` is modeled as an **ordered** collection.] ([RS_MANI_00039](#))

Please note that although the modeling of structures is formally done by way of using `CppImplementationDataType` it is actually only possible to use `StdCppImplementationDataType` for this purpose (see [[constr_1578](#)]).

Class	CppImplementationDataTypeElement			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CppImplementationDataType			
Note	Declares a data object which is locally aggregated. Such an element can only be used within the scope where it is aggregated. A <code>CppImplementationDataTypeElement</code> is used to represent an element of a structure, defining its type.			
Base	<code>ARObject</code> , <code>AbstractImplementationDataTypeElement</code> , <code>AtpClassifier</code> , <code>AtpFeature</code> , <code>AtpStructureElement</code> , <code>CppImplementationDataTypeContextTarget</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>			
Aggregated by	<code>AtpClassifier.atpFeature</code> , <code>CppImplementationDataType.subElement</code>			
Attribute	Type	Mult.	Kind	Note
isOptional	Boolean	0..1	attr	This attribute represents the ability to declare the enclosing <code>CppImplementationDataTypeElement</code> as optional. This means that, at runtime, the <code>CppImplementationDataTypeElement</code> may or may not have a valid value and shall therefore be ignored. The underlying runtime software provides means to set the <code>CppImplementationDataTypeElement</code> as not valid at the sending end of a communication and determine its validity at the receiving end.
typeReference	<code>CppImplementationDataTypeElementQualifier</code>	0..1	aggr	This aggregation defines the type of the <code>CppImplementationDataTypeElement</code> and determines whether in C++ the <code>CppImplementationDataTypeElement</code> is defined inside or outside of the enclosing <code>CppImplementationDataType</code> .

Table 3.18: CppImplementationDataTypeElement

Please note that there is no intention to support a “mixed” modeling of structured data types such that the resulting data type on C++ level would be composed of data types that are native to C++ and data types from the C subsystem.

While this would technically be possible on code level it would impose a huge effort on modeling level and the consensus is that there is no real use case for such a “mixed” data type.

The C++ data type system can, as far as the implementation of the *AUTOSAR adaptive platform* is concerned, fully replace the “legacy” C data types in C++.

[[constr_1572](#)]{DRAFT} **Usage of `SwDataDefProps.implementationDataType` within a `CppImplementationDataType`** [Within the scope of a `CppImplementationDataType` the reference `CppImplementationDataType.swDataDefProps.implementationDataType` **shall not exist**.] ()

This aspect is also expressed in a more general form by [[constr_1579](#)].

As a consequence of [constr_1572], type-references have to be done differently on the *AUTOSAR adaptive platform*. For this purpose dedicated references are available.

[TPS_MANI_01172]{DRAFT} **Description of type references in the scope of `CppImplementationDataType`** [The reference `CppImplementationDataType.typeReference` can be used to create a type reference from the enclosing `CppImplementationDataType` to another `CppImplementationDataType`.] (*RS_MANI_00039*)

[TPS_MANI_01173]{DRAFT} **Description of type references in the scope of `CppImplementationDataTypeElement`** [`CppImplementationDataTypeElement.typeReference` can be used to create a reference to the `CppImplementationDataType` that shall apply for the enclosing `CppImplementationDataTypeElement`.] (*RS_MANI_00039*)

Please note that the `CppImplementationDataTypeElement.typeReference` is realized as an Association Class that allows to add the `inplace` attribute to the `typeReference`.

Class	<code>CppImplementationDataTypeElementQualifier</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CppImplementationDataType			
Note	This element qualifies the <code>typeReference</code> of the <code>CppImplementationDataTypeElement</code> to the <code>CppImplementationDataType</code> .			
Base	<i>ARObject</i>			
Aggregated by	<code>CppImplementationDataTypeElement.typeReference</code>			
Attribute	Type	Mult.	Kind	Note
<code>inplace</code>	Boolean	0..1	attr	This attribute defines whether the member type of the <code>CppImplementationDataTypeElement</code> in C++ is an embedded type element inside of the enclosing struct (true) or whether the type declaration is defined outside of the struct.
<code>typeReference</code>	<code>CppImplementationDataType</code>	0..1	ref	This reference defines a type reference.

Table 3.19: `CppImplementationDataTypeElementQualifier`

[constr_10128]{DRAFT} **Multiplicity of attribute `CppImplementationDataTypeElementQualifier.typeReference`** [For each `CppImplementationDataTypeElementQualifier`, the attribute `typeReference` shall exist **at the time before the generation of the ara API starts**.] ()

[TPS_MANI_03196]{DRAFT} **Semantics of `CppImplementationDataTypeElementQualifier.inplace` attribute** [The `CppImplementationDataTypeElementQualifier.inplace` attribute defines whether the data type of the `CppImplementationDataTypeElement` in the C++ language binding is derived from the name or the properties of the referenced `CppImplementationDataType`.

Specifically, the following rules shall apply:

- if `CppImplementationDataTypeElement.typeReference.inplace` is set to `False` then the **shortName** of the `CppImplementationDataType` referenced in the role `CppImplementationDataTypeElement.typeReference.typeReference` shall be used in the C++ language binding.
- if `CppImplementationDataTypeElement.typeReference.inplace` is set to `True` then only the **properties** of the `CppImplementationDataType` referenced in the role `CppImplementationDataTypeElement.typeReference.typeReference` shall be used in the C++ language binding and the `shortName` is ignored.

](RS_MANI_00039)

Please note that [Figure 3.13](#) shows an example of a Structure where the `typeReference` of one `subElement` is classified as `inplace`.

[constr_1659]{DRAFT} Restriction for the usage of `CppImplementationDataTypeElementQualifier.inplace` [The attribute `CppImplementationDataTypeElementQualifier.inplace` shall only exist if the target referenced in the role `CppImplementationDataTypeElementQualifier.typeReference` is an `StdCppImplementationDataType` that has the attribute `category` set to either of the values

- ARRAY
- VECTOR
- ASSOCIATIVE_MAP
- VARIANT
- STRUCTURE
- STRING
- TYPE_REFERENCE, if the `CppImplementationDataType` refers to a `CompuMethod` of category `TEXTTABLE`

]()

Rationale for the existence of [\[constr_1659\]](#): by application of the exclusion principle, there are three cases where attribute `CppImplementationDataTypeElementQualifier.inplace` shall not exist:

- `StdCppImplementationDataType` of category `VALUE`
- `CustomCppImplementationDataType`
- `CppImplementationDataType` of category `TYPE_REFERENCE`, unless the `CppImplementationDataType` refers to a `CompuMethod` of category `TEXTTABLE`

Neither of them can be used as a target of `CppImplementationDataTypeElementQualifier.typeReference` where `CppImplementationDataTypeElementQualifier.inplace` is set to `True` because in these cases there is already a valid name that is directly usable for the language binding and a possible indirection via a `using` clause would obviously require an additional name that is not available from the model.

After all, the motivation for the definition of a `TYPE_REFERENCE` is the direct opposite of the motivation behind using the attribute `CppImplementationDataTypeElementQualifier.inplace` to control the language binding. Therefore, this case is also excluded.

[TPS_MANI_03201]{DRAFT} Semantics of `CppTemplateArgument.inplace` attribute [The `CppTemplateArgument.inplace` attribute defines whether the data type that is referenced by the `templateType` in the C++ language binding is derived from the name or the properties of the referenced `CppImplementationDataType`.

Specifically, the following rules shall apply:

- if `CppTemplateArgument.inplace` is set to `False` then the **shortName** of the `CppImplementationDataType` referenced in the role `CppTemplateArgument.templateType` shall be used in the C++ language binding.
- if `CppTemplateArgument.inplace` is set to `True` then only the **properties** of the `CppImplementationDataType` referenced in the role `CppTemplateArgument.templateType` shall be used in the C++ language binding and the `shortName` is ignored.

](*RS_MANI_00039*)

[constr_1660]{DRAFT} Restriction for the usage of `CppTemplateArgument.inplace` [The attribute `CppTemplateArgument.inplace` shall only exist if the target referenced in the role `CppTemplateArgument.templateType` is an `StdCppImplementationDataType` that has the attribute `category` set to either of the values

- `ARRAY`
- `VECTOR`
- `ASSOCIATIVE_MAP`
- `VARIANT`
- `STRUCTURE`
- `STRING`

]()

Rationale for the existence of `[constr_1660]`: by application of the exclusion principle, there are three cases where attribute `CppTemplateArgument.inplace` shall not exist:

- `StdCppImplementationDataType` of category `VALUE`
- `CustomCppImplementationDataType`
- `CppImplementationDataType` of category `TYPE_REFERENCE`

Neither of them can be used as a target of `CppTemplateArgument.templateType` where `CppTemplateArgument.inplace` is set to `True` because in these cases there is already a valid name that is directly usable for the language binding and a possible indirection via a `using` clause would obviously require an additional name that is not available from the model.

After all, the motivation for the definition of a `TYPE_REFERENCE` is the direct opposite of the motivation behind using the attribute `CppTemplateArgument.inplace` to control the language binding. Therefore, this case is also excluded.

Please note that the question of the value of attribute `CppTemplateArgument.inplace` for the case of `CppTemplateArgument.templateType` referring to `StdCppImplementationDataType` of category `STRUCTURE` is regulated by [[constr_3462](#)].

[constr_1708]{DRAFT} Combination of `CppImplementationDataTypeElement.isOptional` and `CppImplementationDataTypeElementQualifier.inplace` [If a `CppImplementationDataTypeElement` is typed by a `CppImplementationDataType` of category `STRUCTURE` then the combination of attribute `CppImplementationDataTypeElement.isOptional` set to `True` and `CppImplementationDataTypeElement.typeReference.inplace` set to `True` is not allowed.]()

Rationale for the existence of [[constr_1708](#)]: the “optional” semantics is implemented via a template and it is not possible to pass an “inplace” structure as a template argument.

[constr_3462]{DRAFT} `CppTemplateArgument.templateType` reference to `StdCppImplementationDataType` of category `STRUCTURE` and the `inplace` flag [`CppTemplateArgument.templateType` that points to a `StdCppImplementationDataType` of category `STRUCTURE` shall have the `inplace` attribute set to `false`.]()

Class	Allocator			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CppImplementationDataType			
Note	This meta-class represents the ability to specify an optional custom C++ allocator for a C++ type which may dynamically grow beyond it's initial allocated size during it's lifetime. Any storage principles are defined in the implementation of the allocator itself, which should implement the ISO C++ <code>std::allocator_traits</code> interface. Tags: atp.recommendedPackage=Allocators			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	Allocator			
headerFile	String	0..1	attr	Configuration of the Header File with the custom class declaration
namespace (ordered)	SymbolProps	*	aggr	This aggregation allows for the definition of a namespace of an Allocator.

Table 3.20: Allocator

The reason for [[constr_3462](#)] is that the usage of an unnamed struct as template argument is not permitted by ISO C++11/14/17.

[[constr_3446](#)]{DRAFT} [CppTypeArgument](#) with [allocator](#) reference and the [inplace](#) flag [A [CppTypeArgument](#) that points with an [allocator](#) reference to an [Allocator](#) shall not have the [inplace](#) flag set to a value.]()

[[constr_1578](#)]{DRAFT} **Applicable data categories** [

Category	Applicable to ...								Description
	ApplicationArrayDataType	ApplicationRecordDataType	ApplicationPrimitiveDataType	ApplicationRecordElement	ApplicationArrayElement	ApplicationValueSpecification	StdCppImplementationDataType	CustomCppImplementationDataType	
VALUE			x	x	x	x	x		Contains a single value. See also [TPS_MANI_03192].
TYPE_REFERENCE							x		The element is defined via reference to another data type (via CppTypeImplementationDataType.typeReference).
STRUCTURE	x			x	x		x		Holds one or several further elements which can have different AutosarDataTypes . See also [TPS_MANI_03180].
VARIANT							x	x	Can hold values of different data types. It is similar to STRUCTURE except that all of its members start at the same location in memory. A VARIANT data prototype can contain only one of its elements at a time and represents a type-safe union. The size of the VARIANT is at least the size of the largest member. See also [TPS_MANI_03189].
ARRAY	x			x	x		x	x	A fixed-sized array of sub-elements of the same data type. See also [TPS_MANI_03169].
VECTOR							x	x	An array of elements of the same data type that is able to grow at run-time. See also [TPS_MANI_03174].
ASSOCIATIVE_MAP							x	x	An associative array of key-value pairs. See also [TPS_MANI_03183].
STRING			x	x	x	x	x		Contains a text string. See also [TPS_MANI_03178].
BOOLEAN			x	x	x	x			Contains one boolean state. Depending on the CPU direct addressing of single bits may not be available. So a byte or a word can be used to store only one logical state.

]()

3.3.3.2 Attributes of SwDataDefProps

[constr_1579]{DRAFT} **SwDataDefProps** applicable to **CppImplementation-DataTypes** exclusive to the **AUTOSAR adaptive platform** [

Attributes of SwDataDefProps	Root Element	Attribute Existence per Category								
		CppImplementationDataType	VALUE	TYPE_REFERENCE	STRUCTURE	VARIANT	ARRAY	VECTOR	ASSOCIATIVE_MAP	STRING
additionalNativeTypeQualifier										
annotation	x	*	*	*	*	*	*	*	*	
baseType										
compuMethod	x		0..1							
dataConstr.dataConstrRule.physConstrs	x		d/c			d/c	d/c			
dataConstr.dataConstrRule.internalConstrs	x		0..1			0..1	0..1			
displayFormat	x	0..1	0..1	0..1	0..1	0..1	0..1	0..1	0..1	
implementationDataType										
invalidValue	x		0..1						0..1	
stepSize										
swAddrMethod										
swAlignment										
swBitRepresentation										
swCalibrationAccess										
swCalprmAxisSet										
swComparisonVariable										
swDataDependency										
swHostVariable										
swImplPolicy										
swIntendedResolution										
swInterpolationMethod										
swIsVirtual										
swPointerTargetProps										
swPointerTargetProps.swDataDefProps										
swRecordLayout										
swRefreshTiming	x	0..1	0..1	0..1	0..1	0..1	0..1	0..1	0..1	
swTextProps										
swValueBlockSize										
unit										
valueAxisDataType										
Other Attributes										





Attributes of SwDataDefProps	Root Element	Attribute Existence per Category							
	CppImplementationDataType	VALUE	TYPE_REFERENCE	STRUCTURE	VARIANT	ARRAY	VECTOR	ASSOCIATIVE_MAP	STRING
subElement: CppImplementationDataTypeElement	x			1..*					
templateArgument	x			1..*	1	1..*	2..*	0..1	
typeReference	x		1						

]()

A consequence of [constr_1578] is that [constr_1579] shows only the values of `category` that are limited to the *AUTOSAR adaptive platform*. For all other values of `category` that are also supported on the *AUTOSAR classic platform* please refer to a similar table contained in the specification of the Software Component Template [1].

The `invalidValue` is applicable to Primitive Data Types and defines one specific value (in the range of that Primitive Data Type) which indicates that the respective value is not valid.

A typical use case is a composite data type that contains the values of all 4 wheel speeds. If one of the wheel speed sensors fails, and is no longer able to provide useful data, it does still make sense to provide the other 3 wheel speed values.

In such a scenario the one wheel speed value would then be set to the `invalidValue`. The receivers are able to check for each individual element of the data composition whether the value corresponds to the `invalidValue` and take corresponding actions.

[constr_3569]{DRAFT} Applicability of attribute `invalidValue` on `CppImplementationDataType` of category `TYPE_REFERENCE` [If a `CppImplementationDataType` of category `TYPE_REFERENCE` has an `invalidValue` defined, then the referenced `CppImplementationDataType` (via `typeReference`) shall eventually be of category `VALUE`.]()

Please note that the following rationale exists for the support of `invalidValue` for specific `category`s of data types:

- The usage of `category VALUE` on the *AUTOSAR adaptive platform* boils down to the usage of the standard types. There is no use case to define an `invalidValue` for a standard data type because **all usages** of the standard data type would be characterized by the same `invalidValue`.

- The definition of an `invalidValue` for a container (except `STRING`) is not supported because there are no known use cases for supporting an `invalidValue`.
- The definition of an `invalidValue` on a data type of category `STRING` is accepted because it is also supported on the *AUTOSAR classic platform* and it is necessary to sustain interoperability between the *AUTOSAR classic platform* and the *AUTOSAR adaptive platform*.
- The definition of an `invalidValue` on an `StdCppImplementationDataType` of category `TYPE_REFERENCE` represents the main-stream use case for the definition of an `invalidValue`.

3.3.3.3 Primitive Data Types

[TPS_MANI_03192]{DRAFT} **CppImplementationDataType of category VALUE**
[The primitive data types like Boolean, fixed-width integer data types and floating-point data types are described as `CppImplementationDataTypes` of category `VALUE`.]
(RS_MANI_00039)

[TPS_MANI_03193]{DRAFT} **CppImplementationDataType of category TYPE_REFERENCE**
[The definition of a `CppImplementationDataType` of category `TYPE_REFERENCE` creates an alias for another `CppImplementationDataType` that is referenced by the `typeReference`.]
(RS_MANI_00039)

3.3.3.4 String Data Type

[TPS_MANI_03178]{DRAFT} **StdCppImplementationDataType of category STRING**
[A `StdCppImplementationDataType` of category `STRING` represents a container data type for a sequence of characters.]
(RS_MANI_00039)

Please note that it is nonetheless possible to use a different encoding, e.g. UTF-16 on the level of a SOME/IP message. This behavior can be configured by means of `ApSomeipTransformationProps`. As a consequence, a transcoding may have to be applied between the representation of a string on the wire and in the software.

[TPS_MANI_03179]{DRAFT} **C++ language binding of StdCppImplementationDataTypes of category STRING**
[A `CppImplementationDataType` of category `STRING` shall be implemented as `ara::core::String`.]
(RS_MANI_00039)

The formulation of [TPS_MANI_03179] leaves room for potential later extensions towards the support for other storage formats.

The example depicted in Figure 3.8 contains the definition of both an `ApplicationDataType` as well as the definition of the corresponding `CppImplementationDataType`.

The latter obviously becomes significantly lighter to model thanks to the restriction that, as far as the C++ language binding is concerned, a `CppImplementationDataType` of category `STRING` shall only be implemented on the basis of an `ara::core::String`.

Another aspect of the example in Figure 3.8 is that it defines the intended encoding of the modeled data type in the scope of the `ApplicationPrimitiveDataType`.

Since C++ strings are not containerized types, they do not receive a containerized `typename` in the `template<>` argument list on code level. It is therefore necessary in this case to restrict the referenced `templateType` in `CppTemplateArgument`.

[constr_6815]{DRAFT} Existence of `CppTemplateArgument.templateType` for `CppImplementationDataType` of category `STRING` [In a `CppImplementationDataType` of category `STRING`, the reference `templateType` shall not exist.] ()

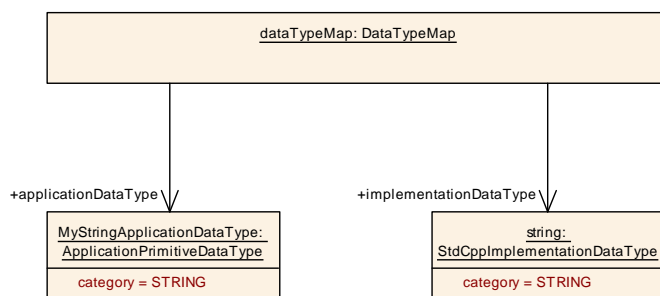


Figure 3.8: Example of the model of a string with UTF-8 encoding

[TPS_MANI_03188]{DRAFT} Usage of an Allocator for a `StdCppImplementationDataType` of category `STRING` [A `StdCppImplementationDataType` of category `STRING` is allowed to aggregate a `CppTemplateArgument` that refers to an `Allocator` with the `allocator` reference.] ([RS_MANI_00039](#))

3.3.3.5 Array Data Type

[TPS_MANI_03169]{DRAFT} `CppImplementationDataType` with fixed size array semantics [A `CppImplementationDataType` of category `ARRAY` represents a container data type that encapsulates fixed size arrays.] ([RS_MANI_00039](#))

[TPS_MANI_03170]{DRAFT} `CppImplementationDataType` of category `ARRAY` [For a C++ binding, a `CppImplementationDataType` of category `ARRAY` can be implemented as

- an `ara::core::Array` if `StdCppImplementationDataType` subclass is used for modeling or as
- an array type in a custom namespace (e.g. `my::array`) if `CustomCppImplementationDataType` subclass is used (provided that the type in the custom namespace can be configured with the available modeling capabilities).

] ([RS_MANI_00039](#))

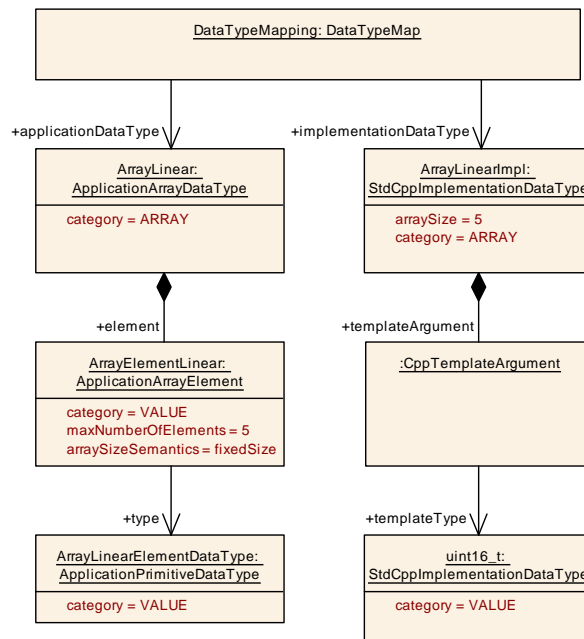


Figure 3.9: Example of the model of a one-dimensional array

[TPS_MANI_03171]{DRAFT} **Value type of a CppImplementationDataType of category ARRAY** [The type of elements contained in a CppImplementationDataType of category ARRAY is defined by the aggregated templateArgument and the corresponding templateType that defines the data type of the CppTemplateArgument.](RS_MANI_00039)

[constr_3433]{DRAFT} **Aggregation of templateArguments for an ARRAY** [Cp-ImplementationDataType of category ARRAY that boils down to ara::core::Array shall aggregate exactly one templateArgument that defines the type of elements contained in the CppImplementationDataType of category ARRAY.]()

[TPS_MANI_03172]{DRAFT} **Size of a CppImplementationDataType of category ARRAY** [The primitive attribute arraySize of a CppImplementationDataType of category ARRAY shall be used to define the size of the array.](RS_MANI_00039)

Figure 3.9 shows an example of an one-dimensional array of uint16 elements with arraySize = 5.

[TPS_MANI_03173]{DRAFT} **Definition of a multidimensional Array** [A multidimensional CppImplementationDataType of category ARRAY contains nested CppImplementationDataTypes of category ARRAY.

The CppImplementationDataType of category ARRAY that represents the outer array will refer to a CppImplementationDataType of category ARRAY that represents the inner array via the aggregated templateArgument. Such a definition describes a two-dimensional Array; consequently a type with more dimensions is described by just nesting more CppImplementationDataTypes of category ARRAY.

The array element itself is specified by the innermost `CppImplementationDataType` with `category` different from `ARRAY`.] (*RS_MANI_00039*)

Figure 3.10 shows an example of a multidimensional array where a `CppImplementationDataType` of `category` `ARRAY` with `arraySize` = 5 has a `templateArgument` that points to the inner `CppImplementationDataType` of `category` `ARRAY` in the role `templateType`.

The inner `CppImplementationDataType` has a `templateArgument` that finally points with the `templateType` reference to a primitive type.

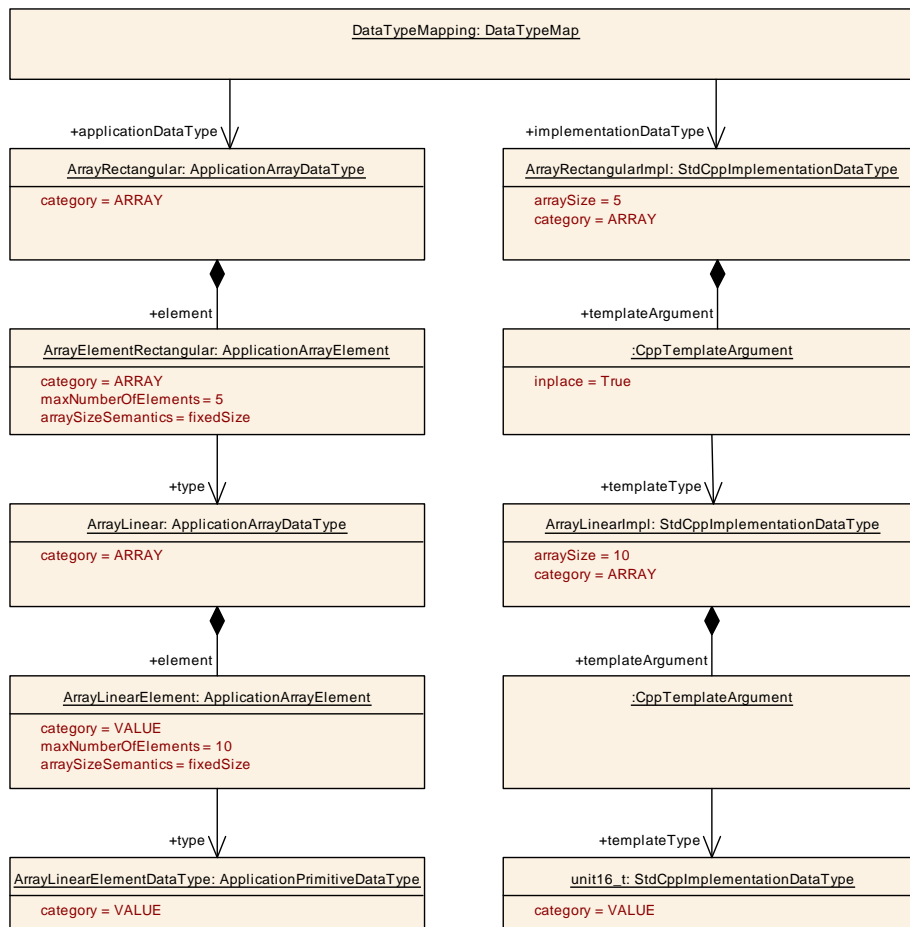


Figure 3.10: Example of the model of a multidimensional array

3.3.3.6 Vector Data Type

[TPS_MANI_03174]{DRAFT} **CppImplementationDataType with variable size array semantics** [A `CppImplementationDataType` of `category` `VECTOR` represents a container data type that encapsulates variable size arrays.] (*RS_MANI_00039*)

[TPS_MANI_03175]{DRAFT} **CppImplementationDataType of category VECTOR** [For a C++ binding, a `CppImplementationDataType` of `category` `VECTOR` can be implemented as

- an `ara::core::Vector` if `StdCppImplementationDataType` subclass is used or as
- a vector type in a custom namespace (e.g. `my::vector`) if `CustomCppImplementationDataType` subclass is used (provided that the type in the custom namespace can be configured with the available modeling capabilities).

](RS_MANI_00039)

[TPS_MANI_03176]{DRAFT} Value type of a `CppImplementationDataType` of category `VECTOR` [The type of elements contained in a `CppImplementationDataType` of category `VECTOR` is defined by the aggregated `templateArgument` and the corresponding `templateType` that defines the data type of the `CppTemplateArgument`.](RS_MANI_00039)

[constr_3434]{DRAFT} Aggregation of `templateArguments` for a `VECTOR` [`CppImplementationDataType` of category `VECTOR` that boils down to `ara::core::Vector` shall aggregate

- one `templateArgument` that defines the type of elements contained in the `CppImplementationDataType` of category `VECTOR` with the `templateType` reference.
- optionally one additional `templateArgument` that defines the `Allocator` with the `allocator` reference.

]()

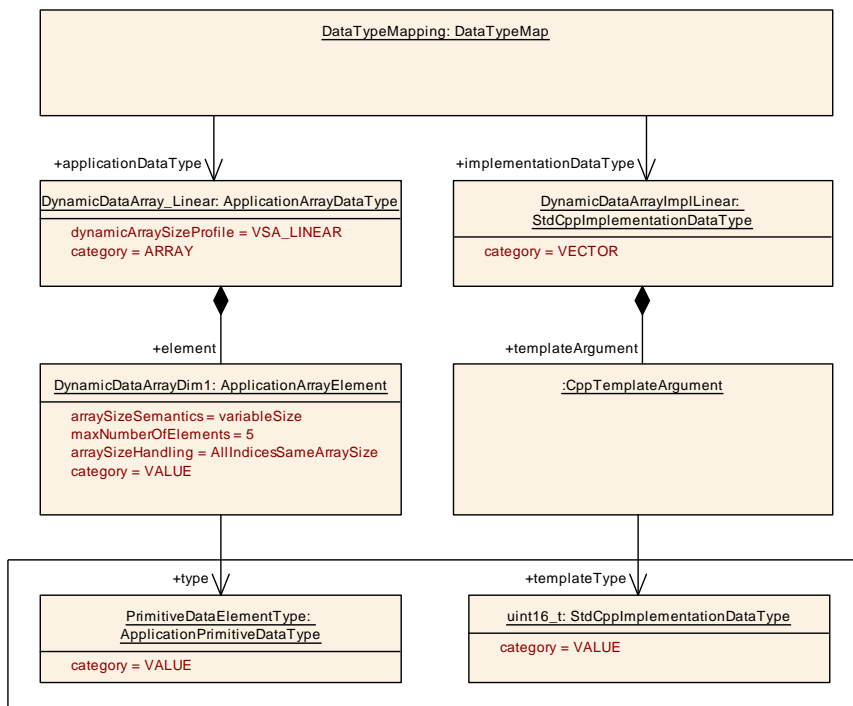


Figure 3.11: Example of the model of a one-dimensional vector

Figure 3.11 shows an example of an one-dimensional vector of uint16 elements.

[TPS_MANI_03186]{DRAFT} Usage of **arraySize** in case of a **Vector** [If the `CppImplementationDataType` of category **VECTOR** aggregates a `templateArgument` that defines the `Allocator` with the `allocator` reference then the attribute `arraySize` that defines the maximum size of the vector is allowed to be used.] ([RS_MANI_00039](#))

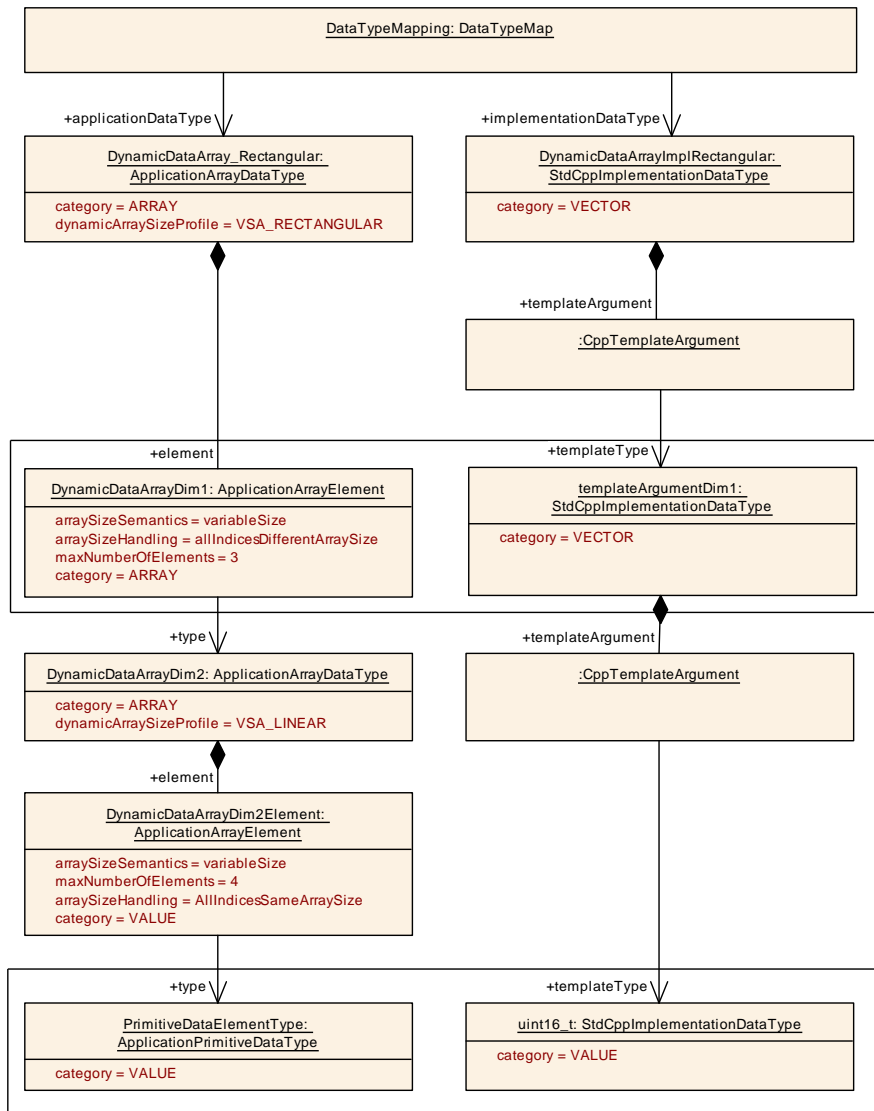


Figure 3.12: Example of the model of a multidimensional vector

[TPS_MANI_03177]{DRAFT} Definition of a multidimensional **Vector** [A multidimensional `CppImplementationDataType` of category **VECTOR** contains nested `CppImplementationDataTypes` of category **VECTOR**.

The `CppImplementationDataType` of category **VECTOR** that represents the outer vector will refer to a `CppImplementationDataType` of category **VECTOR** that represents the inner vector via the aggregated `templateArgument`.

Such a definition describes a two-dimensional Vector; consequently a type with more dimensions is described by just nesting more `CppImplementationDataTypes` of category VECTOR.

The vector element itself is specified by the innermost `CppImplementationDataType` with category different from VECTOR. *(RS_MANI_00039)*

Figure 3.12 shows an example of a multidimensional vector where a `CppImplementationDataType` of category VECTOR has a `templateArgument` that points to the inner `CppImplementationDataType` of category VECTOR in the role `templateType`. The inner `CppImplementationDataType` has a `templateArgument` that finally points with the `templateType` reference to a primitive type.

Please note that the meta-model supports the creation of a reference to a specific element (identified by means of the `index`) of a `CppImplementationDataType` of category VECTOR.

However, this may lead to a problem at run-time if the specific element does not exist at the respective point in time. Any software using such data types needs to be prepared for the potential non-existence of vector elements.

Alternatively, it could be an option to simply avoid a situation where an element of a `CppImplementationDataType` of category VECTOR becomes the target of a reference in the model.

3.3.3.7 Struct Data Type

[TPS_MANI_03180]{DRAFT} Definition of Structures [A `StdCppImplementationDataType` of category STRUCTURE represents a data type for holding an ordered collection of variables of arbitrary data types.] *(RS_MANI_00039)*

[TPS_MANI_03181]{DRAFT} Definition of members in StdCppImplementationDataType of category STRUCTURE [Members in a `StdCppImplementationDataType` of category STRUCTURE are defined by ordered `CppImplementationDataTypeElements` that are aggregated in the role `subElement` by the enclosing `StdCppImplementationDataType` of category STRUCTURE.

The name of each member is defined by the `shortName` of the `CppImplementationDataTypeElement`.

The type of each member is defined by the `typeReference` to a `CppImplementationDataType`. *(RS_MANI_00039)*

Please note that the `inplace` flag that is able to classify a `CppImplementationDataTypeElement.typeReference` is documented in [TPS_MANI_03196].

The example depicted in Figure 3.13 shows the definition of a Structure, called `MyStruct`, that has two members. The `typeReference` of the `subElements` with the `shortName` `ArrayElement` is classified with `inplace = True`.

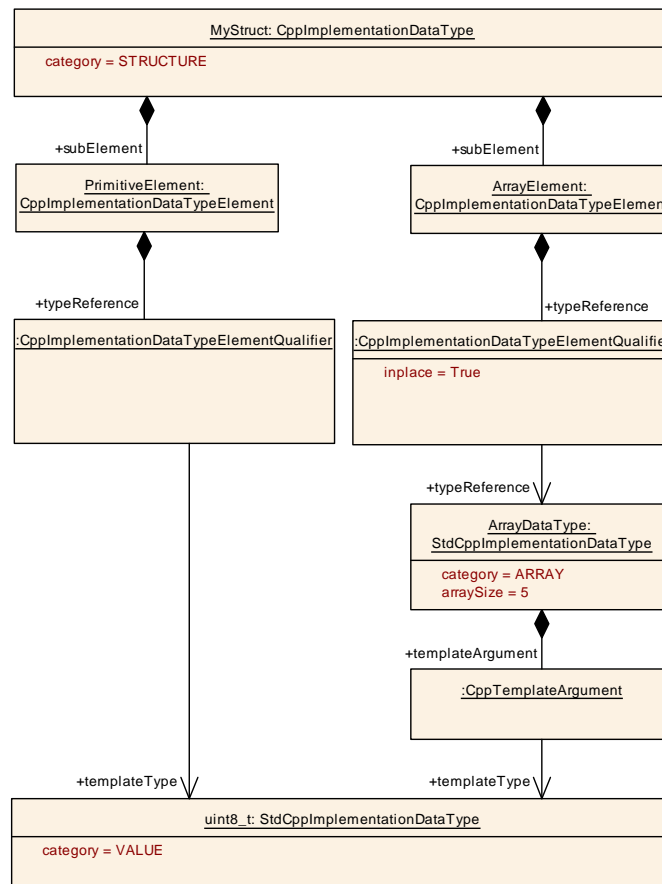


Figure 3.13: Example of the model of a Struct

In case that the `inPlace` attribute in the `typeReference` to the array is set to **False** the model results in a using-declaration of `ArrayDataType` that is defined outside `MyStruct`.

3.3.3.8 Enumeration Data Type

[TPS_MANI_03187]{DRAFT} Definition of enumeration types [In the AUTOSAR meta-model, an enumeration is not implemented by means of a `CppImplementationDataType` with an own `category`.

Instead, a discrete set of integer numbers can be used as a structural description for a single fundamental `CppImplementationDataType` of `category` `TYPE_REFERENCE` that boils down to a `CppImplementationDataType` of `category` `VALUE`.

The mapping of the integer numbers to labels in the scope of the definition of an enumeration is considered part of the semantical definition via an attached `CompuMethod` with `category` `TEXTTABLE` rather than part of the structural description. | ([RS_MANI_00039](#))

The rules for the usage of a `CompuMethod` with `category` `TEXTTABLE` are the same as in the AUTOSAR Classic Platform and are described in the Software Component Template [1].

To summarize, an enumeration value in the `CompuMethod` with `category` `TEXTTABLE` can be provided as a text value in the `vt` of the `CompuConst`, in the `shortLabel` or `symbol` of the applicable `CompuScale` of the `CompuMethod`.

Each `CompuScale` shall be defined as `compuInternalToPhys` computation in the `CompuMethod` and shall contain an `upperLimit` and `lowerLimit`.

The following example illustrates how an enumeration is specified using a `CompuMethod`.

```

<COMPU-METHOD>
  <SHORT-NAME>cylinders</SHORT-NAME>
  <CATEGORY>TEXTTABLE</CATEGORY>
  <COMPU-INTERNAL-TO-PHYS>
    <COMPU-SCALES>
      <COMPU-SCALE>
        <LOWER-LIMIT INTERVAL-TYPE="CLOSED">0</LOWER-LIMIT>
        <UPPER-LIMIT INTERVAL-TYPE="CLOSED">0</UPPER-LIMIT>
        <COMPU-CONST>
          <VT>Cylinder1</VT>
        </COMPU-CONST>
      </COMPU-SCALE>
      <COMPU-SCALE>
        <LOWER-LIMIT INTERVAL-TYPE="CLOSED">1</LOWER-LIMIT>
        <UPPER-LIMIT INTERVAL-TYPE="CLOSED">1</UPPER-LIMIT>
        <COMPU-CONST>
          <VT>Cylinder2</VT>
        </COMPU-CONST>
      </COMPU-SCALE>
      <COMPU-SCALE>
        <LOWER-LIMIT INTERVAL-TYPE="CLOSED">2</LOWER-LIMIT>
        <UPPER-LIMIT INTERVAL-TYPE="CLOSED">2</UPPER-LIMIT>
        <COMPU-CONST>
          <VT>Cylinder3</VT>
        </COMPU-CONST>
      </COMPU-SCALE>
      <COMPU-SCALE>
        <LOWER-LIMIT INTERVAL-TYPE="CLOSED">3</LOWER-LIMIT>
        <UPPER-LIMIT INTERVAL-TYPE="CLOSED">3</UPPER-LIMIT>
        <COMPU-CONST>
          <VT>Cylinder4</VT>
        </COMPU-CONST>
      </COMPU-SCALE>
    </COMPU-SCALES>
  </COMPU-INTERNAL-TO-PHYS>
</COMPU-METHOD>
    
```

Listing 3.2: example for enumeration

3.3.3.9 Map Data Type

[TPS_MANI_03183]{DRAFT} **CppImplementationDataType** of category **ASSOCIATIVE_MAP** [A **CppImplementationDataType** of category **ASSOCIATIVE_MAP** represents a container that contains key-value pairs with unique keys.]([RS_MANI_00039](#))

[TPS_MANI_03184]{DRAFT} **CppImplementationDataType** of category **ASSOCIATIVE_MAP** [For a C++ binding, a **CppImplementationDataType** of category **ASSOCIATIVE_MAP** can be implemented as

- an `ara::core::Map` if `StdCppImplementationDataType` subclass is used or as
- a map type in a custom namespace (e.g. `my::map`) if `CustomCppImplementationDataType` subclass is used (provided that the type in the custom namespace can be configured with the available modeling capabilities).

]([RS_MANI_00039](#))

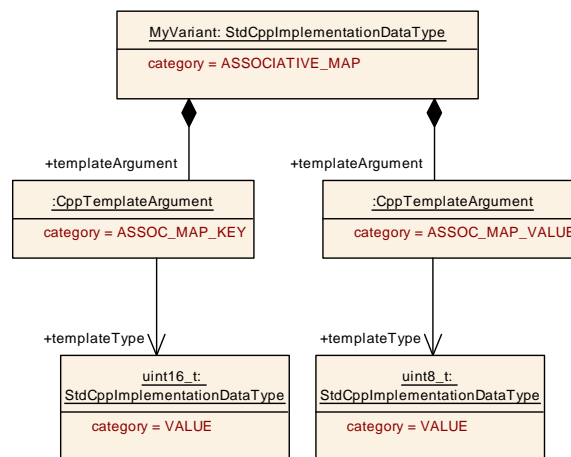


Figure 3.14: Example of the model of an **ASSOCIATIVE_MAP**

[TPS_MANI_03185]{DRAFT} **Structure of a CppImplementationDataType** of category **ASSOCIATIVE_MAP** [A **CppImplementationDataType** of category **ASSOCIATIVE_MAP** that boils down to a `ara::core::Map` shall aggregate the following **CppTemplateArguments**:

- one **CppTemplateArgument** shall have the category `ASSOC_MAP_KEY` and shall reference a **CppImplementationDataType** with the `templateType` reference. This **CppTemplateArgument** represents the role that corresponds to `ApplicationAssocMapDataType.key` and defines the respective data type details.
- one **CppTemplateArgument** shall have the category `ASSOC_MAP_VALUE` and shall reference a **CppImplementationDataType** with the `templateType` reference. This **CppTemplateArgument** represents

the role that corresponds to `ApplicationAssocMapDataType.value` and defines the respective data type details.

- one additional optional `CppTemplateArgument` is allowed to reference an `Allocator` with the `allocator` reference.

](RS_MANI_00039)

The example depicted in Figure 3.14 shows the definition of a `ASSOCIATIVE_MAP` that has two `CppTemplateArguments`, one for the key and one for the value.

3.3.3.10 Variant Data Type

[TPS_MANI_03189]{DRAFT} **Definition of `CppImplementationDataType` of category `VARIANT`** [A `CppImplementationDataType` of category `VARIANT` represents a type safe union.] (RS_MANI_00039)

[TPS_MANI_03190]{DRAFT} **`CppImplementationDataType` of category `VARIANT`** [For a C++ binding, a `CppImplementationDataType` of category `VARIANT` can be implemented as

- an `ara::core::Variant` if `StdCppImplementationDataType` subclass is used or as
- a variant type in a custom namespace (e.g. `my::variant`) if `CustomCppImplementationDataType` subclass is used (provided that the type in the custom namespace can be configured with the available modeling capabilities).

](RS_MANI_00039)

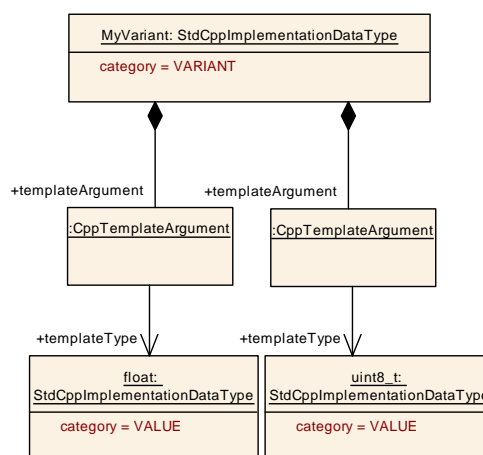


Figure 3.15: Example of the model of an `VARIANT`

[TPS_MANI_03191]{DRAFT} **Definition of type alternatives stored in a `VARIANT`** [A type alternative that is stored in a `CppImplementationDataType` of category `VARIANT` is defined by the aggregated `templateArgument` and the corresponding

`templateType` that defines the data type of the `CppTemplateArgument`.] (*RS_MANI_00039*)

[constr_3429]{DRAFT} No allocator usage for CppImplementationDataTypes of category VARIANT [`CppImplementationDataType` of category `VARIANT` is not allowed to aggregate a `templateArgument` that points to an `Allocator` in the role `allocator`.] ()

The example depicted in Figure 3.15 shows the definition of a `VARIANT` that has two `CppTemplateArguments`. Each one represents one alternative type. Please note that the `CppTemplateArguments` of a `CppImplementationDataType` are ordered in ARXML and this order is not visible in the object diagram.

[TPS_MANI_01393]{DRAFT} Initialization of a data object typed by a CppImplementationDataType of category VARIANT [The initialization of a data object that is typed by a `CppImplementationDataType` of category `VARIANT` is done by using a `RecordValueSpecification` with two `fields`:

- The first `field` identifies the index of the element inside the variant data type. The index of the first element shall be 1 and growing from there.
- The second `field` identifies the “payload” of the initialization and consists of a `ValueSpecification` that matches the data type of the element in the variant data type that is supposed to be initialized.

] (*RS_MANI_00039*)

Please note the convention to let the index be 1-based is in place to achieve the same initialization semantics as on the *AUTOSAR classic platform*.

This means that – in principle – the same `RecordValueSpecification` can be used to initialize a data object typed by a variant data type (*AUTOSAR adaptive platform*) and a corresponding data object typed by a `Wrapped Union Data Type` on the *AUTOSAR classic platform*.

The conversion of the index value to a numerical value used in an expression of the language binding of the variant data type is out of scope of the TPS Manifest Specification.

In other words, if the actual initialization uses 0-based index value then the value provided in the model has to be decremented by 1 accordingly.

[constr_10399]{DRAFT} Allowed interval of the “index” field according to the initialization rule for data object typed by a CppImplementationDataType of category VARIANT [The allowed value range of the “index” `field` of a `RecordValueSpecification` according to [TPS_MANI_01393] goes from 1 to the number of `templateArguments` owned by the `CppImplementationDataType` of category `VARIANT`.] ()

3.3.3.11 Bitfield Data Type

[TPS_MANI_03202]{DRAFT} Definition of bitfield types [In the AUTOSAR meta-model, a bitfield is not implemented by means of a `CppImplementationDataType` with an own category.

A bitfield is defined in the context of a primitive `StdCppImplementationDataType` of category `TYPE_REFERENCE` that boils down to a `StdCppImplementationDataType` of category `VALUE`.

A `CompuMethod` of category `BITFIELD_TEXTTABLE` is used to assign a special meaning to each bit of the primitive `StdCppImplementationDataType`.] (*RS_MANI_00039*)

`CompuScales` with a `mask` inside of the `CompuMethod` of category `BITFIELD_TEXTTABLE` are defining isolated parts that can be independent from each other with respect to the semantics of the data that match the mask.

The rules for the usage of a `CompuMethod` with category `BITFIELD_TEXTTABLE` are the same as in the AUTOSAR Classic Platform and are described in the Software Component Template [1].

3.3.4 Compatibility of `ApplicationDataType` and `CppImplementationDataType`

The usage of `ApplicationDataTypes` implies that also a corresponding `CppImplementationDataType` exists at a certain point in time. The usage of `CppImplementationDataTypes` in a `ServiceInterface` is required as the basis for generating the `ara::com` proxies and skeletons and as basis for the serialization of the payload in the network binding.

[TPS_MANI_03223]{DRAFT} Existence of `CppImplementationDataType` [The existence of `CppImplementationDataTypes` is **not** required until the methodology step of generating the Service header files for a `ServiceInterface`. Before arriving at this step in the methodology, it is perfectly feasible to use only `ApplicationDataTypes` for describing the semantics of `ServiceInterfaces`.] (*RS_MANI_00003*)

As a consequence, it is necessary to define compatibility rules that unambiguously clarify the conformance of an `ApplicationDataType` with a `CppImplementationDataType` and vice versa.

Several rules depend on the `category` of the data types:

1. As a general rule, if a `CppImplementationDataType` of category `TYPE_REFERENCE` is targeted by a type mapping all the rules given below apply to the `CppImplementationDataType` which is finally valid after resolving all such references.

This is not repeated in all rules. For example, if the document states that a given `ApplicationDataType` can be mapped to a `CppImplementationDataType` of category `VALUE` this shall include the possibility of mapping to a `CppImplementationDataType` of category `TYPE_REFERENCE` which refers to another `CppImplementationDataType` of category `VALUE`.

2. **[constr_5033]{DRAFT} Compatibility of data types with category VALUE**
[An `ApplicationDataType` of category `VALUE` can only be mapped to a `CppImplementationDataType` which also has category `VALUE`.]()

In this case, the C++ data type resulting from the `CppImplementationDataType` shall be able to express all the numerical values required by the `ApplicationDataType`.

This condition is fulfilled if the numerical range which can be expressed by the C++ data type at least covers the range defined by the limits in `ApplicationDataType.swDataDefProps.dataConstr` (which are either internal limits or physical limits to be converted via the `CompuMethod` which also has to be provided by the `ApplicationDataType`).

The condition is also fulfilled if the C++ data type covers the range defined in the `CompuMethod` for an enumeration.

3. **[constr_5034]{DRAFT} Compatibility of data types with category BOOLEAN**
[An `ApplicationDataType` of category `BOOLEAN` can only be mapped to a `CppImplementationDataType` of category `VALUE`.]()

4. **[constr_5035]{DRAFT} Compatibility of data types with category STRING**
[A `CppImplementationDataType` where attribute `category` is set to the value `STRING` can only be mapped to an `ApplicationDataType`
- where attribute `category` is set to the value `STRING` and
 - where attribute `swDataDefProps.swTextProps.baseType.baseTypeDefinition.baseTypeEncoding` is set to the value `UTF-8`.

]()

5. **[constr_5036]{DRAFT} Compatibility of data types with category ARRAY**
[An `ApplicationDataType` of category `ARRAY` can only be mapped to

- a `CppImplementationDataType` of category `ARRAY` or
- a `CppImplementationDataType` of category `VECTOR`.

]()

In this case, the array size and the type of the array elements of the `CppImplementationDataType` shall be such that they can be mapped/transferred 1:1 by order to the corresponding application data and vice versa.

6. **[constr_5037]{DRAFT} Compatibility of data types with category ARRAY with variableSize** [An `ApplicationDataType` of category `ARRAY` that

includes one `ApplicationArrayElement` with `arraySizeSemantics` set to `variableSize` in one of the defined dimensions shall be mapped to

- a `CppImplementationDataType` of category VECTOR

]()

7. **[constr_5038]{DRAFT} Compatibility of data types with category ARRAY with fixedSize** [An `ApplicationDataType` of category ARRAY that includes only `ApplicationArrayElements` with `arraySizeSemantics` set to `fixedSize` in all defined dimensions shall be mapped to

- a `CppImplementationDataType` of category ARRAY

]()

8. **[constr_5039]{DRAFT} Compatibility of data types with category STRUCTURE** [An `ApplicationDataType` of category STRUCTURE can only be mapped to a `CppImplementationDataType` of category STRUCTURE.]()

This means, that the corresponding pairs of elements shall also have compatible types.

9. **[constr_5040]{DRAFT} Compatibility of `ApplicationRecordDataType` and `CppImplementationDataType` that both represent an Optional Element Structure** [An `ApplicationRecordDataType` that represents an Optional Element Structure can only be mapped to a `CppImplementationDataType` of category STRUCTURE that represents an Optional Element Structure if corresponding pairs of elements have the same value of the attribute `isOptional`.]()
10. **[constr_5041]{DRAFT} Compatibility of data types with category ASSOCIATIVE_MAP** [An `ApplicationDataType` of category ASSOCIATIVE_MAP can only be mapped to a `CppImplementationDataType` of category ASSOCIATIVE_MAP.]()
11. **[constr_5042]{DRAFT} No data type mapping for `CppImplementationDataType` of category VARIANT** [An `ApplicationDataType` shall never be mapped to a `CppImplementationDataType` of category VARIANT.]()
12. **[constr_5043]{DRAFT} Forbidden mappings to `CppImplementationDataType`** [An `ApplicationDataType` of category COM_AXIS, RES_AXIS, CURVE, MAP, CUBOID, CUBE_4, CUBE_5 is not supported by the Adaptive Platform and can therefore not be mapped to a `CppImplementationDataType`.]()

Please note that the categories listed in [\[constr_5043\]](#) are not supported because there is no use case for the usage in Adaptive Platform.

On the AUTOSAR classic Platform, elements of a composite data type are not required to be considered in a `DataTypeMap`. This regulation is motivated by the fact that an

element of a composite data type on the AUTOSAR classic Platform does not necessarily have a reference to an `ImplementationDataType`.

On the AUTOSAR adaptive Platform the situation is different. The `CppImplementationDataTypeElement` always requires a reference to a formalized `CppImplementationDataType`.

Since the processing of the data type definition becomes much easier if all the relevant data types are mentioned in a `DataTypeMap` the existence of [\[constr_5044\]](#) is motivated.

[constr_5044]{DRAFT} `DataTypeMap` for composite data types [In the context of a given `ServiceInterface`, all pairs of `ApplicationDataType` and `CppImplementationDataType` used in the context of the definition of an `ApplicationCompositeDataType` used in the context of an `event`, `field`, `method` shall be described in a `DataTypeMap` that is contained in one of the `DataTypeMappingSets` that are referenced in a `PortInterfaceToDataTypeMapping` that also references the mentioned `ServiceInterface`.]()

3.4 Service Interface

3.4.1 Overview

[TPS_MANI_01001]{DRAFT} Meaning of `ServiceInterface` [Meta-class `ServiceInterface` inherits from `PortInterface` and allows for a heterogeneous aggregation of elements, i.e. it is possible to mix

- aggregation of `VariableDataPrototype` in the role `event` with
- aggregation of meta-class `Field` in the role `field` with
- aggregation of `ClientServerOperation` in the role `method`
- aggregation of `Trigger` in the role `trigger`

within the same `ServiceInterface`.] ([RS_MANI_00001](#), [RS_MANI_00003](#))

The purpose of this modeling is to embrace the concept of service-oriented communication [4] and better support this paradigm for communication on the *AUTOSAR adaptive platform*.

Please note that, in terms of semantics, the `ApApplicationError` represents a sort of second-class citizen (that only makes sense in the presence of `ClientServerOperation` in the role `method`) in the scope of the `ServiceInterface`.

More information can be found in section [3.4.8](#).

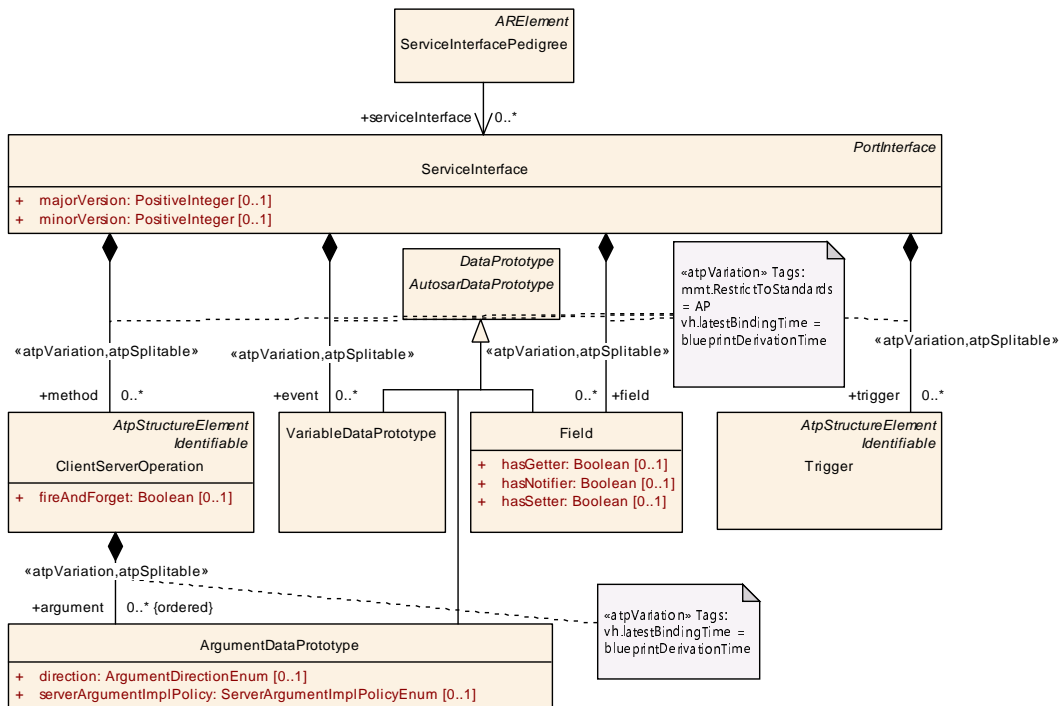


Figure 3.16: Modeling of the **ServiceInterface**

[constr_1483]{DRAFT} **Applicability of a ServiceInterface** [The applicability of a **ServiceInterface** shall be limited to the *AUTOSAR adaptive platform*, i.e. a **ServiceInterface** shall only be taken to type a **PortPrototype** if the latter is aggregated by an **AdaptiveApplicationSwComponentType** or by a **CompositionSwComponentType** defined in the context of an **Executable**.]()

Please note that on the *AUTOSAR adaptive platform* there are use-cases for the utilization of a **ServiceInterface** **without** the existence of a corresponding **PortPrototype**. For more explanation, please refer to [TPS_MANI_01032].

Class	ServiceInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This represents the ability to define a PortInterface that consists of a heterogeneous collection of methods, events and fields. Tags: atp.recommendedPackage=ServiceInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
event	VariableDataPrototype	*	aggr	This represents the collection of events defined in the context of a ServiceInterface. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=event.shortName, event.variationPoint.shortLabel vh.latestBindingTime=blueprintDerivationTime xml.sequenceOffset=30





Class	ServiceInterface			
field	Field	*	aggr	This represents the collection of fields defined in the context of a ServiceInterface. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=field.shortName, field.variationPoint.shortLabel vh.latestBindingTime=blueprintDerivationTime xml.sequenceOffset=40
majorVersion	PositiveInteger	0..1	attr	Major version of the service contract. Tags: xml.sequenceOffset=10
method	ClientServerOperation	*	aggr	This represents the collection of methods defined in the context of a ServiceInterface. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=method.shortName, method.variationPoint.shortLabel vh.latestBindingTime=blueprintDerivationTime xml.sequenceOffset=50
minorVersion	PositiveInteger	0..1	attr	Minor version of the service contract. Tags: xml.sequenceOffset=20
trigger	Trigger	*	aggr	This represents the collection of triggers defined in the context of a ServiceInterface. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=trigger.shortName, trigger.variationPoint.shortLabel vh.latestBindingTime=blueprintDerivationTime xml.sequenceOffset=60

Table 3.21: ServiceInterface

As already described in [TPS_SWCT_01844], AUTOSAR does not support the existence of optional [arguments](#) in a [ClientServerOperation](#).

This restriction is motivated by the lack of support for optional arguments in the APIs of the RTE on the *AUTOSAR classic platform*. For the sake of interoperability between the *classic platform* and the *adaptive platform*, this restriction is observed on the *AUTOSAR adaptive platform* as well.

[TPS_MANI_01007]{DRAFT} Atomic unit of service discovery [As far as the application level is concerned, the atomic unit for **service discovery** on the *AUTOSAR adaptive platform* is the [ServiceInterface](#).] ([RS_MANI_00003](#))

Please note that there is no obligation to have any [method](#), [event](#), [trigger](#), or [field](#) defined in the context of a given [ServiceInterface](#). In other words, the existence of a [ServiceInterface](#) by itself represents a valid semantics that has a value on its own.

For example, a use case could exist where a given service instance that corresponds to such a [ServiceInterface](#) is offered with the mere intention to signal that the ECU that provides the service instance is becoming ready for something, e.g. being diagnosed.

A tester could then take the existence of the offer as an indication to initiate a connection to the respective ECU.

3.4.2 Event

[TPS_MANI_01033]{DRAFT} Semantics of `ServiceInterface.event` [An `event` represents an update to a piece of data. The server decides when to send this update and makes sure that the `event` has full control over the value.

The occurrence of an `event` is transmitted from a server to one or more client(s).] ([RS_MANI_00003](#))

[constr_1494]{DRAFT} Initial value for `event` [An `ServiceInterface.event` shall **not** have an `initValue`.]()

For the client, the only way to get access to the value of an `event` is to receive an update of the `event` from the server.

As mentioned in [\[constr_1494\]](#), the Server always has full control over the value of the `event` and when it is sent to clients. Therefore, the definition of an `initValue` is not necessary.

Class	VariableDataPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::DataPrototypes			
Note	A VariableDataPrototype represents a formalized generic piece of information that is typically mutable by the application software layer. VariableDataPrototype is used in various contexts and the specific context gives the otherwise generic VariableDataPrototype a dedicated semantics.			
Base	<i>ARObject, AtpFeature, AtpPrototype, AutosarDataPrototype, DataPrototype, Identifiable, Multilanguage Referrable, Referrable</i>			
Aggregated by	ApplicationInterface.indication, AtpClassifier.atpFeature, BswInternalBehavior.arTypedPerInstanceMemory, BswModuleDescription.providedData, BswModuleDescription.requiredData, BulkNvDataDescriptor.bulkNvBlock, InternalBehavior.staticMemory, NvBlockDescriptor.ramBlock, NvDataInterface.nvData, SenderReceiverInterface.dataElement, ServiceInterface.event, SwcInternalBehavior.arTypedPerInstanceMemory, SwcInternalBehavior.explicitInterRunnableVariable, SwcInternalBehavior.implicitInterRunnableVariable			
Attribute	Type	Mult.	Kind	Note
initValue	ValueSpecification	0..1	aggr	Specifies initial value(s) of the VariableDataPrototype

Table 3.22: VariableDataPrototype

3.4.3 Trigger

[TPS_MANI_03291]{DRAFT} Semantics of `ServiceInterface.trigger` [A `trigger` represents a special kind of an event without any data that is transmitted from a server to one or more client(s) and at which occurrence the Service Consumer shall react in a particular manner.] ([RS_MANI_00003](#))

Class	Trigger			
Package	M2::AUTOSARTemplates::CommonStructure::TriggerDeclaration			
Note	The Trigger represents a special kind of an event (without data) at which occurrence the Service Consumer shall react in a particular manner.			
Base	AObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	AtpClassifier.atpFeature, BswModuleDescription.releasedTrigger, BswModuleDescription.requiredTrigger, ServiceInterface.trigger , TriggerInterface.trigger			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.23: Trigger

Please note that the `trigger` is processed in the queued manner, i.e. the `triggers` are stored in a queue and are processed in “first in first out” order.

3.4.4 Field

[TPS_MANI_01034]{DRAFT} **Semantics of `ServiceInterface.field`** [A `field` represents a piece of data hosted by a server that exposes to one or more client(s) a get accessor and/or a set mutator.

Clients can optionally receive notifications of changes of the `field`’s value.]([RS_-MANI_00003](#))

In comparison to an `event`, a `field` has a concrete value at any time. This conceptual difference can be explained along the following examples:

Let a traffic-sign detection be an example for the semantics of an `event`. The detection of a traffic-sign represents a discrete event in time that would be raised by the service component any time a speed limit sign is detected.

On the other hand, let a temperature preset of the in-vehicle air-condition be an example for a `field` that has a concrete value at any given time. The concrete value can be set by a client, can be obtained on request of a client, and – at the same time – a change of the temperature preset represents relevant information by itself.

In summary, this means that if a `field` is defined with `hasNotifier` and a client subscribes to it then the current value of the `field` is sent back immediately to the subscriber in an event-like notification pattern as soon as the subscription to the field becomes effective.

Additional update notifications will be sent to subscribers whenever the value of the `field` gets updated.

In more technical terms, the `get()` accessor method the current field value can be retrieved by the client. By means of calling the `set()` mutator method the `field` value can be updated by the client.

Please note that all features that a field provides are optional, given a fulfillment of [constr_1673]. In the `ServiceInterface.field` description it is defined whether the `field` supports the on-change-notification (`hasNotifier`), the `get ()` accessor (`hasGetter`) or the `set ()` mutator (`hasSetter`).

Admittedly, the concept of the `field` is roughly equivalent to an aggregation of an `event` with correlated `get ()/set ()` methods.

As far as the meta-model is concerned, the fact that a `field` shall have a concrete value at any time demands the **definition of an initial value** for the `field`. This aspect is clarified by [TPS_MANI_03212].

The existence of meta-class `field` as a first class citizen in the `ServiceInterface` expresses in addition to the existence of an individual `event` and individual `methods` that the two defined accessor/mutator methods `get ()` and `set ()` are applied to the **same data object** and that the defined `field` notifier reports each value change of this data object to subscribers.

In other words, the semantics of meta-class `Field` is fully determined by the attributes `hasGetter`, `hasSetter`, and `hasNotifier`.

Therefore, a `Field` where all of these attributes are set to `False` wouldn't have any useful meaning and shall therefore not exist.

[constr_1673]{DRAFT} Existence of attributes `hasGetter`, `hasSetter`, and `hasNotifier` [For any given `Field`, all of the attributes

- `hasGetter`
- `hasSetter`
- `hasNotifier`

shall exist and at least one of the attributes shall be set to `True`.]()

Please note that [constr_1673] allows that a `Field` may be defined with a notifier but without the two defined methods `get ()` and `set ()`. As described above a subscriber to a `field` notifier will get the current value of the `Field` immediately after the subscription. This functionality makes a `Field` without `get ()/set ()` methods useful in some functional cases compared to the usage of an `event` where the value would only be sent after the event is triggered.

Class	Field			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class represents the ability to define a piece of data that can be accessed with read and/or write semantics. It is also possible to generate a notification if the value of the data changes.			
Base	<i>ARObject</i> , <i>AtpFeature</i> , <i>AtpPrototype</i> , <i>AutosarDataPrototype</i> , <i>DataPrototype</i> , <i>Identifiable</i> , <i>Multilanguage Referrable</i> , <i>Referrable</i>			
Aggregated by	ApplicationInterface.attribute, <i>AtpClassifier.atpFeature</i> , <i>ServiceInterface.field</i>			
Attribute	Type	Mult.	Kind	Note





Class	Field			
hasGetter	Boolean	0..1	attr	This attribute controls whether read access is foreseen to this field.
hasNotifier	Boolean	0..1	attr	This attribute controls whether a notification semantics is foreseen to this field.
hasSetter	Boolean	0..1	attr	This attribute controls whether write access is foreseen to this field.

Table 3.24: Field

[constr_10129]{DRAFT} Multiplicity of attribute `Field.hasGetter` [For each `Field`, the attribute `hasGetter` shall exist **at the time before the generation of the ara API starts.**]()

[constr_10130]{DRAFT} Multiplicity of attribute `Field.hasSetter` [For each `Field`, the attribute `hasSetter` shall exist **at the time before the generation of the ara API starts.**]()

[constr_10131]{DRAFT} Multiplicity of attribute `Field.hasNotifier` [For each `Field`, the attribute `hasNotifier` shall exist **at the time before the generation of the ara API starts.**]()

3.4.5 Method

[TPS_MANI_01035]{DRAFT} Semantics of `ServiceInterface.method` [A `method` represents a function that is executed by and in the scope of a server on request of one or more client(s).] (*RS_MANI_00003*)

Class	ClientServerOperation			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	An operation declared within the scope of a client/server interface.			
Base	<i>ARObject</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	ApplicationInterface.command, <i>AtpClassifier.atpFeature</i> , <i>ClientServerInterface.operation</i> , <i>DiagnosticDataElementInterface.read</i> , <i>DiagnosticDataIdentifierInterface.read</i> , <i>DiagnosticDataIdentifierInterface.write</i> , <i>DiagnosticRoutineInterface.requestResult</i> , <i>DiagnosticRoutineInterface.start</i> , <i>DiagnosticRoutineInterface.stop</i> , <i>PhmRecoveryActionInterface.recovery</i> , <i>ServiceInterface.method</i>			
Attribute	Type	Mult.	Kind	Note
argument (ordered)	ArgumentDataPrototype	*	aggr	An argument of this ClientServerOperation Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=argument.shortName, argument.variation Point.shortLabel vh.latestBindingTime=blueprintDerivationTime
fireAndForget	Boolean	0..1	attr	This attribute defines whether this method is a fire&forget method (true) or not (false). Tags: atp.Status=draft





Class	ClientServerOperation			
possibleApError	ApApplicationError	*	ref	This reference identifies AdaptivePlatformApplication Errors as a possible error raised by the enclosing Client ServerOperation. Tags: atp.Status=draft
possibleApError Set	ApApplicationErrorSet	*	ref	This reference represents the ability to refer to an entire group of ApApplicationErrors as one model element instead of having to refer to all the represented Ap ApplicationErrors separately. Tags: atp.Status=draft

Table 3.25: ClientServerOperation

3.4.5.1 Fire and Forget Method

A so-called “fire & forget” method represents a special form of a [method](#) dedicated to the sole purpose of conveying information from a client to a server.

There is no expectation that the implementation of the [method](#) executes any kind of algorithm other than to merely accept the incoming data.

Spun from this angle, the semantics of a “fire & forget” method is comparable to the semantics of an [event](#), only reverse.

In other words, the “fire & forget” method conveys the data and the occurrence of the data **from a client to a server**. For comparison, the [event](#) is used to convey information in combination with the occurrence of the information from **a server to a client**.

The *occurrence* aspect of this statement has the consequence that e.g. the number of “fire & forget” calls can be counted by the implementation of the server and this meta-information could be taken to convey additional semantics on top of the actual data.

[TPS_MANI_01064]{DRAFT} Semantics of attribute [method.fireAndForget](#) [The activation of the “fire & forget” semantics of a given [method](#) is achieved by setting the value of attribute [method.fireAndForget](#) to value `true`.] ([RS_MANI_00003](#))

[TPS_MANI_03118]{DRAFT} Semantics of [ServiceInterface.method](#) with [fireAndForget](#) set to true [A [method](#) with [fireAndForget](#) set to the value `true` represents a void-return-method where the client is not expecting any kind of acknowledge or handshake from the server side.] ([RS_MANI_00003](#))

[constr_3374]{DRAFT} [method](#) with attribute [fireAndForget](#) set to true shall not have any inout or out arguments [A [method](#) that has the value of attribute [fireAndForget](#) set to `true` is not allowed to have any [arguments](#) with [direction](#) `inout` or `out`.] ()

[constr_3375]{DRAFT} **method with attribute `fireAndForget` set to true shall not reference an `ApApplicationError`** [A `method` that has the value of attribute `fireAndForget` set to `true` is not allowed to reference

- an `ApApplicationError` in role `possibleApError` and/or
- an `ApApplicationErrorSet` in the role `possibleApErrorSet`.

]()

[TPS_MANI_03119]{DRAFT} **Default value for the attribute `fireAndForget` of meta-class `ClientServerOperation`** [If the attribute `fireAndForget` is not defined then it shall be assumed that no “fire & forget” semantics is intended.] ([RS_MANI_00003](#))

3.4.6 Versioning of `ServiceInterfaces`

Using multiple versions of the same `ServiceInterface` supports an independent life cycle of services and allows to change and enhance `ServiceInterfaces` without affection of existing consumers. This chapter describes how different versions of the same `ServiceInterface` can be modeled.

A version of a `ServiceInterface` may be defined for example as `ServiceInterface` with an own `shortName` (e.g. `Service_Version1`, `Service_Version2`) or as `ServiceInterface` that is located in an own `ARPackage` (e.g. `/Version1/Service`, `/Version2/Service`).

It is also allowed to assign a different `namespace` to the different `ServiceInterface` versions to influence the generated code, e.g. to generate `com::version1::Service` and `com::version2::Service`.

It is expected that if using different versions of the same `ServiceInterface` in one `Executable` then different `namespaces` shall be used for each `ServiceInterface` version.

The attributes `ServiceInterface.majorVersion` and `ServiceInterface.minorVersion` provide the possibility to define version information at the level of the `ServiceInterface`.

[TPS_MANI_03616]{DRAFT} **Semantic versioning of `ServiceInterface.majorVersion` and `ServiceInterface.minorVersion`** [Service contract versioning rules:

- for backwards-incompatible interface or behavior changes the `majorVersion` number shall be increased and the `minorVersion` number shall be set to 0
- for backwards-compatible interface or behavior changes the `majorVersion` number shall be unchanged and the `minorVersion` number shall be increased.

] ([RS_MANI_00064](#))

Note that it is expected that the decision about backwards compatibility is made by the service designer. In other words AUTOSAR does not define formal criteria for the backwards compatibility of [ServiceInterfaces](#).

As for the modeling of several versions of a [ServiceInterface](#), the fully qualified [shortNames](#) of the [ServiceInterfaces](#) have to be different. The [ServiceInterfacePedigree](#) allows to collect the set of [ServiceInterfaces](#) which form the collection of different versions of the same [Service](#).

Class	ServiceInterfacePedigree			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	Collection of ServiceInterfaces that belong to the same versioning. Tags: atp.recommendedPackage=ServiceInterfacePedigrees			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
serviceInterface	ServiceInterface	*	ref	Reference to the ServiceInterfaces which belong to the same versioning.

Table 3.26: ServiceInterfacePedigree

The other consumers of this service do not need to switch to using the latest version of this [ServiceInterface](#), but can continue to use older versions of the [ServiceInterface](#) they were designed for and tested with.

3.4.6.1 Versioning driven by transport layer

Each transport layer mechanism (e.g. SOME/IP) may define its own compatibility rules. Therefore, for each individual transport layer an own impact assessment on the compatibility needs to be performed whether the changed service interface has an incompatible representation on this transport layer.

The compatibility depends on the features that are used on the transport layer. For example, in SOME/IP a length field that is put in front of a struct allows that during deserialization unknown elements at the end of an extensible data struct are skipped.

An additional option in SOME/IP is the usage of Data IDs in front of optional struct members. With this approach the receiver can skip unknown members of the struct, i.e. where the Data ID is unknown.

Therefore, on the Application Design level, all changes of [ServiceInterfaces](#) shall be handled carefully since only the used transport layer and the used features on the transport layer decide whether the change is compatible or not.

If one wants to make sure that two [AutosarDataPrototypes](#) inside a [ServiceInterface](#) are compatible then both [AutosarDataPrototypes](#) shall be typed by an identical [AutosarDataType](#).

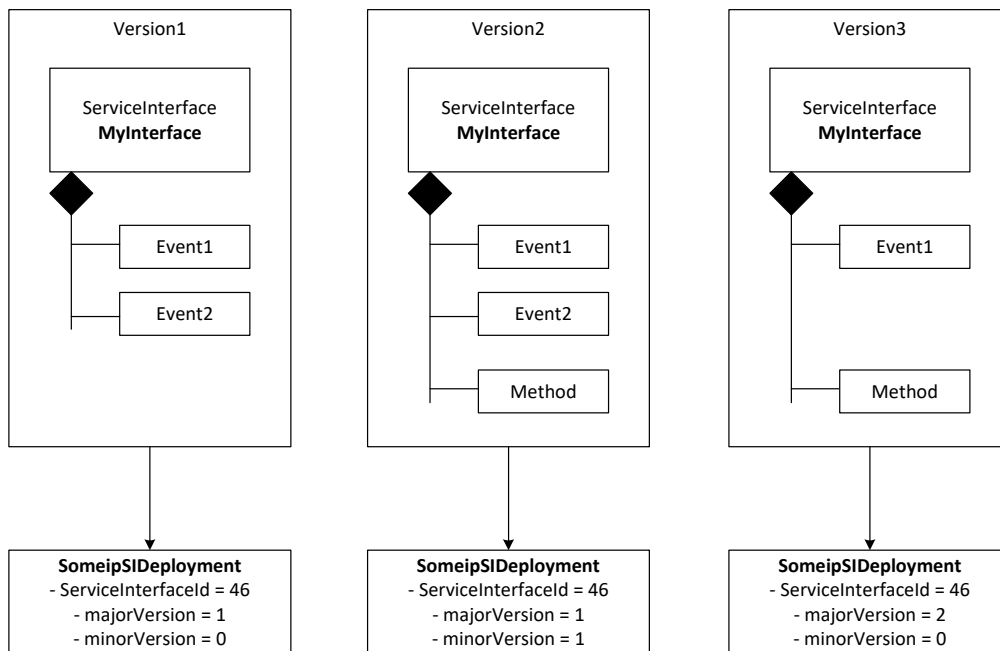


Figure 3.17: Example for different versions of the same `ServiceInterface`

During the `ServiceInterfaceDeployment` the `ServiceInterface` is mapped to a middleware transport layer where the necessary middleware transport layer specific configuration settings are performed, as described in chapter 11.2.

For example, it is possible to assign the same SOME/IP `serviceInterfaceId` to different versions of the same `ServiceInterface`, but a different `majorVersion` or `minorVersion`.

This approach takes into account that the compatibility of `ServiceInterfaces` is heavily influenced by the used transport binding.

Please note that the compatibility rules for SOME/IP are described in [8].

3.4.7 Namespace

The definition of a `ServiceInterface` has a direct impact on the code of an application on the *AUTOSAR adaptive platform*.

Without going into too much detail at this point, it is necessary to support the definition of a *namespace* in the context of a `ServiceInterface`.

The namespace shall be used to encapsulate source code related to the `ServiceInterface` and thus avoid name clashes with the content of other definitions of `ServiceInterfaces`.

In principle, the definition of the namespace around a concrete `ServiceInterface` could be derived from the structure of `ARPackages` in which the definition of the

`ServiceInterface` is contained. However, this approach puts some constraints of the package structure.

The same `ServiceInterface` may be used in different projects that may or may not demand the usage of a specific *different* package structure.

This placement of the same `ServiceInterface` in potentially different package hierarchies would lead to the definition of different namespaces, and thus the necessity to create or generate the code representing the `ServiceInterface` plus the code that uses this definition again and again.

One way to overcome this potential issue is to attach a dedicated namespace definition to the definition of the `ServiceInterface` itself.

This approach is documented in Figure 3.18.

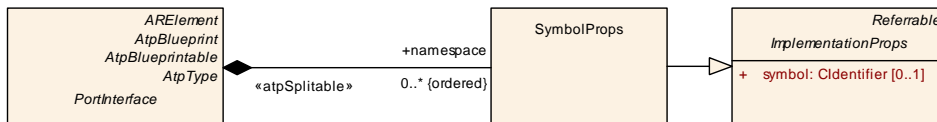


Figure 3.18: Specification of namespaces in `PortInterfaces`

[TPS_MANI_01004]{DRAFT} **Semantics of `ServiceInterface.namespace`** [The aggregation `ServiceInterface.namespace` shall be used to define the namespace to be used for the source code that corresponds to the given `ServiceInterface`.] (*RS_MANI_00003*)

```

<SERVICE-INTERFACE>
  <SHORT-NAME>MyServiceInterface</SHORT-NAME>
  <NAMESPACES>
    <SYMBOL-PROPS>
      <SHORT-NAME>first</SHORT-NAME>
      <SYMBOL>com</SYMBOL>
    </SYMBOL-PROPS>
    <SYMBOL-PROPS>
      <SHORT-NAME>second</SHORT-NAME>
      <SYMBOL>myCompany</SYMBOL>
    </SYMBOL-PROPS>
    <SYMBOL-PROPS>
      <SHORT-NAME>third</SHORT-NAME>
      <SYMBOL>software</SYMBOL>
    </SYMBOL-PROPS>
  </NAMESPACES>
</SERVICE-INTERFACE>
  
```

Listing 3.3: Example for the definition of a namespace for a given `ServiceInterface`

[TPS_MANI_01005]{DRAFT} **The definition of the namespace of a `ServiceInterface` may follow a hierarchical pattern** [The namespace of a `ServiceInterface` may follow a hierarchical pattern, as supported by many modern programming languages.

The separator between the elements of the hierarchical namespace definition depends on the used programming language and is not explicitly defined in the model.

The model only defines the elements of the hierarchical namespace pattern. | ([RS_MANI_00003](#))

As the consequence of the ability to define a hierarchical namespace, the aggregation `ServiceInterface.namespace` is qualified as being `ordered`.

This means that the order of individual elements to the collection of `namespaces` has a semantical relevance⁴.

[TPS_MANI_01006]{DRAFT} Ordered definition of `ServiceInterface.namespace` [In a hierarchical definition of `ServiceInterface.namespace` the order of `namespace` fragments shall be maintained in the translation of the namespace to source code.

In other words, the first `namespace` fragment shall appear first, followed by the second `namespace` fragment, and so on. | ([RS_MANI_00003](#))

Class	PortInterface (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	Abstract base class for an interface that is either provided or required by a port of a software component.			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	AbstractRawDataStreamInterface , AbstractSynchronizedTimeBaseInterface , ClientServerInterface , CryptoInterface , DataInterface , DiagnosticPortInterface , FirewallStateSwitchInterface , LogAndTraceInterface , ModeSwitchInterface , PersistencyInterface , PlatformHealthManagementInterface , SecurityEventReportInterface , ServiceInterface , StateManagementPortInterface , TriggerInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
namespace (ordered)	SymbolProps	*	aggr	This represents the SymbolProps used for the definition of a hierarchical namespace applicable for the generation of code artifacts out of the definition of a ServiceInterface. Stereotypes: <code>atpSplitable</code> Tags: <code>atp.Splitkey=namespace.shortName</code> <code>atp.Status=draft</code>

Table 3.27: PortInterface

Class	SymbolProps
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components
Note	This meta-class represents the ability to contribute a part of a namespace.
Base	ARObject , ImplementationProps , Referrable
Aggregated by	Allocator.namespace , ApApplicationErrorDomain.namespace , AtomicSwComponentType.symbolProps , CpplImplementationDataType.namespace , ImplementationDataType.symbolProps , PortInterface.namespace , SecurityEventDefinition.eventSymbolName



⁴This means that the definition of a namespace `a : : b` is semantically different from the definition of a namespace `b : : a`.



Class	SymbolProps			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.28: SymbolProps

The Listing 3.3 exemplifies the statement made by [TPS_MANI_01006], i.e. the resulting name space in e.g. C++ would look like sketched in Listing 3.4.

```

1 namespace com {
2     namespace myCompany {
3         namespace software {
4
5         }
6     }
7 }
```

Listing 3.4: Resulting namespace for the example [ServiceInterface](#)

3.4.8 Error Handling

The modeling of error handling on the *AUTOSAR adaptive platform* slightly differs from the approach implemented on the *AUTOSAR classic platform*.

In particular, the formal representation of an error during the execution of a `method` is done in a global scope, i.e. such a definition can be reused arbitrarily by any `ServiceInterface`.

[TPS_MANI_01190]{DRAFT} **Semantics of [ApApplicationError](#)** [Meta-class [ApApplicationError](#) represents the ability to define the existence of an error during the execution of a `method` independently of the scope of a `ServiceInterface` or `ClientServerOperation`.] ([RS_MANI_00002](#))

Class	ApApplicationError			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class represents the ability to formally specify the semantics of an application error on the AUTOSAR adaptive platform Tags: atp.recommendedPackage=ApplicationErrors			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
errorCode	Integer	0..1	attr	This attribute has the ability to specify the error code value within the enclosing AdaptivePlatformApplication Error.
errorDomain	ApApplicationError Domain	0..1	ref	This reference represents the error domain of the Ap ApplicationError.

Table 3.29: ApApplicationError

[constr_10132]{DRAFT} Multiplicity of attribute `ApApplicationError.errorCode` [For each `ApApplicationError`, the attribute `errorCode` shall exist at the time before the generation of the ara API starts.]()

[constr_1625]{DRAFT} Existence of reference `ApApplicationError.errorDomain` [For each `ApApplicationError`, the reference `errorDomain` shall exist.

In other words, the association of an `ApApplicationError` with a corresponding `ApApplicationErrorDomain` is mandatory.]()

[TPS_MANI_01198]{DRAFT} Semantics of `ApApplicationErrorSet` [Meta-class `ApApplicationErrorSet` has the ability to group references to `ApApplicationError` and thus represents a “proxy” to this group of references towards the `ClientServerOperation`.

The use case for this modeling ability is that some `ClientServerOperations` may have to reference an identical significant number of `ApApplicationErrors`.

Letting each of the `ClientServerOperations` repeat the same set of references to `ApApplicationError` is considered unnecessary and therefore the ability to refer to a group instead of individual references is provided as an alternative.](*RS_MANI_00026*)

The decision whether an `ApApplicationErrorSet` is defined and referenced from specific `ClientServerOperations` has to be done on an individual basis. AUTOSAR just wants to make this business as straightforward as possible.

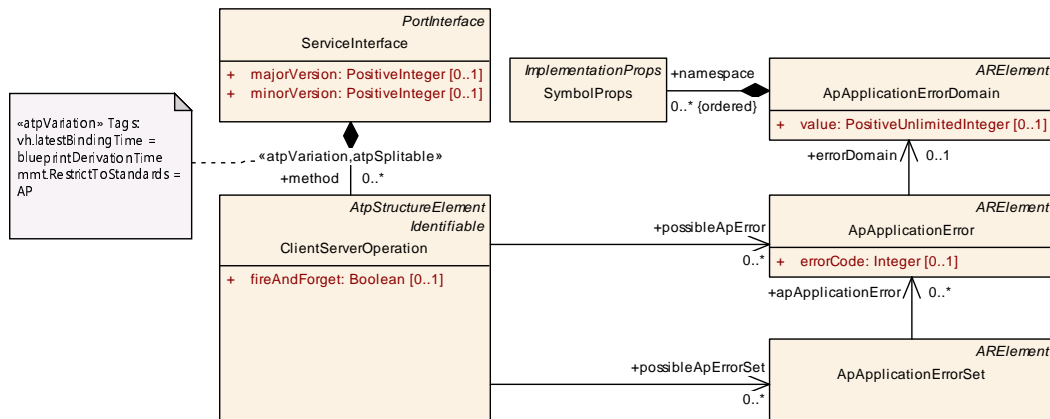


Figure 3.19: Modeling of `ApApplicationError` on the AUTOSAR adaptive platform

Please note that it is also positively possible to mix the usage of `ClientServerOperation.possibleApError` and `ClientServerOperation.possibleApErrorSet`.

Class	ApApplicationErrorSet			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class acts as a reference target that represents an entire collection of ApApplicationErrors. This takes the burden from ClientServerOperations that reference a larger number of ApApplication Errors. Tags: atp.recommendedPackage=ApplicationErrorSets			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
apApplicationError	ApApplicationError	*	ref	This reference represents the collection of ApApplicationError represented by the enclosing ApApplicationErrorSet

Table 3.30: ApApplicationErrorSet

As [ApApplicationError](#) is no longer defined within the scope of a [ServiceInterface](#), there is no need to define a mapping between two [ApApplicationErrors](#) by means of a dedicated sub-class of [ServiceInterfaceElementMapping](#).

[TPS_MANI_01191]{DRAFT} Modeling of possible errors [A [ClientServerOperation](#) aggregated by a [ServiceInterface](#) in the role [method](#) shall reference

- one or more [ApApplicationError](#)(s) in the role [possibleApError](#)
- one or more [ApApplicationErrorSet](#)(s) in the role [possibleApErrorSet](#)

to formally specify the existence of possible errors raised by the [ClientServerOperation](#).] ([RS_MANI_00026](#))

[TPS_MANI_01192]{DRAFT} Semantics of [ApApplicationErrorDomain](#) [Meta-class [ApApplicationErrorDomain](#) shall be used to define a specific error domain that can potentially be standardized by AUTOSAR.

Therefore, the definition of such an error domain is not defined in the scope of the [ApApplicationError](#) itself. Instead, an [ApApplicationError](#) identifies the applicable error domain by means of a reference in the role [errorDomain](#).

It is possible to attach the definition of a [namespace](#) to [ApApplicationErrorDomain](#) because this information is relevant for the language binding.]) ([RS_MANI_00026](#))

[TPS_MANI_01863]{DRAFT} Supported value range for attribute [ApApplicationErrorDomain.value](#) [The supported value range of attribute [ApApplicationErrorDomain.value](#) is given by [[constr_2637](#)].] ([RS_MANI_00026](#))

Please note that [[constr_2637](#)] can be found in the document TPS Generic Structure Template [7].

[[constr_10133](#)]{DRAFT} Multiplicity of attribute [ApApplicationErrorDomain.value](#) [For each [ApApplicationErrorDomain](#), the attribute [value](#) shall exist **at the time before the generation of the ara API starts**.] (])

[[constr_1664](#)]{DRAFT} Unique [ApApplicationError.shortName](#) [Within the set of all [ApApplicationErrors](#) that reference a given [ApApplicationErrorDomain](#)

in the role `errorDomain` the attribute `ApApplicationError.shortName` shall have a unique value.]()

[**constr_1665**]{DRAFT} **Unique** `ApApplicationError.errorCode` [Within the set of all `ApApplicationErrors` that reference a given `ApApplicationErrorDomain` in the role `errorDomain` the attribute `ApApplicationError.errorCode` shall have a unique value.]()

Class	ApApplicationErrorDomain			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class represents the ability to define a global error domain for an <code>ApApplicationError</code> . Tags: atp.recommendedPackage=ApplicationErrorDomains			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
namespace (ordered)	SymbolProps	*	aggr	This aggregation defines the namespace of the <code>ApApplicationErrorDomain</code>
value	PositiveUnlimitedInteger	0..1	attr	This attribute identifies the error category.

Table 3.31: ApApplicationErrorDomain

Rationale for the existence of [**constr_1664**] and [**constr_1665**]: the language binding for C++ foresees the usage of attributes `ApApplicationError.shortName` and `ApApplicationError.errorCode` for the creation of an `enum` within the context of the `ApApplicationErrorDomain`.

Duplicates in terms of labels of enumerators or values of enumerators lead to compile-time errors.

3.4.9 Service Interface Data Type Mapping

An important step in the workflow of implementing software on the *AUTOSAR adaptive platform* is the creation of a code-based representation of a `ServiceInterface` to make it accessible for the application code.

This creation of a code-based representation is usually automatized and will be executed by a code generator. This code generator needs an input from the model. The main input for this purpose is obviously the definition of the `ServiceInterface` itself.

However, this is not sufficient. The designer of a `ServiceInterface` is free to use `ApplicationDataTypes` for the specification of the details of the `ServiceInterface`.

It is therefore necessary to provide the definition of an `AbstractImplementationDataType` for each of the used `ApplicationDataType`. In the meta-model, this correspondence is implemented by means of the meta-class `DataTypeMappingSet`⁵.

⁵For more background regarding the definition and use of meta-class `DataTypeMappingSet` please refer to [1].

However, from the methodological point of view it is considered inappropriate to let `ServiceInterface` directly refer to one or more `DataTypeMappingSet(s)`.

For clarification, this would mean that the mapping of `ApplicationDataType` to `AbstractImplementationDataType` becomes an integral part of the definition of the `ServiceInterface` although the mapping itself does not really contribute to the actual semantics of the `ServiceInterface`.

As a consequence, the `ServiceInterface` would have to be updated whenever the mapping between data types changes.

But since the definition of `ServiceInterfaces` are usually considered very stable a frequent update for the mere purpose of acknowledging a change in the data type mapping is not acceptable.

In this concrete case, the described problem can be circumvented by the definition of a mapping class that refers to both a `ServiceInterface` and a `DataTypeMappingSet` and therefore create the correspondence without the need to update the `ServiceInterface`.

Although the prelude into this chapter suggests the existence of a meta-class that maps a `ServiceInterface` to one or more `DataTypeMappingSet(s)` the actual meta-model is designed with a broader focus.

In the future, there could be further kinds of `PortInterfaces` beside the `ServiceInterface` that need to fulfill the same use case.

Consequently, the name of the meta-class created for this purpose is `PortInterfaceToDataTypeMapping`.

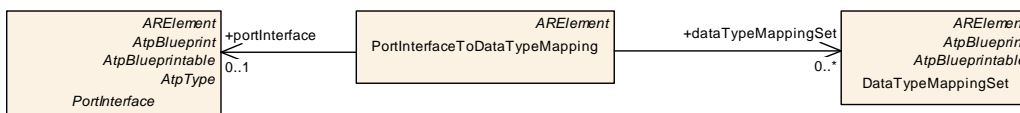


Figure 3.20: Modeling of `PortInterfaceToDataTypeMapping`

[constr_1507]{DRAFT} `PortInterfaceToDataTypeMapping` is only applicable to `ServiceInterface` or `PersistencyKeyValueStorageInterface` [`PortInterfaceToDataTypeMapping.portInterface` shall only refer to either a `ServiceInterface` or a `PersistencyKeyValueStorageInterface`.]()

Class	PortInterfaceToDataTypeMapping
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface
Note	<p>This meta-class represents the ability to associate a <code>PortInterface</code> with a <code>DataTypeMappingSet</code>. This association is needed for the generation of header files in the scope of a single <code>PortInterface</code>.</p> <p>The association is intentionally made outside the scope of the <code>PortInterface</code> itself because the designers of a <code>PortInterface</code> most likely will not want to add details about the level of <code>ImplementationDataType</code>.</p> <p>Tags:atp.recommendedPackage=PortInterfaceToDataTypeMappings</p>





Class	PortInterfaceToDataTypeMapping			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataTypeMappingSet	DataTypeMappingSet	*	ref	This represents the reference to the applicable data TypemappingSet Tags: atp.StatusComment=Reserved for adaptive platform
portInterface	PortInterface	0..1	ref	This represents the reference to the applicable Port Interface Tags: atp.StatusComment=Reserved for adaptive platform

Table 3.32: PortInterfaceToDataTypeMapping

[constr_10134]{DRAFT} Multiplicity of reference in the role [PortInterfaceToDataTypeMapping.dataTypeMappingSet](#) [For each [PortInterfaceToDataTypeMapping](#), the reference in the role [dataTypeMappingSet](#) shall exist at least once **at the time before the generation of the ara API starts.**]()

[constr_10135]{DRAFT} Multiplicity of reference in the role [PortInterfaceToDataTypeMapping.portInterface](#) [For each [PortInterfaceToDataTypeMapping](#), the reference in the role [portInterface](#) shall exist **at the time before the generation of the ara API starts.**]()

Class	DataTypeMappingSet			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	This class represents a list of mappings between ApplicationDataTypes and ImplementationDataTypes . In addition, it can contain mappings between ImplementationDataTypes and ModeDeclarationGroups . Tags: atp.recommendedPackage=DataTypeMappingSets			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataTypeMap	DataTypeMap	*	aggr	This is one particular association between an ApplicationDataType and its AbstractImplementationDataType .
modeRequestTypeMap	ModeRequestTypeMap	*	aggr	This is one particular association between an ModeDeclarationGroup and its AbstractImplementationDataType .

Table 3.33: DataTypeMappingSet

Class	DataTypeMap			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	This class represents the relationship between ApplicationDataType and its implementing AbstractImplementationDataType .			





Class	DataTypeMap			
Base	ARObject			
Aggregated by	DataTypeMappingSet.dataTypeMap			
Attribute	Type	Mult.	Kind	Note
applicationData Type	ApplicationDataType	0..1	ref	This is the corresponding ApplicationDataType
implementation DataType	AbstractImplementationDataType	0..1	ref	This is the corresponding AbstractImplementationDataType.

Table 3.34: DataTypeMap

3.4.10 Communication Group pattern

The Communication Group defines a specific pattern of the usage of a *ServiceInterface* in a bi-directional way.

The details can be found in SWS_CommunicationManagement [9]. In order to define a Communication Group several *ServiceInterface.category* values are defined.

[TPS_MANI_03628]{DRAFT} Standardized values of *ServiceInterface.category* [The AUTOSAR Standard reserves the following values for attribute *ServiceInterface.category*:

- COMMUNICATION_GROUP
- COMMUNICATION_GROUP_SERVER
- COMMUNICATION_GROUP_CLIENT

It is possible to use a custom, non-standardized value for the attribute *ServiceInterface.category* but this option comes with the obligation to use a value that is guaranteed to not clash with possible future extensions of the collection of standardized values, e.g. use company name in the *category* value.] (*RS_MANI_00003*)

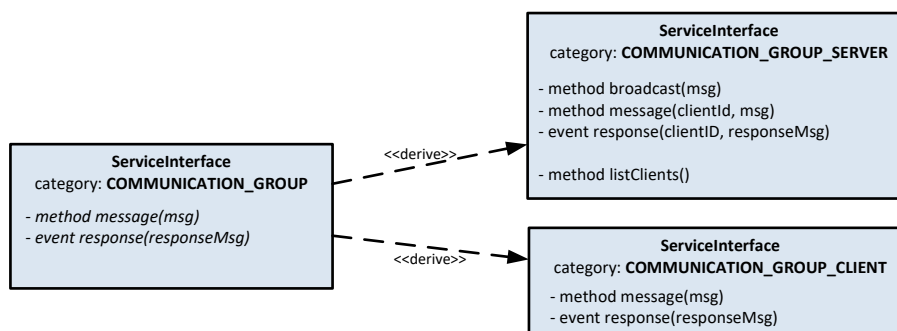


Figure 3.21: Example of Communication Group categories

The general idea of the Communication Group pattern is that a `ServiceInterface` of category `COMMUNICATION_GROUP` is created to describe the information to be transported (the `msg` and `responseMsg` data types). There will not be any instance of this `ServiceInterface` of category `COMMUNICATION_GROUP` in the system, it is just a design artifact.

Out of the `ServiceInterface` of category `COMMUNICATION_GROUP` the two `ServiceInterfaces` for the server (category `COMMUNICATION_GROUP_SERVER`) and the client (category `COMMUNICATION_GROUP_CLIENT`) roles are created. The rules how this creation shall be done are defined in `SWS_CommunicationManagement` [9].

3.5 Service Interface Mapping

Please note that, according to [TPS_MANI_01007], the `ServiceInterface` becomes the single basis for both `VFB`-based and *external* (i.e. using communication networks) communication.

This concept is in stark contrast to the approach on the *AUTOSAR classic platform* where different model elements are used for the `VFB`-level (`PortInterface`) and the network-level (`SystemSignal`, `ISignal`, and `ISignalIPdu`).

The usage of different model elements optimally supports the existence of different granularity for `VFB`-based vs. network-based communication.

In other words, design of communication on the network level may be subject to different design restrictions, e.g. keep the bus load caused by service discovery manageable by defining coarse-grained communication packages.

Opposed to that, designers on the `VFB` level may want to define interface granularity to achieve maximum reusability.

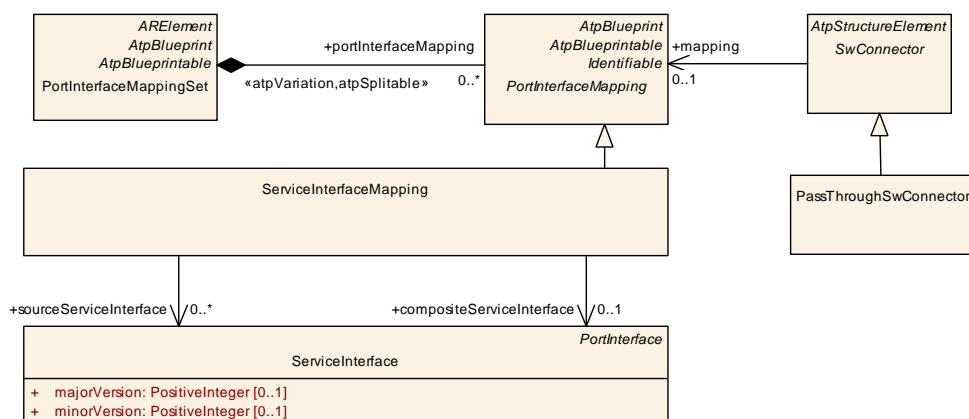


Figure 3.22: Modeling of the `ServiceInterfaceMapping`

[TPS_MANI_01002]{DRAFT} Semantics of meta-class `ServiceInterfaceMapping` [In order to sort out a potentially different motivation between the definition of

- `ServiceInterfaces` explicitly designed for `VFB`-based communication and

- `ServiceInterfaces` explicitly designed for network-based communication

meta-class `ServiceInterfaceMapping` is available to map

- (fine-grained) `ServiceInterfaces` for the VFB-communication to
- (coarse-grained) `ServiceInterfaces` for network communication.

]([RS_MANI_00017](#))

[TPS_MANI_01032]{DRAFT} Usage of `ServiceInterfaceMapping` [It is possible to derive a dedicated `AdaptiveApplicationSwComponentType` that implements the mapping functionality. A `SwComponentPrototype` derived from this so-called *facade* software-component would expose `PortPrototypes` for each of the `ServiceInterfaces`.

Other `SwComponentPrototypes` could then “connect” to the `PortPrototypes` typed by `ServiceInterfaces` referenced in the role `sourceServiceInterface`.

This means that the `PortPrototype` typed by the `ServiceInterface` referenced in the role `compositeServiceInterface` is used for external communication.

`PassThroughSwConnectors` can be used to describe in the modeled *facade* `CompositionSwComponentType` which “fine-grained” Ports are combined to a “coarse-grained” Port that is used for network communication. The mapping of Service Interface elements of the “fine-grained” Ports to the Service Interface elements of the “course-grained” Port is described with the `ServiceInterfaceMapping` or rather `ServiceInterfaceElementMapping`.]([RS_MANI_00017](#))

Please note that the modeling of a *facade* `SwComponentType` does not make any assumptions about the implementation and about the realization of such a *facade* functionality. The *facade* may be realized by an Adaptive Software Component/Application or it may be realized by a “Network-Daemon”. AUTOSAR does not define any instructions for the implementation of such a functionality and the decision is project specific. The behavioral aspects of such a “facade” (e.g. when is the coarse-grained `ServiceInstance` offered) are also project-specific and are not predefined by AUTOSAR.

Figure 3.23 summarizes the idea behind the creation of a *facade* software-component. The latter is able to “bundle” the communication of different `PortPrototypes` owned by potentially different `SwComponentTypes` for external communication.

In other words, elements `event1` owned by `SWC1` and `event2` owned by `SWC2` are combined into one `ServiceInterface` used to type one `PortPrototype` of the *facade* software-component.

From the communication-related outside point-of-view, `SWC3` acts like a facade to the “inner structure” created by `SWC1` and `SWC2` that is, by way of the existence of `SWC3`, abstracted away.

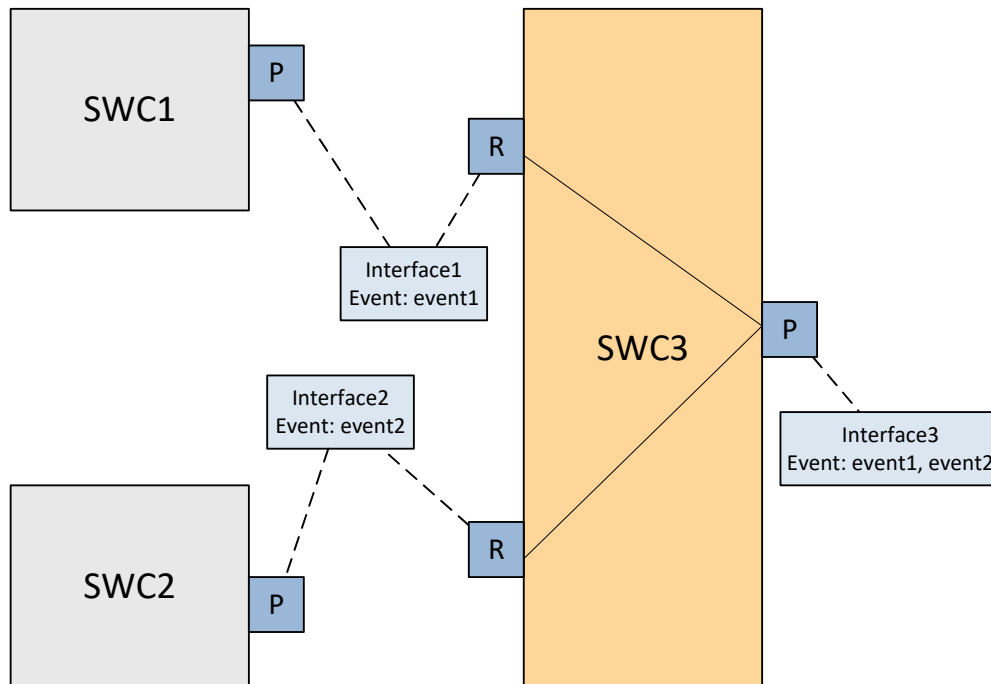


Figure 3.23: Concept of a facade software-component

[constr_5056]{DRAFT} Restriction of sub-class of `CompositionSwComponentType.connector` [In the context of a `CompositionSwComponentType.connector` (transitively) referenced by a `Executable.rootSwComponentPrototype`, the only supported sub-class of `SwConnector` is `PassThroughSwConnector`.]()

[constr_5057]{DRAFT} `PassThroughSwConnector` and `ServiceInterfaceMapping` [If a `PassThroughSwConnector` is defined between two Ports in a `CompositionSwComponentType` either:

- a `ServiceInterfaceMapping` between the `ServiceInterfaces` of these two Ports shall be defined and the `PassThroughSwConnector` shall reference the relevant `ServiceInterfaceMapping` in the role `mapping` or
- `ServiceInterfaceElementMappings` for elements of `ServiceInterfaces` of the two Ports shall be defined and the `PassThroughSwConnector` shall reference the relevant `ServiceInterfaceElementMappings` in the role `serviceInterfaceElementMapping`.

]()

[TPS_MANI_01022]{DRAFT} Concept behind `ServiceInterfaceMapping` [The concept behind the definition of a `ServiceInterfaceMapping` is that **all elements** of the `sourceServiceInterface` are required to have a **counterpart of the same kind** (`ServiceInterface.event`, `ServiceInterface.field`, or `ServiceInterface.method`) and with the identical `shortName`.]([RS_MANI_00017](#))

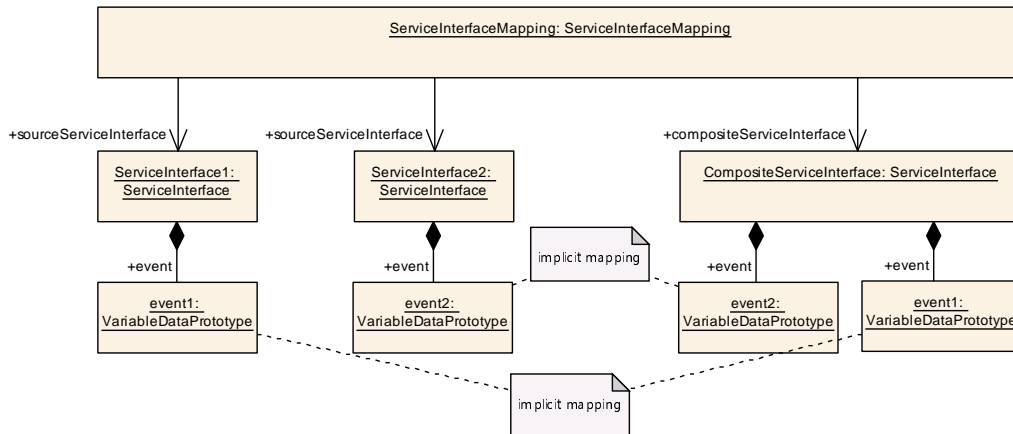


Figure 3.24: Example for the application of a `ServiceInterfaceMapping`

The regulation stated in [TPS_MANI_01022] is exemplified in Figure 3.24.

Please note that the creation of a `ServiceInterfaceMapping` is considered an atomic step, it is unlikely that such a `ServiceInterfaceMapping` is partially created and then later finished by a different party.

After all, there are mutually exclusive ways to specify the mapping, and any creator of a partial mapping of `ServiceInterfaces` could not be sure which of the alternatives apply for a specific pairing of one `ServiceInterface` with another without already knowing the other `ServiceInterface` (in which case the mapping can already be completed).

Therefore, there is no need to set the lower multiplicity of the references to `ServiceInterface` to 0.

Class	ServiceInterfaceMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ServiceInterfaceMapping			
Note	Specifies one <code>ServiceInterfaceMapping</code> that allows to define that a <code>ServiceInterface</code> is composite of several other <code>ServiceInterfaces</code> . Tags: atp.recommendedPackage=ServiceInterfaceMappings			
Base	<code>ARObject</code> , <code>AtpBlueprint</code> , <code>AtpBlueprintable</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PortInterfaceMapping</code> , <code>Referrable</code>			
Aggregated by	<code>PortInterfaceMappingSet.portInterfaceMapping</code>			
Attribute	Type	Mult.	Kind	Note
compositeServiceInterface	<code>ServiceInterface</code>	0..1	ref	This represents the composite <code>ServiceInterface</code> .
sourceServiceInterface	<code>ServiceInterface</code>	*	ref	<code>ServiceInterface</code> that is mapped into the composite <code>ServiceInterface</code> .

Table 3.35: ServiceInterfaceMapping

[constr_10136]{DRAFT} Multiplicity of reference in the role `ServiceInterfaceMapping.compositeServiceInterface` [For each `ServiceInterfaceMapping`, the reference in the role `compositeServiceInterface` shall exist at the time before the generation of the ara API starts.]()

[constr_10137]{DRAFT} **Multiplicity of reference in the role `ServiceInterfaceMapping.sourceServiceInterface`** [For each `ServiceInterfaceMapping`, the reference in the role `sourceServiceInterface` shall exist at least once at the time before the generation of the ara API starts.]()

[TPS_MANI_01003]{DRAFT} **Limitation of the applicability of `ServiceInterfaceMapping`** [The applicability of the `ServiceInterfaceMapping` is limited to cases where the `shortNames` of the elements of the `compositeServiceInterface` are **unique** in the context of the `compositeServiceInterface`.] (*RS_MANI_00017*)

Note that the `ServiceInterfaceMapping` is not an up-front association (by means of `SwConnectors`) between communication ends in the sense of section 3.4.6.

As stated in [TPS_MANI_01032], the `ServiceInterfaceMapping` allows for the derivation of a facade software-component or a proper configuration of the communication middleware.

The compatibility between the `sourceServiceInterfaces` and the `compositeServiceInterface` is achieved by an adequate transformation implemented in the facade software-component or the configuration of the middleware.

Thus, connecting `ServiceInterfaces` (or parts of them) via `ServiceInterfaceMappings` is not constrained by any compatibility rules apart from the ones stated in [TPS_MANI_01022].

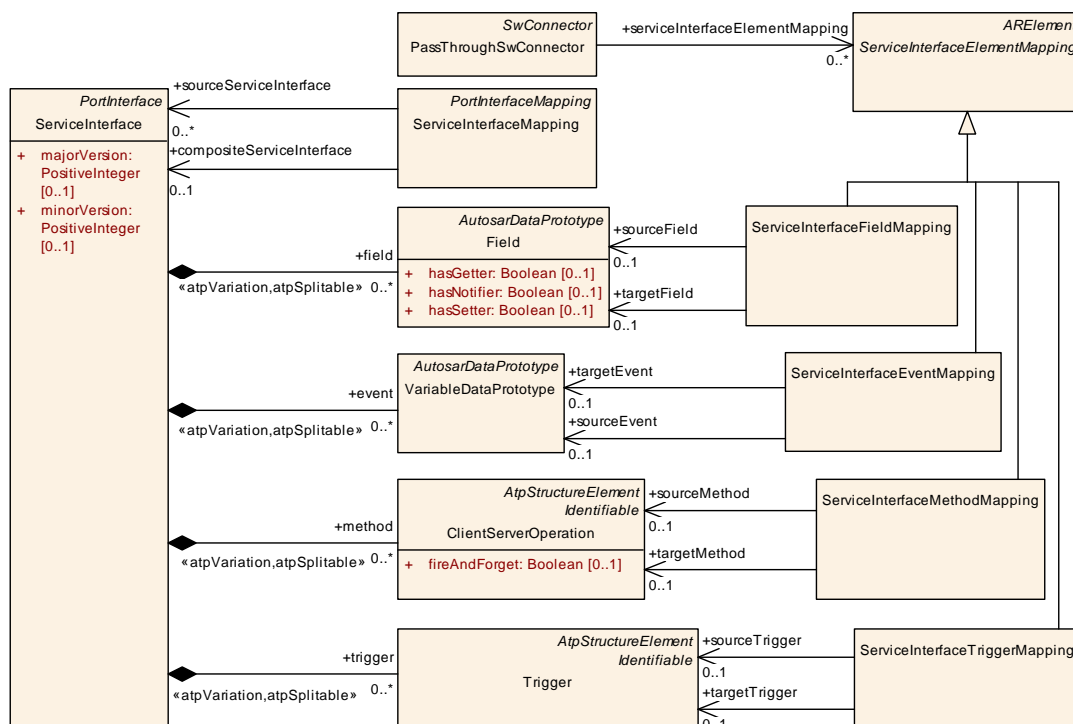


Figure 3.25: Overview of the modeling of the `ServiceInterfaceMapping` and `ServiceInterfaceElementMapping`

Class	PassThroughSwConnector			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Composition			
Note	This kind of SwConnector can be used inside a CompositionSwComponentType to connect two delegation PortPrototypes.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable , MultilanguageReferrable , Referrable , SwConnector			
Aggregated by	AtpClassifier.atpFeature, CompositionSwComponentType.connector			
Attribute	Type	Mult.	Kind	Note
providedOuterPort	AbstractProvidedPortPrototype	0..1	ref	This represents the provided outer delegation Port Prototype of the PassThroughSwConnector.
requiredOuterPort	AbstractRequiredPortPrototype	0..1	ref	This represents the required outer delegation Port Prototype of the PassThroughSwConnector.
serviceInterfaceElementMapping	ServiceInterfaceElementMapping	*	ref	Reference to a ServiceInterfaceElementMapping specifying the mapping of unequal named ServiceInterface elements of the two different ServiceInterfaces typing the two PortPrototypes which are referenced by the PassThroughSwConnector. Tags: atp.Status=draft

Table 3.36: PassThroughSwConnector

3.6 Service Interface Element Mapping

3.6.1 Overview

The existence of the [ServiceInterfaceMapping](#) leaves the question about how [ServiceInterfaces](#) where elements have non-matching [shortName](#) can be mapped.

The answer to this question is provided by the ability to create an element-wise mapping of elements of the same kind.

Figure 3.26 provides an example of how such a mapping on element basis looks like. Note that, in this example, both `ServiceInterface1` and `ServiceInterface2` aggregate a `field` with the `shortName field1`.

This configuration disqualifies the scenario from the application of the [ServiceInterfaceMapping](#), as of [TPS_MANI_01003]. The element-wise mapping, however, is able to work around the existence of the `shortName field1` in both “source” [ServiceInterfaces](#) quite nicely:

- `ServiceInterface1.field1` is mapped to `CompositeServiceInterface.leftField`
- `ServiceInterface2.field1` is mapped to `CompositeServiceInterface.rightField`

The formal modeling of the individual mappings is described in section 3.6.

Please note that it is **not intended** to mix a mapping of [ServiceInterfaces](#) with a mapping of elements of a [ServiceInterface](#).

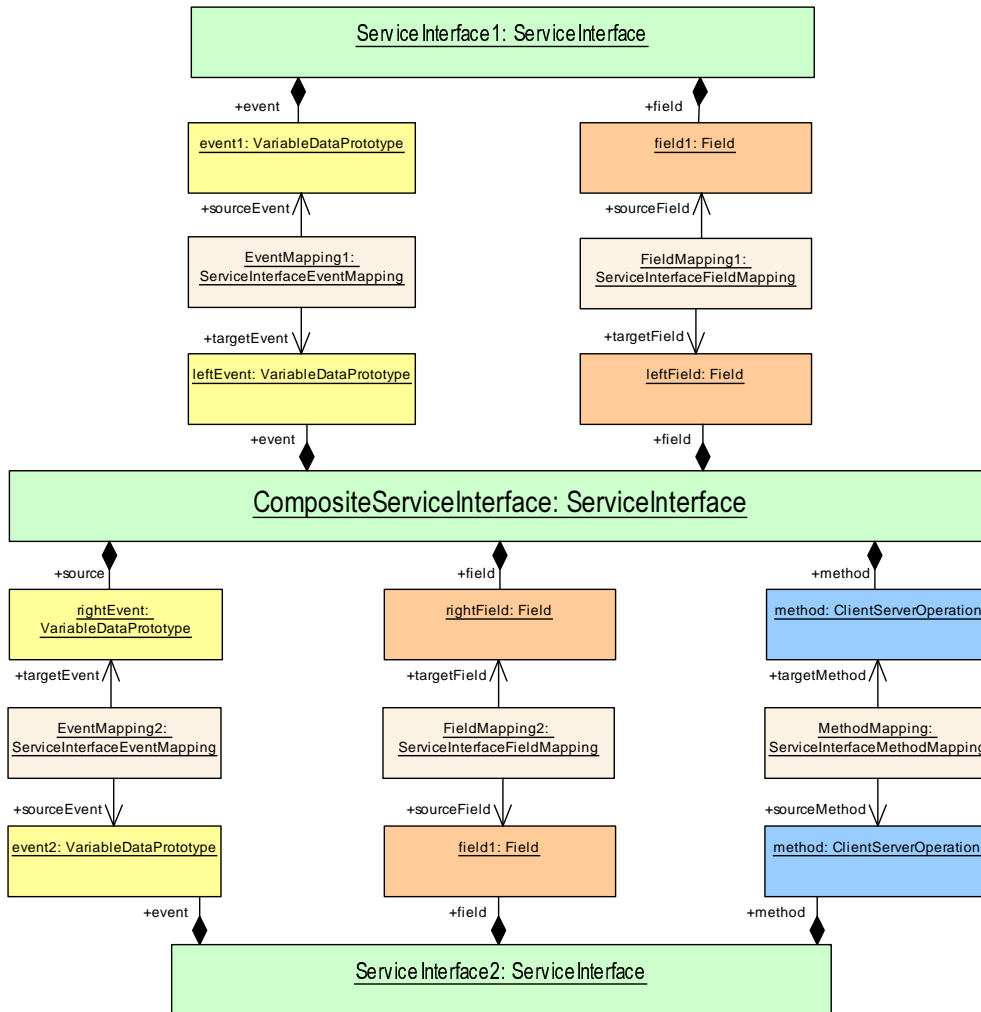


Figure 3.26: Example for a mapping of elements of `ServiceInterface`

In other words, as soon as a mapping between two `ServiceInterfaces` exists, it is not supported that a mapping between elements of the same pair of `ServiceInterfaces` exists. This important restriction is formalized by [\[constr_1482\]](#).

[constr_1482]{DRAFT} Mapping of service interfaces vs. mapping of service interface elements [In order to establish a mapping between a given pair of `ServiceInterfaces`, at most **one** of the following alternatives can exist:

- the given pair of `ServiceInterfaces` is referenced by a `ServiceInterfaceMapping`, where one `ServiceInterface` is referenced in the role `sourceServiceInterface` and the other `ServiceInterface` is referenced in the role `compositeServiceInterface`.
- an arbitrary mixture of the following options exists:
 - an `event` aggregated by one of the given `ServiceInterfaces` is referenced by a `ServiceInterfaceEventMapping` in the role `sourceEvent`

and one `events` aggregated by the other given `ServiceInterface` is referenced by the same `ServiceInterfaceEventMapping` in the role `targetEvent`.

- a `trigger` aggregated by one of the given `ServiceInterfaces` is referenced by a `ServiceInterfaceTriggerMapping` in the role `sourceTrigger` and one `trigger` aggregated by the other given `ServiceInterface` is referenced by the same `ServiceInterfaceTriggerMapping` in the role `targetTrigger`.
- a `field` aggregated by one of the given `ServiceInterfaces` is referenced by a `ServiceInterfaceFieldMapping` in the role `sourceField` and one `fields` aggregated by the other given `ServiceInterface` is referenced by the same `ServiceInterfaceFieldMapping` in the role `targetField`.
- a `method` aggregated by one of the given `ServiceInterfaces` is referenced by a `ServiceInterfaceMethodMapping` in the role `sourceMethod` and one `methods` aggregated by the other given `ServiceInterface` is referenced by the same `ServiceInterfaceMethodMapping` in the role `targetMethod`.

]()

Of course, it is possible that the same `ServiceInterface` is referenced by mappings to elements and mappings to entire `ServiceInterfaces`. The limitation formalized in [constr_1482] always applies to a **pair** of `ServiceInterfaces`.

A mapping between elements of `ServiceInterfaces` is modeled by means of a subclass of the abstract meta-class `ServiceInterfaceElementMapping`.

Class	<code>ServiceInterfaceElementMapping</code> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ServiceInterfaceMapping			
Note	This abstract meta-class acts as base class for the mapping of specific elements of a <code>ServiceInterface</code> .			
Base	<code>ARElement</code> , <code>ARObject</code> , <code>CollectableElement</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PackageableElement</code> , <code>Referrable</code>			
Subclasses	<code>ServiceInterfaceEventMapping</code> , <code>ServiceInterfaceFieldMapping</code> , <code>ServiceInterfaceMethodMapping</code> , <code>ServiceInterfaceTriggerMapping</code>			
Aggregated by	<code>ARPackage.element</code>			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.37: ServiceInterfaceElementMapping

Please note that the creation of a `ServiceInterfaceElementMapping` is considered an atomic step, i.e. it is unlikely that such a `ServiceInterfaceElementMapping` is partially created, handed over to a different party and then later finished by that different party.

After all, there are mutually exclusive ways to specify the mapping, and any creator of a partial mapping of `ServiceInterfaces` could not be sure which of the alternatives

apply for a specific pairing of one *ServiceInterface* with another without already knowing the other *ServiceInterface* (in which case the mapping can already be completed).

Therefore, there is no need to set the lower multiplicity of the references to elements of the *ServiceInterface* to 0.

[TPS_MANI_03277]{DRAFT} *ServiceInterfaceElementMappings* for a subset of elements of a single *ServiceInterface* [If elements of a source *ServiceInterface* are mapped to target *ServiceInterface* elements by *ServiceInterfaceElementMappings* it is allowed that only a subset of those source *ServiceInterface* elements are mapped to the target *ServiceInterface* elements.] (*RS_MANI_00017*)

With [TPS_MANI_03277] use cases are supported as shown in Figure 3.27 where the event4 and method2 of *ServiceInterface2* that is provided by AppM1_2 are used only locally on the Machine1 and event3 of the same *ServiceInterface* is provided together with the *ServiceInterface1* elements as new SOME/IP Service over the network.

Please note that the modeling of a facade *SwComponentType* does not make any assumptions about the implementation and about the realization of such a facade functionality.

AUTOSAR does not define any instructions for the implementation of such a functionality and the decision is project specific.

The behavioral aspects of such a “facade” (e.g. when is the coarse-grained *ProvidedApServiceInstance* offered) are also project-specific and are not predefined by AUTOSAR.

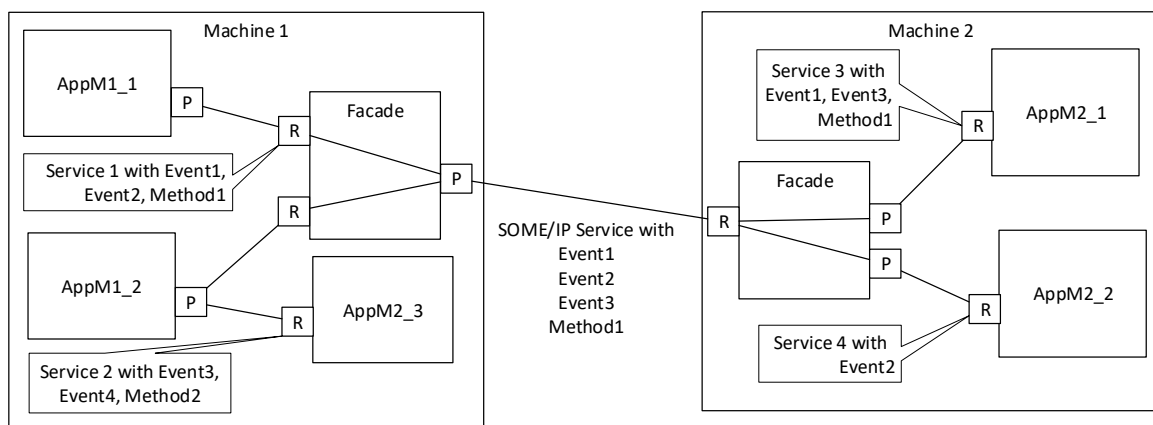


Figure 3.27: Example for *ServiceInterfaceElementMapping* for a subset of elements of a single *ServiceInterface* on the provider side

Similar use cases are applicable on the Consumer side as well as shown in Figure 3.28 where the Facade component is the service consumer of a SOME/IP service with

event1, event2 and event3, and method1 but only event1, event3 and method1 are used by Software that is deployed on Machine2.

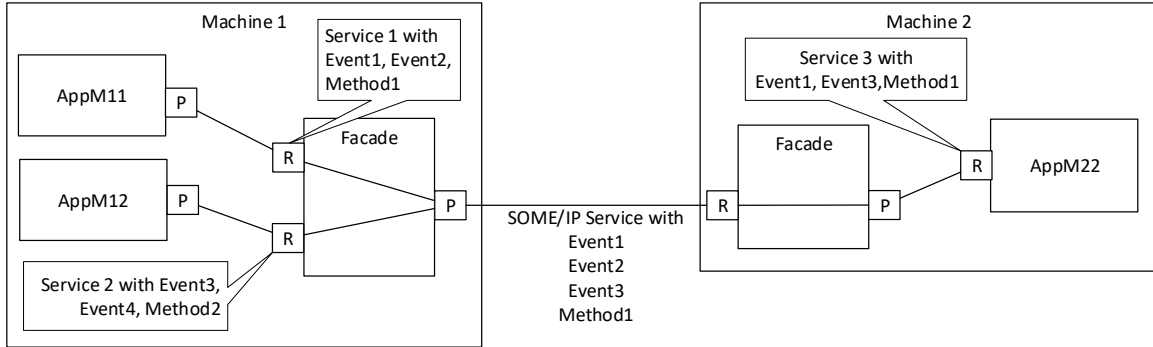


Figure 3.28: Example for `ServiceInterfaceElementMapping` for a subset of elements of a single `ServiceInterface` on the consumer side

3.6.2 Service Interface Event Mapping

[TPS_MANI_01024]{DRAFT} **Semantics of `ServiceInterfaceEventMapping`**
 [Meta-class `ServiceInterfaceEventMapping` has the ability to map a `ServiceInterface.event` referenced in the role `sourceEvent` explicitly to another `ServiceInterface.event` referenced in the role `targetEvent`.] (*RS_MANI_00017*)

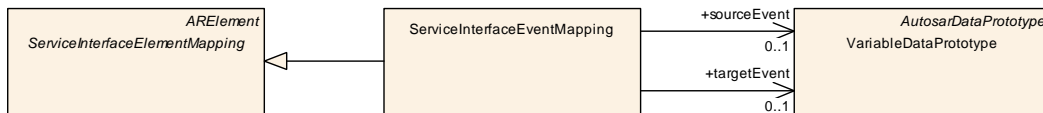


Figure 3.29: Modeling of the `ServiceInterfaceEventMapping`

Class	ServiceInterfaceEventMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ServiceInterfaceMapping			
Note	This meta-class allows to define a mapping between events of ServiceInterfaces that are mapped to each other by the ServiceInterfaceMapping. Tags: atp.recommendedPackage=ServiceInterfaceElementMappings			
Base	<i>ARElement, ARObjct, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, ServiceInterfaceElementMapping</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
sourceEvent	VariableDataPrototype	0..1	ref	Reference to an event that is contained in the source ServiceInterface.
targetEvent	VariableDataPrototype	0..1	ref	Reference to an event that is contained in the composite ServiceInterface.

Table 3.38: ServiceInterfaceEventMapping

[constr_10138]{DRAFT} **Multiplicity of reference in the role `ServiceInterfaceEventMapping.sourceEvent`** [For each `ServiceInterfaceEventMapping`, the reference in the role `sourceEvent` shall exist **at the time before the generation of the ara API starts.**]()

[constr_10139]{DRAFT} **Multiplicity of reference in the role `ServiceInterfaceEventMapping.targetEvent`** [For each `ServiceInterfaceEventMapping`, the reference in the role `targetEvent` shall exist **at the time before the generation of the ara API starts.**]()

The explicit mapping implemented by `ServiceInterfaceEventMapping` does **not** require equal `shortNames` on both sides of the mapping.

It is also possible to map a given `event` of a given `ServiceInterface` multiple times in different roles to the `ServiceInterface` that aggregates the `targetEvent`, as exemplified by Figure 3.30.

Please note that the mapping of one `sourceEvent` to different `targetEvents` does **not** represent a *fan-out* of any kind.

It only means that the `sourceEvent` will be used in different roles, as specified in the deployment. For more explanation, please find an example of how the role-based mapping of elements of `ServiceInterfaces` works in Figure A.5.

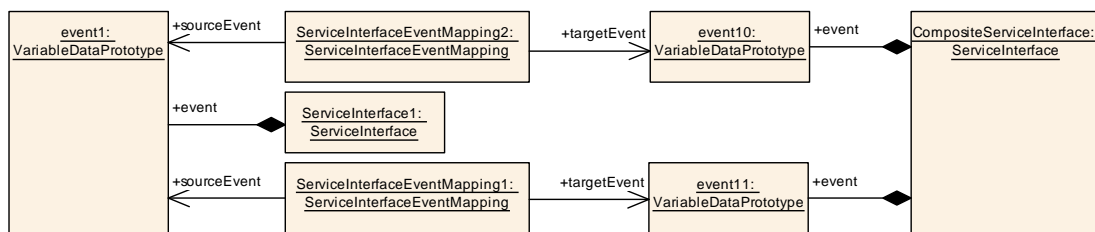


Figure 3.30: Example for the application of a `ServiceInterfaceEventMapping`

3.6.3 Service Interface Trigger Mapping

[TPS_MANI_03289]{DRAFT} **Semantics of `ServiceInterfaceTriggerMapping`** [Meta-class `ServiceInterfaceTriggerMapping` has the ability to map a `ServiceInterface.trigger` referenced in the role `sourceTrigger` explicitly to another `ServiceInterface.trigger` referenced in the role `targetTrigger`.] (*RS-MANI_00017*)

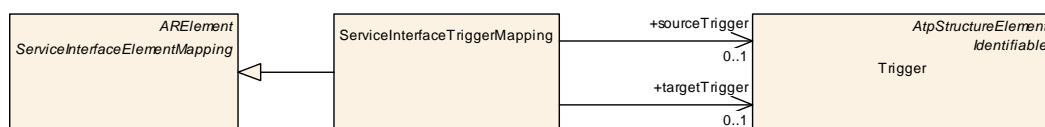


Figure 3.31: Modeling of the `ServiceInterfaceTriggerMapping`

Class	ServiceInterfaceTriggerMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ServiceInterfaceMapping			
Note	This meta-class allows to define a mapping between triggers of ServiceInterfaces that are mapped to each other by the ServiceInterfaceMapping. Tags: atp.recommendedPackage=ServiceInterfaceElementMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , ServiceInterfaceElementMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
sourceTrigger	Trigger	0..1	ref	Reference to a trigger that is contained in the source ServiceInterface.
targetTrigger	Trigger	0..1	ref	Reference to a trigger that is contained in the target ServiceInterface.

Table 3.39: ServiceInterfaceTriggerMapping

The explicit mapping implemented by [ServiceInterfaceTriggerMapping](#) does **not** require equal `shortNames` on both sides of the mapping.

It is also possible to map a given `trigger` of a given [ServiceInterface](#) multiple times in different roles to the [ServiceInterface](#) that aggregates the `targetTrigger`.

Please note that the mapping of one `sourceTrigger` to different `targetTriggers` does **not** represent a *fan-out* of any kind.

It only means that the `sourceTrigger` will be used in different roles, as specified in the deployment.

3.6.4 Service Interface Field Mapping

[TPS_MANI_01025]{DRAFT} **Semantics of [ServiceInterfaceFieldMapping](#)**
 [Meta-class [ServiceInterfaceFieldMapping](#) has the ability to map a [ServiceInterface.field](#) referenced in the role `sourceField` explicitly to another [ServiceInterface.field](#) referenced in the role `targetField`.] ([RS_MANI_00017](#))

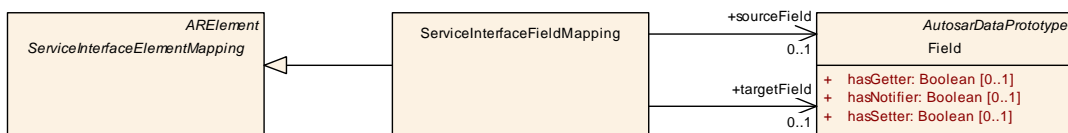


Figure 3.32: Modeling of the [ServiceInterfaceFieldMapping](#)

The explicit mapping implemented by [ServiceInterfaceFieldMapping](#) does **not** require equal `shortNames` on both sides of the mapping.

It is also possible to map a given `field` of a given [ServiceInterface](#) multiple times in different roles to the [ServiceInterface](#) that aggregates the `targetField`, as exemplified by [Figure 3.33](#).

Class	ServiceInterfaceFieldMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ServiceInterfaceMapping			
Note	This meta-class allows to define a mapping between fields of ServiceInterfaces that are mapped to each other by the ServiceInterfaceMapping. Tags: atp.recommendedPackage=ServiceInterfaceElementMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , ServiceInterfaceElementMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
sourceField	Field	0..1	ref	Reference to a field that is contained in the source ServiceInterface.
targetField	Field	0..1	ref	Reference to a field that is contained in the composite ServiceInterface.

Table 3.40: ServiceInterfaceFieldMapping

[constr_10140]{DRAFT} Multiplicity of reference in the role [ServiceInterfaceFieldMapping.sourceField](#) [For each [ServiceInterfaceFieldMapping](#), the reference in the role `sourceField` shall exist **at the time before the generation of the ara API starts.**.]()

[constr_10141]{DRAFT} Multiplicity of reference in the role [ServiceInterfaceFieldMapping.targetField](#) [For each [ServiceInterfaceFieldMapping](#), the reference in the role `targetField` shall exist **at the time before the generation of the ara API starts.**.]()

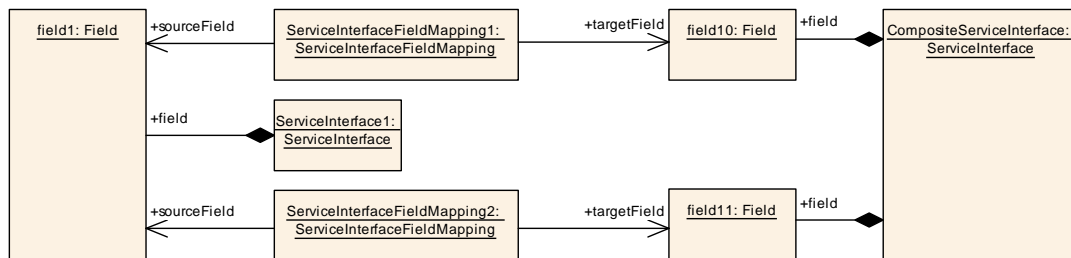


Figure 3.33: Example for the application of a [ServiceInterfaceFieldMapping](#)

Please note that the mapping of one `sourceField` to different `targetFields` does **not** represent a *fan-out* of any kind.

It only means that the `sourceField` will be used in different roles, as specified in the deployment. For more explanation, please find an example of how the role-based mapping of elements of `ServiceInterfaces` works in [Figure A.5](#).

3.6.5 Service Interface Method Mapping

[TPS_MANI_01026]{DRAFT} Semantics of [ServiceInterfaceMethodMapping](#) [Meta-class `ServiceInterfaceMethodMapping` has the ability to map a `ServiceInterface.method` referenced in the role `sourceMethod` explicitly to another

ServiceInterface.method referenced in the role targetMethod.](RS_MANI_00017)

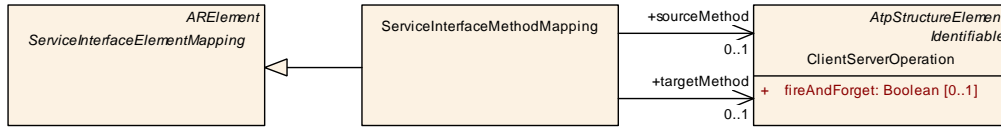


Figure 3.34: Modeling of the ServiceInterfaceMethodMapping

Class	ServiceInterfaceMethodMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ServiceInterfaceMapping			
Note	This meta-class allows to define a mapping between methods of ServiceInterfaces that are mapped to each other by the ServiceInterfaceMapping. Tags: atp.recommendedPackage=ServiceInterfaceElementMappings			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, ServiceInterfaceElementMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
sourceMethod	ClientServerOperation	0..1	ref	Reference to a method that is contained in the source ServiceInterface.
targetMethod	ClientServerOperation	0..1	ref	Reference to a method that is contained in the composite ServiceInterface.

Table 3.41: ServiceInterfaceMethodMapping

[constr_10142]{DRAFT} **Multiplicity of reference in the role ServiceInterfaceMethodMapping.sourceMethod** [For each ServiceInterfaceMethodMapping, the reference in the role sourceMethod shall exist at the time before the generation of the ara API starts.]()

[constr_10143]{DRAFT} **Multiplicity of reference in the role ServiceInterfaceMethodMapping.targetMethod** [For each ServiceInterfaceMethodMapping, the reference in the role targetMethod shall exist at the time before the generation of the ara API starts.]()

The explicit mapping implemented by ServiceInterfaceMethodMapping does not require equal shortNames on both sides of the mapping.

It is also possible to map a given method of a given ServiceInterface multiple times in different roles to the ServiceInterface that aggregates the targetMethod, as exemplified by Figure 3.35.

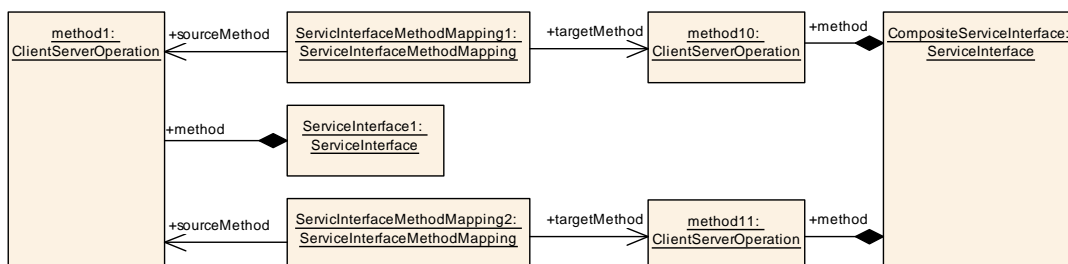


Figure 3.35: Example for the application of a ServiceInterfaceMethodMapping

Please note that the mapping of one `sourceMethod` to different `targetMethods` does **not** represent a *fan-out* of any kind.

It only means that the `sourceMethod` will be used in different roles, as specified in the deployment. For more explanation, please find an example of how the role-based mapping of elements of `ServiceInterfaces` works in Figure A.5.

3.7 State Management Interface

3.7.1 Overview

`PortInterfaces` defined in the context of State Management are supposed to be used by the modeling of the State Management itself, i.e. the `PortInterfaces` described in this chapter shall be used to type `PortPrototypes` in the context of one or more `Executable(s)` that implement(s) the State Management.

There are two kinds of `PortInterfaces` used in the context of State Management:

- `ServiceInterface`, see section 3.4
- sub-classes of `StateManagementPortInterface`, see Figure 3.36

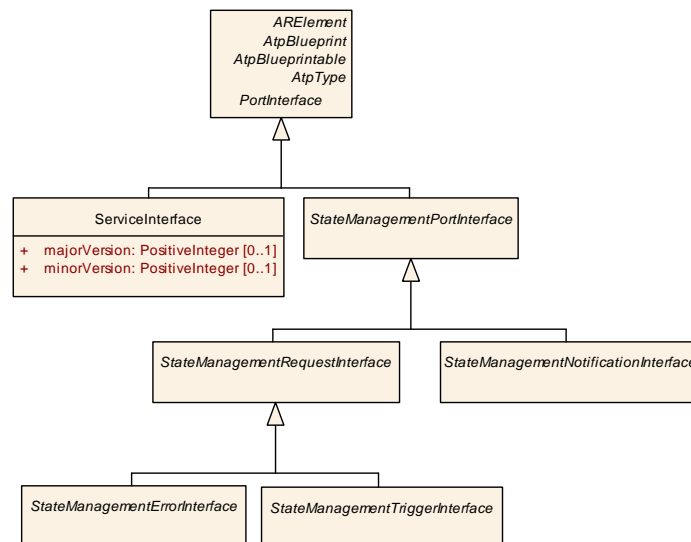


Figure 3.36: Big picture of State Management interface modeling

Class	<code>StateManagementPortInterface</code> (abstract)
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface
Note	This abstract class acts as a base class for <code>PortInterfaces</code> that are used in the context of state management on the AUTOSAR adaptive platform. Tags: atp.Status=draft
Base	<code>ARElement</code> , <code>ARObject</code> , <code>AtpBlueprint</code> , <code>AtpBlueprintable</code> , <code>AtpClassifier</code> , <code>AtpType</code> , <code>CollectableElement</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PackageableElement</code> , <code>PortInterface</code> , <code>Referrable</code>





Class	StateManagementPortInterface (abstract)			
Subclasses	StateManagementNotificationInterface , StateManagementRequestInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.42: StateManagementPortInterface

Furthermore, the subclasses of [StateManagementPortInterface](#) are subdivided in [PortInterfaces](#) for the processing of requests to State Management (represented by abstract class [StateManagementRequestInterface](#)) and the notification of state switches, modeled as abstract class [StateManagementNotificationInterface](#).

The “big picture” of the modeling of [PortInterfaces](#) for State Management is depicted in Figure 3.36.

Class	StateManagementNotificationInterface (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::StateManagement			
Note	This meta-class acts as an abstract base class for state management notification interfaces. Tags: atp.Status=draft			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable , StateManagementPortInterface			
Subclasses	StateManagementFunctionGroupSwitchNotificationInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.43: StateManagementNotificationInterface

In terms of requests, State Management interacts with a variety of function cluster modules and the interaction patterns, as well as the underlying APIs are very diverse. Therefore, it is necessary (for the use cases that don’t utilize [ServiceInterfaces](#)) to define a collection of different [PortInterfaces](#) separately for the two main request use cases:

- Processing of “triggers”, see section 3.7.3
- Processing of “errors”, see section 3.7.4

Class	StateManagementRequestInterface (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::StateManagement			
Note	This meta-class acts as an abstract base class for state management request interfaces. Tags: atp.Status=draft			





Class	StateManagementRequestInterface (abstract)			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable , StateManagementPortInterface			
Subclasses	StateManagementErrorInterface , StateManagementTriggerInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.44: StateManagementRequestInterface

Consequently, further abstract base classes are introduced to organize the definition of [PortInterfaces](#) for the different State Management use cases:

- [StateManagementTriggerInterface](#)
- [StateManagementErrorInterface](#)

Class	StateManagementTriggerInterface (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	The usage of this meta-class for typing a PortPrototype indicates that the PortPrototype is used for the trigger provision in the context of state management on the AUTOSAR adaptive platform. Tags: atp.Status=draft			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable , StateManagementPortInterface , StateManagementRequestInterface			
Subclasses	StateManagementDiagTriggerInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.45: StateManagementTriggerInterface

Class	StateManagementErrorInterface (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::StateManagement			
Note	The usage of this meta-class for typing a PortPrototype indicates that the PortPrototype is used for the error provision in the context of state management on the AUTOSAR adaptive platform. Tags: atp.Status=draft			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable , StateManagementPortInterface , StateManagementRequestInterface			
Subclasses	StateManagemenPhmErrorInterface , StateManagementEmErrorInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.46: StateManagementErrorInterface

3.7.2 State Management Interfaces for Notifications

As depicted by Figure 3.37, there are two kinds of notification that the State Management needs to support:

- Notification of `Function Group` state switch. This notification is typically directed at the execution management, it is formalized as `StateManagementFunctionGroupSwitchNotificationInterface`.
- Notification of the switch of an “internal” state, represented by a `field` owned by a `ServiceInterface`.

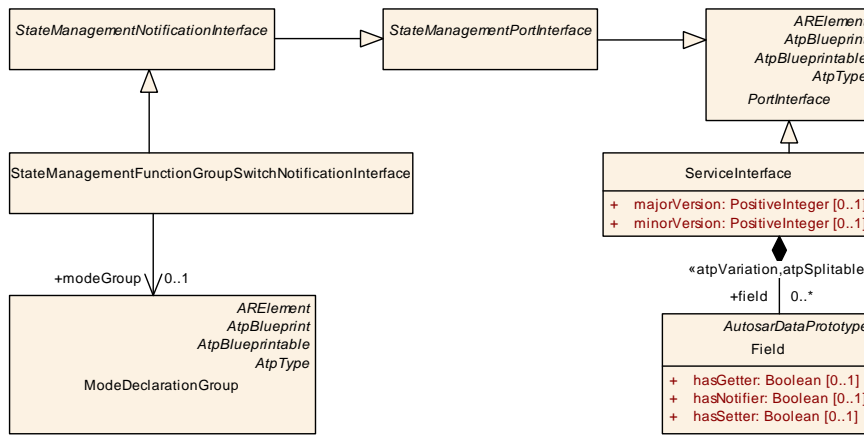


Figure 3.37: Modeling of `StateManagementPortInterfaces` for state switch notifications

Class	StateManagementFunctionGroupSwitchNotificationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::StateManagement			
Note	The usage of this meta-class for typing a PortPrototype indicates that the PortPrototype is used for sending out a notification of a function group state change in the context of state management on the AUTOSAR adaptive platform. Tags: atp.Status=draft atp.recommendedPackage=StateManagementPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable , StateManagementNotificationInterface , StateManagementPortInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
modeGroup	ModeDeclarationGroup	0..1	ref	This reference identifies the ModeDeclarationGroup that defines the individual states that that can be switched to. Tags: atp.Status=draft

Table 3.47: StateManagementFunctionGroupSwitchNotificationInterface

[constr_10389]{DRAFT} Existence of attribute `StateManagementFunctionGroupSwitchNotificationInterface.modeGroup` [For each `StateManagementFunctionGroupSwitchNotificationInterface`, the aggregation in the role `modeGroup` shall exist **at the time when the creation of the manifest is finished.**]()

3.7.3 State Management Interfaces for Triggers

In the majority of cases, communication of triggers is done by means of [ServiceInterface](#). the notable exception from this rule is the diagnostics management, which uses a dedicated subclass of [StateManagementTriggerInterface](#): [StateManagementDiagTriggerInterface](#).

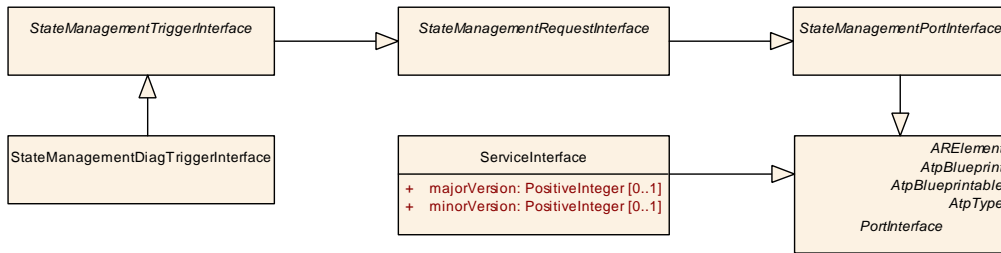


Figure 3.38: Modeling of State Management trigger interfaces

Class	StateManagementDiagTriggerInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::StateManagement			
Note	This meta-class indicates that the PortPrototype that references this class is used for accepting a state change trigger from the diagnostics management. Tags: atp.Status=draft atp.recommendedPackage=StateManagementPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable , StateManagementPortInterface , StateManagementRequestInterface , StateManagementTriggerInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.48: StateManagementDiagTriggerInterface

3.7.4 State Management Interfaces for Errors

In contrast to the communication of triggers, errors in the context of State Management are entirely handled by dedicated subclasses of [StateManagementErrorInterface](#), as depicted in Figure 3.39.

As of the current state of interaction patterns with the State Management, two functional clusters report errors directly to State Management:

- For Execution Management [10], State Management exposes a [PortPrototype](#) typed by [StateManagementEmErrorInterface](#).
- For Platform Health Management [11], State Management exposes a [PortPrototype](#) typed by [StateManagementPhmErrorInterface](#).

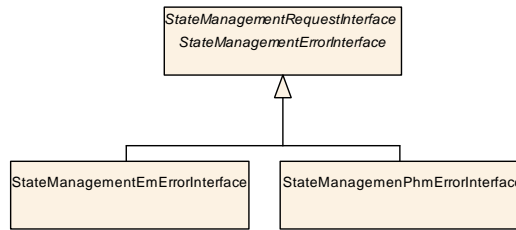


Figure 3.39: Modeling of State Management error interfaces

Class	StateManagementEmErrorInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::StateManagement			
Note	This meta-class indicates that the PortPrototype that references this class is used for accepting a error submissions from the execution management. Tags: atp.Status=draft atp.recommendedPackage=StateManagementPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable , StateManagementErrorInterface , StateManagementPortInterface , StateManagementRequestInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.49: StateManagementEmErrorInterface

Class	StateManagemenPhmErrorInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::StateManagement			
Note	This meta-class indicates that the PortPrototype that references this class is used for accepting a error submissions from the platform health management. Tags: atp.Status=draft atp.recommendedPackage=StateManagementPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable , StateManagementErrorInterface , StateManagementPortInterface , StateManagementRequestInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.50: StateManagemenPhmErrorInterface

3.8 Persistency Interface

3.8.1 Overview

3.8.1.1 The big Picture

The *AUTOSAR adaptive platform* foresees a support for access to persistent data by e.g. application software.

There are some similarities to the communication model in terms of the usage of [PortPrototypes](#).

In contrast to the configuration of communication, however, the modeling approach is much less detailed (i.e. instead of providing access to individual elements of a key-value storage an entire key-value storage is accessible on the level of [PortPrototype](#)).

The aspect of deployment for the configuration of persistent data is explained in [Figure 3.40](#).

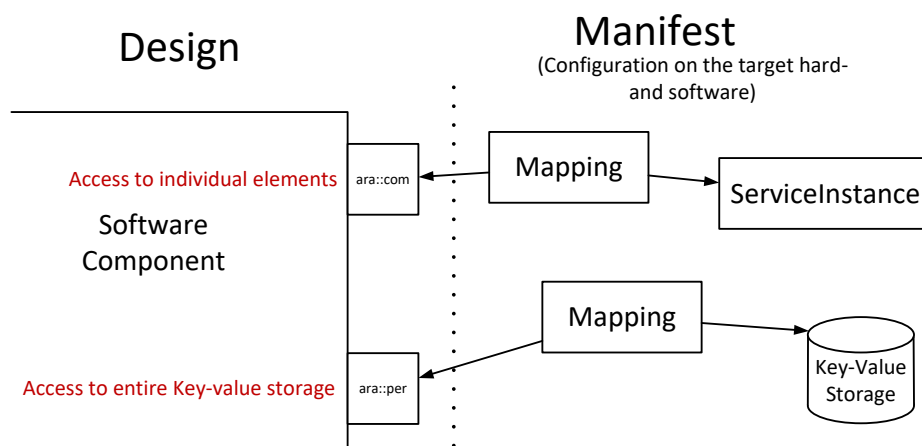


Figure 3.40: General approach for the modeling of persistency

Please note that the AUTOSAR meta-model actually defines two separate meta-classes (for more details, please refer to [Figure 3.41](#)) for the different use cases of access to persistent data (i.e. [PersistencyKeyValueStorageInterface](#)) and access to files on the file system, or maybe an emulation of one (by means of [PersistencyFileStorageInterface](#)).

3.8.1.2 Modeling of Persistency Interface

Abstract meta-class [PersistencyInterface](#) has been created as a means of categorization, i.e. it allows for easily referring to [PortInterfaces](#) dedicated to persistency in general.

As a counterpart to the abstract base class [PersistencyInterface](#) on interface level, meta-class [PersistencyInterfaceElement](#) has been defined as an abstract base class for elements of a [PersistencyInterface](#).

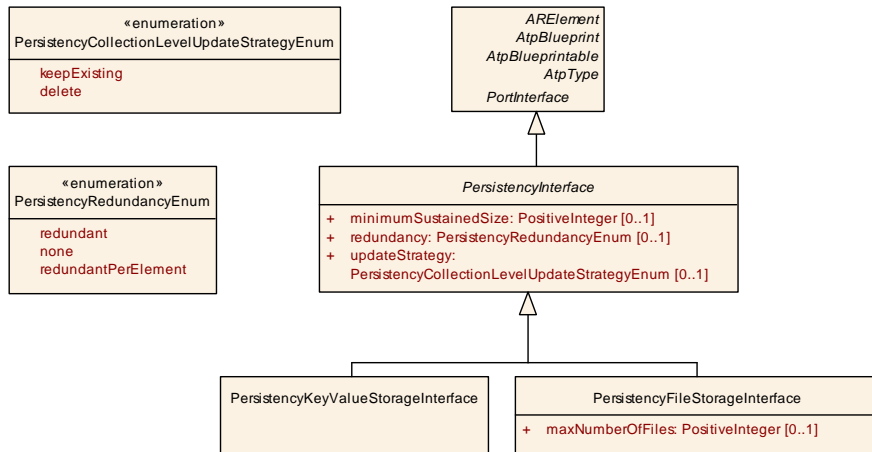


Figure 3.41: Specification of PortInterfaces for persistency use cases

Class	<i>PersistencyInterfaceElement</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::Persistency			
Note	This meta-class provides the abstract ability to define an element of a PortInterface for the support of persistency use cases.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Subclasses	<i>PersistencyDataElement</i> , <i>PersistencyFileElement</i>			
Attribute	Type	Mult.	Kind	Note
updateStrategy	<i>PersistencyElementLevelUpdateStrategyEnum</i>	0..1	attr	This attribute can be used to specify the update strategy of the respective <i>PersistencyInterfaceElement</i> .

Table 3.51: PersistencyInterfaceElement

[TPS_MANI_01194]{DRAFT} **Semantics of *PersistencyInterface.minimumSustainedSize*** [Attribute *PersistencyInterface.minimumSustainedSize* can be used for the definition of a minimum amount of storage that the *PersistencyInterface* will need to allocate from the application designer’s point of view.] (*RS_MANI_00027*)

Class	<i>PersistencyInterface</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::Persistency			
Note	This meta-class provides the abstract ability to define a PortInterface for the support of persistency use cases.			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>AtpBlueprint</i> , <i>AtpBlueprintable</i> , <i>AtpClassifier</i> , <i>AtpType</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>PortInterface</i> , <i>Referrable</i>			
Subclasses	<i>PersistencyFileStorageInterface</i> , <i>PersistencyKeyValueStorageInterface</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
minimumSustainedSize	PositiveInteger	0..1	attr	The value of this attribute represents the minimum size (unit: bytes) required at design time for the enclosing <i>PersistencyInterface</i> .
redundancy	<i>PersistencyRedundancyEnum</i>	0..1	attr	This attribute represents a requirement towards the redundancy of storage.





<i>Class</i>	<i>PersistencyInterface</i> (abstract)			
redundancy Handling	PersistencyRedundancy Handling	*	aggr	This aggregation represents the chosen approaches to handle redundancy for the various use cases implemented by subclasses
updateStrategy	PersistencyCollection LevelUpdateStrategy Enum	0..1	attr	This attribute can be used to specify the update strategy of the respective <i>PersistencyInterface</i> as a whole.

Table 3.52: PersistencyInterface

3.8.1.3 Redundancy Handling

[TPS_MANI_01204]{DRAFT} **Specification of redundancy of persistent data** [The attribute [PersistencyInterface.redundancy](#) can be taken to specify whether the respective key-value storage or file storage shall store data redundantly from the perspective of the designer of the software-component.] ([RS_MANI_00027](#))

The details are left to an integrator who may also decide to overrule the value of [PersistencyInterface.redundancy](#) entirely if there is a use case for that.

<i>Enumeration</i>	<i>PersistencyRedundancyEnum</i>
<i>Package</i>	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ComSpec
<i>Note</i>	This meta-class provides a way to specify in which way redundancy shall be applied on collection level.
<i>Aggregated by</i>	PersistencyInterface.redundancy
<i>Literal</i>	<i>Description</i>
none	This value represents the requirement that redundancy measures are not applied on persistency storage level. Tags: atp.EnumerationLiteralIndex=1
redundant	This value represents the requirement that redundancy measures are applied on persistency storage level. The nature of the redundant persistent storage is not further qualified and subject to integrator decisions. Tags: atp.EnumerationLiteralIndex=0
redundantPer Element	This value represents the requirement that redundancy measures are applied on key-value level of a key-value storage or on file level of a file storage. The nature of the redundancy used on the persistent storage is not further qualified and subject to integrator decisions. Tags: atp.EnumerationLiteralIndex=2

Table 3.53: PersistencyRedundancyEnum

[TPS_MANI_01319]{DRAFT} **Modeling of redundancy in the context of [PersistencyInterface](#)** [As an alternative to the ability to use [PersistencyInterface.redundancy](#) for announcing the consideration of redundancy at all, the design level for persistency also provides the ability to provide a more detailed definition of redundant behavior for both key-value storage and files by means of the aggregation of [PersistencyRedundancyHandling](#) at [PersistencyInterface](#).

This modeling is attached to the abstract base class `PersistenceInterface` in order to let both aspects of persistency (i.e. key-value storage and file storage) on the AUTOSAR adaptive platform benefit from the existence of meta-class `PersistenceRedundancyHandling`.] (*RS_MANI_00027*)

Class	<i>PersistenceRedundancyHandling</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistence			
Note	This abstract base class represents a formal description of redundancy.			
Base	<i>ARObject</i>			
Subclasses	<i>PersistenceRedundancyChecksum</i> , <i>PersistenceRedundancyMOutOfN</i>			
Aggregated by	<i>PersistenceDeployment</i> . <i>redundancyHandling</i> , <i>PersistenceInterface</i> . <i>redundancyHandling</i>			
Attribute	Type	Mult.	Kind	Note
scope	<i>PersistenceRedundancyHandlingScopeEnum</i>	0..1	attr	This attribute controls the scope in which the redundancy handling is applied.

Table 3.54: PersistenceRedundancyHandling

[TPS_MANI_01320]{DRAFT} **Definition of redundancy on interface level may be overruled in deployment** [The modeling of redundancy by means of `PersistenceInterface.redundancyHandling` represents the intention of the designer of the `PersistenceInterface`.

While this is certainly a valuable input to the deployment phase, it is explicitly foreseen that an integrator may overrule the design decision regarding persistency based on superior knowledge only available at deployment time.] (*RS_MANI_00027*)

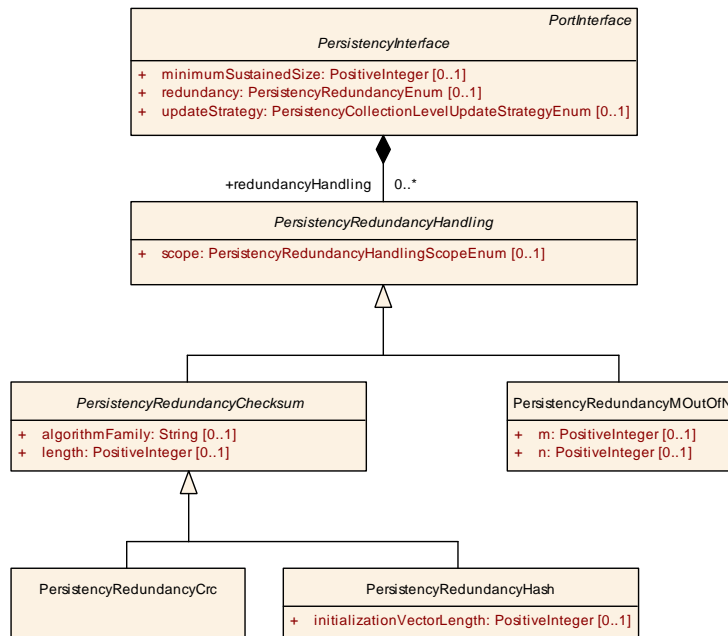


Figure 3.42: Specification of redundancy on the level of PersistenceInterface

[constr_1746]{DRAFT} **Mutual exclusive existence of PersistenceInterface.redundancy and PersistenceInterface.redundancyHandling** [For each `PersistenceInterface`, either the attribute `redundancy` or the aggregation of

[PersistencyRedundancyHandling](#) in the role [redundancyHandling](#) may exist.]
 ()

Enumeration	PersistencyRedundancyHandlingScopeEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency
Note	This meta-class provides values to control the scope of redundancy measures in the persistency deployment
Aggregated by	PersistencyRedundancyHandling.scope
Literal	Description
persistencyRedundancyHandlingScopeElement	The redundancy handling shall be applied on element level (key-value pair and file). Tags: atp.EnumerationLiteralIndex=0
persistencyRedundancyHandlingScopeStorage	The redundancy handling shall be applied on storage (key-value storage and file storage) level. Tags: atp.EnumerationLiteralIndex=1

Table 3.55: PersistencyRedundancyHandlingScopeEnum

[TPS_MANI_01207]{DRAFT} **Standardized values of attribute [PersistencyRedundancyChecksum.algorithmFamily](#)** [The following values of attribute [PersistencyRedundancyChecksum.algorithmFamily](#) are standardized by AUTOSAR:

- CRC_J1850
- CRC_CCITT_FALSE
- CRC_ETHERNET
- CRC_0x42F0E1EBA9EA3693
- CRC_8H2F
- CRC_16ARC
- CRC_32P4

] ([RS_MANI_00027](#))

Class	PersistencyRedundancyChecksum (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	Abstract class that defines the common attributes for implementations of redundancy.			
Base	ARObject , PersistencyRedundancyHandling			
Subclasses	PersistencyRedundancyCrc , PersistencyRedundancyHash			
Aggregated by	PersistencyDeployment.redundancyHandling , PersistencyInterface.redundancyHandling			
Attribute	Type	Mult.	Kind	Note
algorithmFamily	String	0..1	attr	This attribute identifies the algorithm family that is used to execute the CRC/Hash.
length	PositiveInteger	0..1	attr	This attribute describes the length of the CRC/Hash in the unit bits.

Table 3.56: PersistencyRedundancyChecksum

[constr_10144]{DRAFT} Multiplicity of reference in the role **PersistencyRedundancyChecksum.algorithmFamily** [For each **PersistencyRedundancyChecksum**, the reference in the role **algorithmFamily** shall exist **at the time before the generation of the ara API starts.**]()

[constr_10145]{DRAFT} Multiplicity of reference in the role **PersistencyRedundancyChecksum.length** [For each **PersistencyRedundancyChecksum**, the reference in the role **length** shall exist **at the time before the generation of the ara API starts.**]()

[constr_1668]{DRAFT} Allowed combinations of **PersistencyRedundancyChecksum.length** and **algorithmFamily** [

	8	16	32	64
CRC_J1850	X			
CRC_CCITT_FALSE		X		
CRC_ETHERNET			X	
CRC_0x42F0E1EBA9EA3693				X
CRC_8H2F	X			
CRC_16ARC		X		
CRC_32P4			X	

]()

Class	PersistencyRedundancyCrc			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class formally describes the usage of a CRC for the implementation of redundancy.			
Base	ARObject, PersistencyRedundancyChecksum , PersistencyRedundancyHandling			
Aggregated by	PersistencyDeployment.redundancyHandling , PersistencyInterface.redundancyHandling			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.58: PersistencyRedundancyCrc

Class	PersistencyRedundancyHash			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class formally describes the usage of a Hash for the implementation of redundancy.			
Base	ARObject, PersistencyRedundancyChecksum , PersistencyRedundancyHandling			
Aggregated by	PersistencyDeployment.redundancyHandling , PersistencyInterface.redundancyHandling			
Attribute	Type	Mult.	Kind	Note
initializationVectorLength	PositiveInteger	0..1	attr	Length of the initialization vector.

Table 3.59: PersistencyRedundancyHash

[constr_10046]{DRAFT} Value of **PersistencyRedundancyMOutOfN.n** [The value of Value of **PersistencyRedundancyMOutOfN.n** shall be set at least to 2 and at most to 255, i.e. the allowed interval is [2..255].]()

[constr_1751]{DRAFT} Value of [PersistencyRedundancyMOutOfN.m](#) [The value of attribute [PersistencyRedundancyMOutOfN.m](#) shall be set at least to 1 and at most to the value of attribute [PersistencyRedundancyMOutOfN.n](#), i.e. the allowed interval is [[1..PersistencyRedundancyMOutOfN.n](#)].]()

Class	PersistencyRedundancyMOutOfN			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class provides the ability to describe redundancy via an "M out of N" approach. In this case N is the number of copies created and M is the minimum number of identical copies to justify a reliable read access to the data.			
Base	ARObject , PersistencyRedundancyHandling			
Aggregated by	PersistencyDeployment.redundancyHandling , PersistencyInterface.redundancyHandling			
Attribute	Type	Mult.	Kind	Note
m	PositiveInteger	0..1	attr	This attribute represents the "M" coordinate in the "M out of N" scheme.
n	PositiveInteger	0..1	attr	This attribute represents the "N" coordinate in the "M out of N" scheme.

Table 3.60: PersistencyRedundancyMOutOfN

[constr_10146]{DRAFT} Multiplicity of reference in the role [PersistencyRedundancyMOutOfN.m](#) [For each [PersistencyRedundancyMOutOfN](#), the reference in the role [m](#) shall exist **at the time before the generation of the ara API starts.**]()

[constr_10147]{DRAFT} Multiplicity of reference in the role [PersistencyRedundancyMOutOfN.n](#) [For each [PersistencyRedundancyMOutOfN](#), the reference in the role [n](#) shall exist **at the time before the generation of the ara API starts.**]()

3.8.1.4 Update Handling

[TPS_MANI_01139]{DRAFT} Semantics of [PersistencyInterface.updateStrategy](#) [The attribute [PersistencyInterface.updateStrategy](#) can be used to specify the strategy for updating the actual persistent elements used in the context of the [PersistencyDeployment](#) that corresponds to [PersistencyInterface](#).

This update strategy shall be applied to the [PersistencyInterface](#) as a whole except for the explicitly modeled [PersistencyInterfaceElements](#) that define their own [updateStrategy](#).] ([RS_MANI_00027](#))

Enumeration	PersistencyCollectionLevelUpdateStrategyEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface
Note	This enumeration provides possible values for the update strategy on interface/storage level.
Aggregated by	PersistencyDeployment.updateStrategy , PersistencyInterface.updateStrategy
Literal	Description





Enumeration	PersistencyCollectionLevelUpdateStrategyEnum
delete	The update strategy is to delete all values on the level of the respective collection. Tags: atp.EnumerationLiteralIndex=1
keepExisting	The update strategy is to keep the existing values on the level of the respective collection. Tags: atp.EnumerationLiteralIndex=0

Table 3.61: PersistencyCollectionLevelUpdateStrategyEnum

[TPS_MANI_01140]{DRAFT} **Semantics of [PersistencyInterfaceElement.updateStrategy](#)** [The attribute [PersistencyInterfaceElement.updateStrategy](#) can be used to specify the strategy for updating the actual persistent element that corresponds to [PersistencyInterfaceElement](#).] ([RS_MANI_00027](#))

Enumeration	PersistencyElementLevelUpdateStrategyEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::Persistency
Note	This enumeration provides possible values for the update strategy on element level.
Aggregated by	PersistencyDeploymentElement.updateStrategy , PersistencyInterfaceElement.updateStrategy
Literal	Description
delete	The update strategy is to delete the value of the respective data item. Tags: atp.EnumerationLiteralIndex=2
keepExisting	The update strategy is to keep the existing value of the respective data item. Tags: atp.EnumerationLiteralIndex=1
overwrite	The update strategy is to overwrite the respective data item. Tags: atp.EnumerationLiteralIndex=0

Table 3.62: PersistencyElementLevelUpdateStrategyEnum

The behavior of the software in terms of applying an update strategy is explained in detail in [12].

3.8.2 Persistency Key Value Storage Interface

[TPS_MANI_01065]{DRAFT} **Purpose of [PersistencyKeyValueStorageInterface](#)** [The purpose of the [PersistencyKeyValueStorageInterface](#) is to support the persistent access to data in a key-value storage.] ([RS_MANI_00027](#))

Class	PersistencyKeyValueStorageInterface
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::Persistency
Note	This meta-class provides the ability to implement a PortInterface for supporting persistency use cases for data. Tags: atp.recommendedPackage=PersistencyKeyValueStorageInterfaces
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PersistencyInterface , PortInterface , Referrable





Class	PersistenceKeyValueStorageInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataElement	PersistenceDataElement	*	aggr	This aggregation represents the collection of PersistenceDataElements in the context of the enclosing PersistenceKeyValueStorageInterface.
dataTypeForSerialization	AbstractImplementationDataType	*	ref	This reference identifies the AbstractImplementationDataTypes that shall be supported for storing in a key-value storage in addition to the types already determined from the aggregation of PersistenceDataElement.
dataTypeMapping	PersistenceKeyValueDataTypeMapping	0..1	aggr	This aggregation provides a collection of replacement rules for data types used in the context of the enclosing PersistenceKeyValueStorageInterface.

Table 3.63: PersistenceKeyValueStorageInterface

[TPS_MANI_01135]{DRAFT} **Semantics of PersistenceKeyValueStorageInterface.dataTypeForSerialization** [The reference PersistenceKeyValueStorageInterface.dataTypeForSerialization can be taken to get information about data types for which a serialization algorithm has to be generated in order to support the persistent storage of objects of such data type.] (RS_MANI_00027)

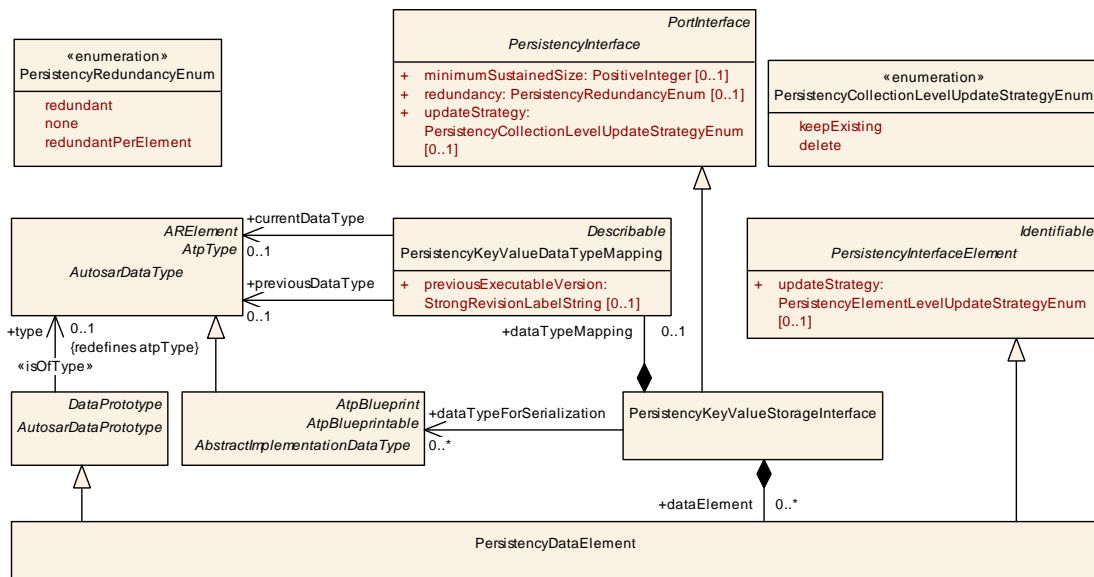


Figure 3.43: Modeling of the PersistenceKeyValueStorageInterface

In contrast to other kinds of PortInterfaces it is **not required** to define elements of a PersistenceKeyValueStorageInterface. If this is intended, however, the aggregation PersistenceKeyValueStorageInterface.dataElement shall be used for this purpose.

[TPS_MANI_01138]{DRAFT} **Semantics of PersistenceKeyValueStorageInterface.dataElement** [By aggregating PersistenceDataElement in the role dataElement, it is possible to explicitly model key-value pairs (and some of their properties) accessible to the application software within the context of a PersistenceKeyValueStorageInterface.] (RS_MANI_00027)

[TPS_MANI_01180]{DRAFT} Collection of data types that requires serialization support [The collection of data types that requires serialization support consists of

- [AbstractImplementationDataTypes](#) referenced in the role [PersistenceKeyValueStorageInterface.dataTypeForSerialization](#)
- either
 - [AbstractImplementationDataTypes](#) taken to type a [PersistenceKeyValueStorageInterface.dataElement](#) or
 - [AbstractImplementationDataTypes](#) mapped to [ApplicationDataTypes](#) taken to type a [PersistenceKeyValueStorageInterface.dataElement](#) by means of [PortInterfaceToDataTypeMapping.dataTypeMappingSet](#) that also refers to the enclosing [PersistenceKeyValueStorageInterface](#).

] ([RS_MANI_00027](#))

Class	PersistenceDataElement			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::Persistence			
Note	This meta-class represents the ability to formally specify a piece of data that is subject to persistence in the context of the enclosing PersistenceKeyValueStorageInterface. PersistenceDataElement represents also a key-value pair of the deployed PersistenceKeyValueStorage and provides an initial value.			
Base	<i>AObject, AtpFeature, AtpPrototype, AutosarDataPrototype, DataPrototype, Identifiable, Multilanguage Referrable, PersistenceInterfaceElement, Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature, PersistenceKeyValueStorageInterface.dataElement</i>			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.64: PersistenceDataElement

Please note that a [PersistenceDataElement](#) can be typed by either an [ApplicationDataType](#) or else a [CppImplementationDataType](#).

[TPS_MANI_01378]{DRAFT} Semantics of meta-class PersistenceKeyValueDataTypeMapping [Meta-class [PersistenceKeyValueDataTypeMapping](#) supports the porting of a previously used data type (represented by the role [previousDataType](#)) used in an existing key-value pair to the currently used data type (represented by the role [currentDataType](#)) used in the context of the application software.

This way, application software that uses a given [AutosarDataType](#) can access a key-value-pair that was stored using a different (i.e. used in previous versions) data type as long as the mapping from the previous data type to the data type used currently in the key-value-pair is formally defined by means of the [PersistenceKeyValueDataTypeMapping](#) such that the application software can provide a suitable conversion. The conversion will typically happen in the update callback function registered by the application.] ([RS_MANI_00027](#))

Class	PersistencyKeyValueDataTypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::Persistency			
Note	This meta-class represents the ability to define a mapping between an existing data type in a key-value-storage stored by a previous version to a new data type used on application software level in the current version.			
Base	<i>ARObject, Describable</i>			
Aggregated by	PersistencyKeyValueStorageInterface.dataTypeMapping			
Attribute	Type	Mult.	Kind	Note
currentData Type	AutosarDataType	0..1	ref	This reference identifies the current data type for an existing key-value-pair in the context of the enclosing PersistencyKeyValueStorageInterface.
previousData Type	AutosarDataType	0..1	ref	This reference identifies the previous data type in a key-value-pair existing in the context of the enclosing PersistencyKeyValueStorageInterface.
previous Executable Version	StrongRevisionLabel String	0..1	attr	This attribute identifies the version of the Executable in which the previousDataType was used.

Table 3.65: PersistencyKeyValueDataTypeMapping

Please note that a [PersistencyKeyValueDataTypeMapping](#) needs to be complete, i.e. for each [PersistencyKeyValueDataTypeMapping](#) the two references shall exist in any case.

[constr_10377]{DRAFT} Completeness of the modeling of [PersistencyKeyValueDataTypeMapping](#) [For each [PersistencyKeyValueDataTypeMapping](#), the references in the roles

- [previousDataType](#)
- [currentDataType](#)

shall **both** exist **at the time before the generation of the ara API starts.**.]()

It only makes sense to map types of the same data type level, which is ensured by the following two constraints:

[constr_10378]{DRAFT} [PersistencyKeyValueDataTypeMapping](#) references [AbstractImplementationDataType](#) in the role [currentDataType](#) [Each [PersistencyKeyValueDataTypeMapping](#) that references to an [AbstractImplementationDataType](#) as part of the collection in the role [currentDataType](#) shall also refer to an [AbstractImplementationDataType](#) in the role [previousDataType](#).

This rule shall be imposed **at the time before the generation of the ara API starts.**.]()

[constr_10379]{DRAFT} [PersistencyKeyValueDataTypeMapping](#) references [ApplicationDataType](#) in the role [currentDataType](#) [Each [PersistencyKeyValueDataTypeMapping](#) that references to an [ApplicationDataType](#) as part of the collection in the role [currentDataType](#) shall also refer to an [ApplicationDataType](#) in the role [previousDataType](#).

This rule shall be imposed **at the time before the generation of the ara API starts.**]()

Of course, it does not make much sense if the modeling of `PersistencyKeyValueDataTypeMapping.currentDataType` is not even used in the context of the enclosing `PersistencyKeyValueStorageInterface` because this way a conversion to an unused data type is defined that would never be used in reality. This caveat is addressed by [advisory_01009].

[advisory_01009]{DRAFT} **PersistencyKeyValueDataTypeMapping.currentDataType** shall refer to a data type used in the context of the **PersistencyKeyValueStorageInterface** [All data types referenced in the role `PersistencyKeyValueDataTypeMapping.currentDataType` shall be in use in the context of the enclosing `PersistencyKeyValueStorageInterface`. This means any data type referenced in the role `currentDataType` shall also be referenced in one of the following roles:

- `PersistencyKeyValueStorageInterface.dataElement.type`
- `PersistencyKeyValueStorageInterface.dataTypeForSerialization`

This rule shall be imposed **at the time before the generation of the ara API starts.**]()

Please note that the usage of references `previousDataType` and `currentDataType` does not make any assumptions with respect to the compatibility of a pair of `previousDataType` and `currentDataType`. It is up to the application software to sort out any potential compatibility issues.

3.8.3 Persistency File Storage Interface

[TPS_MANI_01067]{DRAFT} **Purpose of PersistencyFileStorageInterface** [The purpose of meta-class `PersistencyFileStorageInterface` is to support access to an abstract representation of file storage.] (*RS_MANI_00027*)

As far as AUTOSAR persistency is concerned, a file can have binary or text content. If it has text content then the content of the file is expected to be encoded as UTF-8 encoding with UNIX line endings.

[TPS_MANI_01068]{DRAFT} **Semantics of PersistencyFileStorageInterface.maxNumberOfFiles** [Any `PortPrototype` typed by a `PersistencyFileStorageInterface` has the ability to access a number of files.

The upper bound of the number of files represented by a given `PortPrototype` typed by a `PersistencyFileStorageInterface` can be configured using the attribute `PersistencyFileStorageInterface.maxNumberOfFiles`.

The value of attribute `PersistencyFileStorageInterface.maxNumberOfFiles` includes the explicitly modeled `PersistencyFileStorageInterface.fileElements`.] (*RS_MANI_00027*)

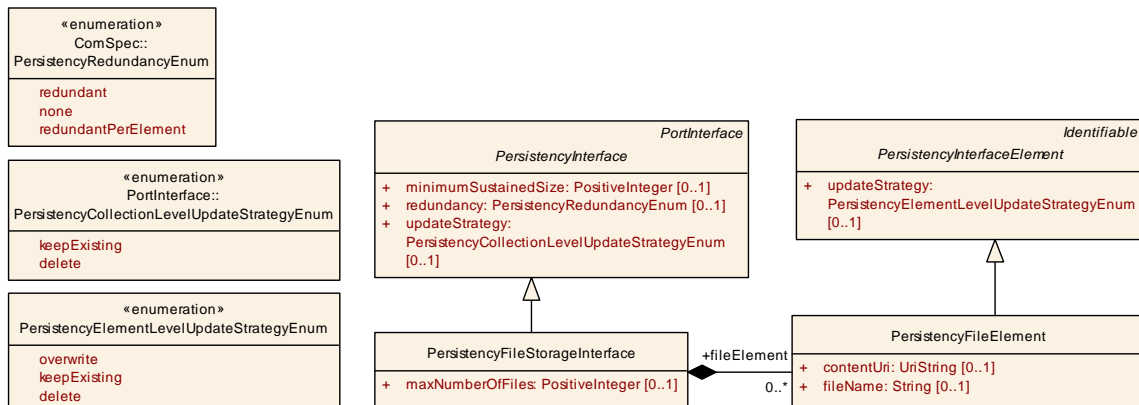


Figure 3.44: Modeling of the `PersistencyFileStorageInterface`

Please note that the existence of the `PersistencyFileStorageInterface` does not violate the restrictions set by the POSIX subset PSE51 defined in IEEE1003.13 [13].

Class	PersistencyFileStorageInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::Persistency			
Note	This meta-class provides the ability to implement a PortInterface for supporting persistency use cases for files. Tags: atp.recommendedPackage=PersistencyFileStorageInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PersistencyInterface , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
fileElement	PersistencyFileElement	*	aggr	This aggregation represents the collection of Persistency FileStorages in the context of the enclosing Persistency FileStorageInterface.
maxNumberOfFiles	PositiveInteger	0..1	attr	This attribute represents the definition of an upper bound for the handling of files at run-time in the context of the enclosing PersistencyFileStorageInterface.

Table 3.66: PersistencyFileStorageInterface

A `PortPrototype` typed by a `PersistencyFileStorageInterface` allows for abstracting the actual calls to the operating system away from the scope of the application software and into the modules of the *AUTOSAR adaptive platform*.

[TPS_MANI_01142]{DRAFT} **Semantics of `PersistencyFileElement`** [By aggregating `PersistencyFileElement` in the role `fileElement`, it is possible to explicitly model files (and some of their properties) accessible to the application software within the context of a `PersistencyFileStorageInterface`.] (*RS_MANI_00027*)

Class	PersistencyFileElement			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::Persistency			
Note	This meta-class has the ability to represent a file at design time such that it is possible to configure the behavior for accessing the represented file at run-time.			
Base	ARObject, Identifiable , MultilanguageReferrable , PersistencyInterfaceElement , Referrable			
Aggregated by	PersistencyFileStorageInterface.fileElement			
Attribute	Type	Mult.	Kind	Note
contentUri	UriString	0..1	attr	This attribute represents the URI that identifies the initial content of the PersistencyFile.
fileName	String	0..1	attr	This attribute holds the filename part of the storage location, e.g. file on the file system.

Table 3.67: PersistencyFileElement

[constr_10148]{DRAFT} Multiplicity of reference in the role [PersistencyFileElement.contentUri](#) [For each [PersistencyFileElement](#), the reference in the role `contentUri` shall exist **at the time before the generation of the ara API starts.**]()

[constr_10149]{DRAFT} Multiplicity of reference in the role [PersistencyFileElement.fileName](#) [For each [PersistencyFileElement](#), the reference in the role `fileName` shall exist **at the time before the generation of the ara API starts.**]()

[constr_1581]{DRAFT} Value of [fileElement.fileName](#) [Within the scope of any given [PersistencyFileStorageInterface](#), the value of all `fileElement.fileName` shall be unique.]()

[constr_10080]{DRAFT} Existence of initial values for [PersistencyFileElement](#) [For each [PersistencyFileElement](#), if the value of attribute `updateStrategy` is set to the value `delete`, then attribute `PersistencyFileElement.contentUri` shall not exist.]()

3.9 Time Synchronization Interface

The Time Synchronization functional cluster within the Adaptive Platform is responsible to provide various Time-Base Resources for the application to read from or to write to.

In order to interface with the Time Synchronization foundation software an application developer needs to declare which kind of Time-Base Resource this application will interact with.

The interface towards the Time Synchronization follows the generic pattern of [PortPrototypes](#) and [PortInterfaces](#) which are applied to many use-cases concerning the interaction of application software with platform software.

In contrast to the service based communication, the modeling of platform software interaction using [PortPrototypes](#) and [PortInterfaces](#) is less detailed. The [PortPrototype](#) is a placeholder for the interaction with platform software, it does

not model the actually used APIs available for the interaction. The APIs to be used are formally specified in the platform software SWS document, i.e. SWS_TimeSync [14].

[TPS_MANI_03535]{DRAFT} Definition of Time Synchronization interaction [The meta-class [AbstractSynchronizedTimeBaseInterface](#) together with its sub classes are used to define the interaction of the application software with a Time Synchronization Time Base.] ([RS_MANI_00040](#))

For more information, please refer to Figure 3.45.

Class	AbstractSynchronizedTimeBaseInterface (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the abstract ability to define a PortInterface for the interaction with Time Synchronization.			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Subclasses	SynchronizedTimeBaseConsumerInterface , SynchronizedTimeBaseProviderInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.68: AbstractSynchronizedTimeBaseInterface

By defining an [RPortPrototype](#) which is typed by one of the [AbstractSynchronizedTimeBaseInterface](#) sub classes the application indicates that it will access a specific Time Base.

[TPS_MANI_03549]{DRAFT} Usage of PortPrototype for the interaction with Time Synchronization [Depending on the use-case the usage of [RPortPrototype](#) or [PPortPrototype](#) typed by one of the sub-classes of [AbstractSynchronizedTimeBaseInterface](#) shall be used for the interaction with the Time Synchronization.] ([RS_MANI_00040](#))

The application software may take the active or the passive role in the interaction with functional cluster, thus either a [RPortPrototype](#) or a [PPortPrototype](#) shall be used to represent this interaction from the application software point of view. The Time-Base Resource instance is identified using the [InstanceSpecifier](#) of the respective [PortPrototype](#).

[TPS_MANI_03536]{DRAFT} Time Synchronization interaction in a provider role [The meta-class [SynchronizedTimeBaseProviderInterface](#) is used to indicate the intended interaction with a synchronized global Time Base in a *provider* role.] ([RS_MANI_00040](#))

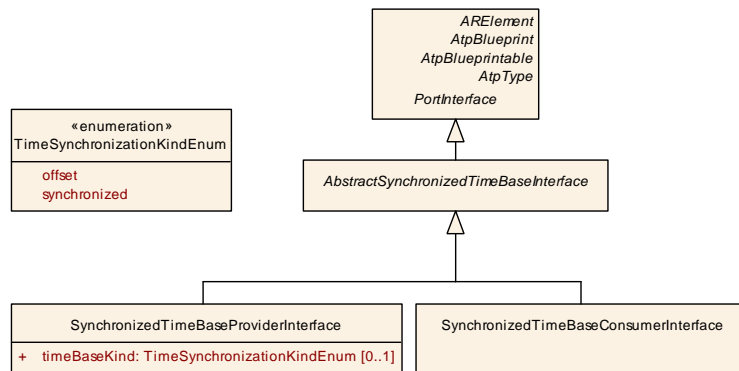


Figure 3.45: Modeling of Time Synch Interfaces

When interacting with a synchronized global Time Base in a *provider* role, the application is able to *set* (and *get*) the value of the synchronized global Time Base which is then propagated to the time value on the network.

[TPS_MANI_03537]{DRAFT} Time Synchronization interaction in a consumer role
 [The meta-class `SynchronizedTimeBaseConsumerInterface` is used to indicate the intended interaction with a synchronized global Time Base in a *consumer* role.]
 ([RS_MANI_00040](#))

When interacting with a synchronized global Time Base in a *consumer* role, the application is able to only *get* the value of the synchronized global Time Base which is synchronized from a time value coming from the network.

[TPS_MANI_03551]{DRAFT} Definition of Time Base kind [The attributes `SynchronizedTimeBaseProviderInterface.timeBaseKind` defines whether the Time Base shall be a *synchronized* or an *offset* Time Base.] ([RS_MANI_00040](#))

Class	SynchronizedTimeBaseProviderInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the ability to define a PortInterface for the interaction with a Time Synchronization Provider. Tags: atp.recommendedPackage=TimeSynchronizationInterfaces			
Base	ARElement , ARObject , AbstractSynchronizedTimeBaseInterface , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
timeBaseKind	TimeSynchronizationKindEnum	0..1	attr	Defines which kind of time base is requested at this interface.

Table 3.69: SynchronizedTimeBaseProviderInterface

[constr_10150]{DRAFT} Multiplicity of reference in the role `SynchronizedTimeBaseProviderInterface.timeBaseKind` [For each `SynchronizedTimeBaseProviderInterface`, the reference in the role `timeBaseKind` shall exist **at the time before the generation of the ara API starts.**]()

Class	SynchronizedTimeBaseConsumerInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the ability to define a PortInterface for the interaction with a Time Synchronization Consumer. Tags: atp.recommendedPackage=TimeSynchronizationInterfaces			
Base	ARElement , ARObject , AbstractSynchronizedTimeBaseInterface , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.70: SynchronizedTimeBaseConsumerInterface

Enumeration	TimeSynchronizationKindEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface
Note	Defines the possible kinds of TimeSynchronizationInterfaces.
Aggregated by	SynchronizedTimeBaseProviderInterface.timeBaseKind
Literal	Description
offset	Defines that the requested time base shall be an offset time based. Tags: atp.EnumerationLiteralIndex=1
synchronized	Defines that the requested time base shall be a synchronized time based. Tags: atp.EnumerationLiteralIndex=0

Table 3.71: TimeSynchronizationKindEnum

In the example in figure 3.46 the interaction of one Application with several time sync aspects are illustrated.

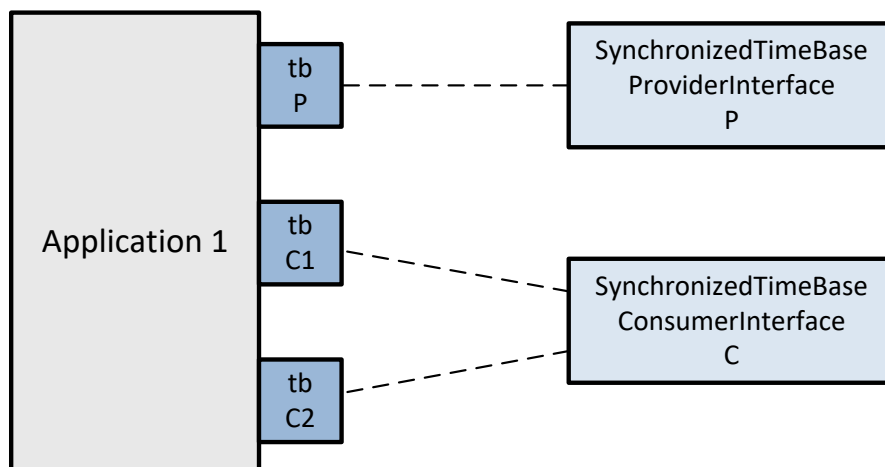


Figure 3.46: Example Application and Time Sync interaction

The interaction approach is that, for each [PortPrototype](#) typed by a sub-class of [AbstractSynchronizedTimeBaseInterface](#), the application developer gains access to the respective kind of Time-Base Resource.

In the application code, the respective Time Base class (as defined in [14]) is constructed using the `InstanceSpecifier` representing the `PortPrototype` name.

During application deployment, those `PortPrototypes` are mapped to actual Time-Base Resources in the Time-Sync Management (see figure 10.24).

3.10 Platform Health Management Interface

3.10.1 Overview

Platform Health Management functional cluster within the Adaptive Platform is responsible to supervise the execution of applications, monitor their status, and triggering the State Management for respective actions.

In order to interface with the Platform Health Management foundation software an application developer needs to declare which supervisions and status information is provided by the application software and shall be observed by the Platform Health Management.

The interface towards the Platform Health Management follows the generic pattern of `PortPrototypes` and `PortInterfaces` which are applied to many use-cases concerning the interaction of application software with platform software.

In contrast to the service based communication, the modeling of platform software interaction using `PortPrototypes` and `PortInterfaces` is less detailed. The `PortPrototype` is a placeholder for the interaction with platform software, it does not model the actually used APIs available for the interaction. The APIs to be used are formally specified in the platform software SWS document [11].

3.10.2 Supervised Entities and Checkpoints

The interaction of supervision with the Platform Health Management is defined by `PhmSupervisedEntityInterface` and `PhmCheckpoints`.

[TPS_MANI_03500]{DRAFT} Definition of Platform Health Management Supervision and Checkpoints [The meta-class `PhmSupervisedEntityInterface` together with the aggregated `PhmCheckpoint` are used to define the interaction of one Supervised Entity with the Platform Health Management supervision.] ([RS_MANI_00032](#))

By defining an `RPortPrototype` which is typed by the `PhmSupervisedEntityInterface` the application indicates that it wants to report the `checkpoints` of this `PhmSupervisedEntityInterface`.

[constr_1727]{DRAFT} Qualified combinations of `PortPrototypes` and `PhmSupervisedEntityInterface` on application software level [Within the context

of an Executable of category APPLICATION_LEVEL the usage of PhmSupervisedEntityInterface is **only** supported for an RPortPrototype.]()

The application software takes the active role in the interaction with foundation platform software thus a RPortPrototype is used to represent this interaction from the application software point of view. The SupervisedEntity instance is constructed using the InstanceSpecifier of the respective RPortPrototype.

The application code then calls the ReportCheckpoint API (defined in [11]) of the SupervisedEntity (which has been constructed in the context of the respective RPortPrototype typed by the PhmSupervisedEntityInterface) in order to notify the Platform Health Management that a specific PhmCheckpoint has been reached in the program flow.

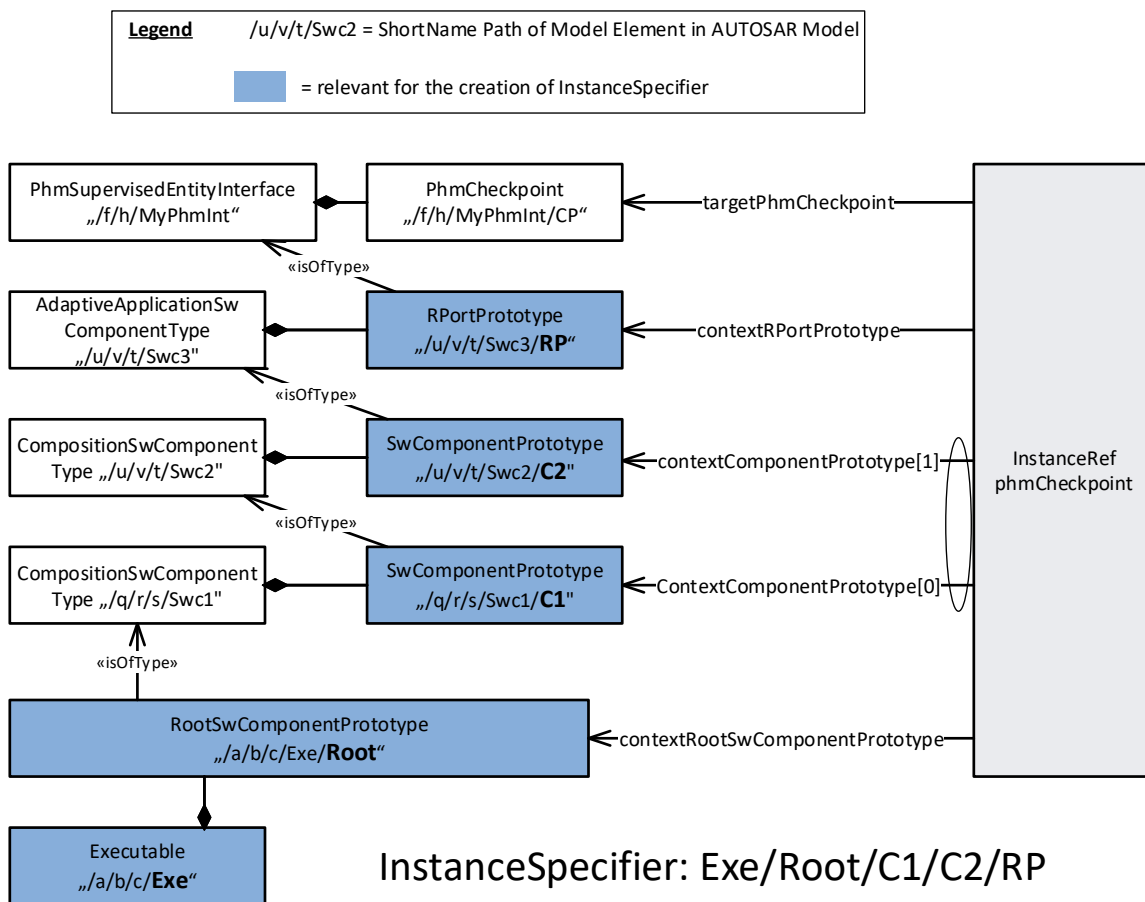


Figure 3.47: Example for the creation of an InstanceSpecifier of a SupervisedEntity

[constr_3530]{DRAFT} **Mandatory definition of checkpointId** [The checkpointId shall be defined for every PhmCheckpoint element.]()

The checkpointId is used during the call to the ReportCheckpoint API as a representation of the PhmCheckpoint.

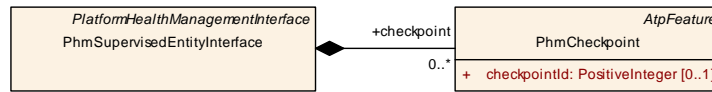


Figure 3.48: Modeling of Supervised Entities and Checkpoints

Note that from the application design point of view there are no relations defined between the checkpoints (as to indicate a specific observed order in reporting). The possible transitions between the checkpoints and their timing aspects are defined in the context of the `PlatformHealthManagementContribution` and described in chapter 10.3.3.

Class	PhmSupervisedEntityInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the ability to implement a PortInterface for interaction with the Platform Health Management Supervised Entity. Tags: atp.recommendedPackage=PlatformHealthManagementInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PlatformHealthManagementInterface , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
checkpoint	PhmCheckpoint	*	aggr	Defines the set of checkpoints which can be reported on this supervised entity.

Table 3.72: PhmSupervisedEntityInterface

Class	PhmCheckpoint			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the ability to implement a checkpoint for interaction with the Platform Health Management Supervised Entity.			
Base	ARObject , AtpFeature , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	AtpClassifier.atpFeature , PhmSupervisedEntityInterface.checkpoint			
Attribute	Type	Mult.	Kind	Note
checkpointId	PositiveInteger	0..1	attr	Defines the numeric value which is used to indicate the reporting of this Checkpoint to the Phm.

Table 3.73: PhmCheckpoint

[constr_10151]{DRAFT} Multiplicity of reference in the role `PhmCheckpoint.checkpointId` [For each `PhmCheckpoint`, the reference in the role `checkpointId` shall exist **at the time before the generation of the ara API starts.**]

3.10.3 Health Channels

The interaction of Health Channels with the Platform Health Management is defined by `PhmHealthChannelInterface` and `PhmHealthChannelStatus` states.

[TPS_MANI_03534]{DRAFT} Definition of Platform Health Management Health Channel [The meta-class `PhmHealthChannelInterface` together with the aggregated `PhmHealthChannelStatus` are used to define the interaction of one Health Channel with the Platform Health Management.] ([RS_MANI_00032](#))

By defining a `RPortPrototype` which is typed by the `PhmHealthChannelInterface` (see [\[constr_1728\]](#)) the application indicates that it wants to report the `status` of this `PhmHealthChannelInterface`.

The application software takes the active role in the interaction with foundation platform software thus a `RPortPrototype` is used to represent this interaction from the application software point of view. The `HealthChannel` instance is constructed using the `InstanceSpecifier` of the respective `RPortPrototype`.

The application code then calls the `ReportHealthStatus` API (defined in [\[11\]](#)) of the `HealthChannel` (which has been constructed in the context of the respective `RPortPrototype` typed by the `PhmHealthChannelInterface`) in order to notify the Platform Health Management that the Health Channel defined by the `RPortPrototype` has changed its status.

[constr_3532]{DRAFT} Mandatory definition of `statusId` [The `statusId` shall be defined for every `PhmHealthChannelStatus` element.] ()

[TPS_MANI_03624]{DRAFT} Usage of `statusId` in application code [The application code shall only use those `PhmHealthChannelStatus.statusId` values which are defined as members of the `PhmHealthChannelInterface.status`.] ([RS_MANI_00032](#))

[TPS_MANI_03630]{DRAFT} Semantics of `triggersRecoveryNotification` [The attribute `triggersRecoveryNotification` defines whether this specific `PhmHealthChannelStatus` shall be considered by the PHM as triggering the recovery notification.] ([RS_MANI_00032](#))

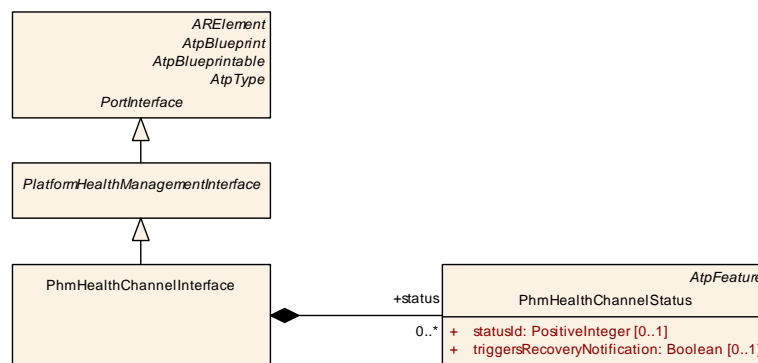


Figure 3.49: Modeling of Health Channel

[constr_1728]{DRAFT} Qualified combinations of `PortPrototypes` and `PhmHealthChannelInterface` on application software level [Within the context of an `Executable` of category `APPLICATION_LEVEL` the usage of `PhmHealthChannelInterface` is **only** supported for a `RPortPrototype`.] ()

Class	PhmHealthChannelInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the ability to implement a PortInterface for interaction with the Platform Health Management Health Channel. Tags: atp.recommendedPackage=PlatformHealthManagementInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PlatformHealthManagementInterface , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
status	PhmHealthChannelStatus	*	aggr	Defines the possible set of status information available to the health channel.

Table 3.74: PhmHealthChannelInterface

Class	PhmHealthChannelStatus			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	The PhmHealthChannelStatus specifies one possible status of the health channel.			
Base	ARObject , AtpFeature , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	AtpClassifier.atpFeature , PhmHealthChannelInterface.status			
Attribute	Type	Mult.	Kind	Note
statusId	PositiveInteger	0..1	attr	Defines the numeric value which is used to indicate the indication of this status the Phm.
triggers Recovery Notification	Boolean	0..1	attr	Defines whether this PhmHealthChannelStatus shall cause the Phm to trigger the Health Channel recovery notification. True: Indicates unhealthy state. Phm to trigger the Health Channel recovery notification when the Health channel status changes to this state. False: Indicates healthy state. Phm not to trigger the Health Channel recovery notification when the Health channel status changes to this state.

Table 3.75: PhmHealthChannelStatus

3.10.4 Recovery notification to State Management

The Phm monitors the reporting of Supervised Entities and Checkpoints as well as the reported Health Channel status information. In case of violations the Phm can be configured to report the violation to the State Management and let the State Management deal with the recovery activities.

The example in figure 3.50 illustrates the reporting of Supervised Entities by Application 1 and 2. The Phm is configured to perform the supervision of these reported elements. In case of violations the Phm is configured to notify the State Management application to deal with the situation.

[TPS_MANI_01280]{DRAFT} Semantics of meta-class [PhmSupervisionRecoveryNotificationInterface](#) [The recovery notification of a failed Supervision by PHM does issue is to call a piece of code on State Management software level.

The mechanism for activating the code on the level of State Management software is to model a `PPortPrototype` typed by a `PhmSupervisionRecoveryNotificationInterface`.] ([RS_MANI_00032](#))

[TPS_MANI_03631]{DRAFT} Semantics of meta-class `PhmHealthChannelRecoveryNotificationInterface` [The recovery notification of a failed HealthChannel monitoring by PHM does issue is to call a piece of code on State Management software level.

The mechanism for activating the code on the level of State Management software is to model a `PPortPrototype` typed by a `PhmHealthChannelRecoveryNotificationInterface`.] ([RS_MANI_00032](#))

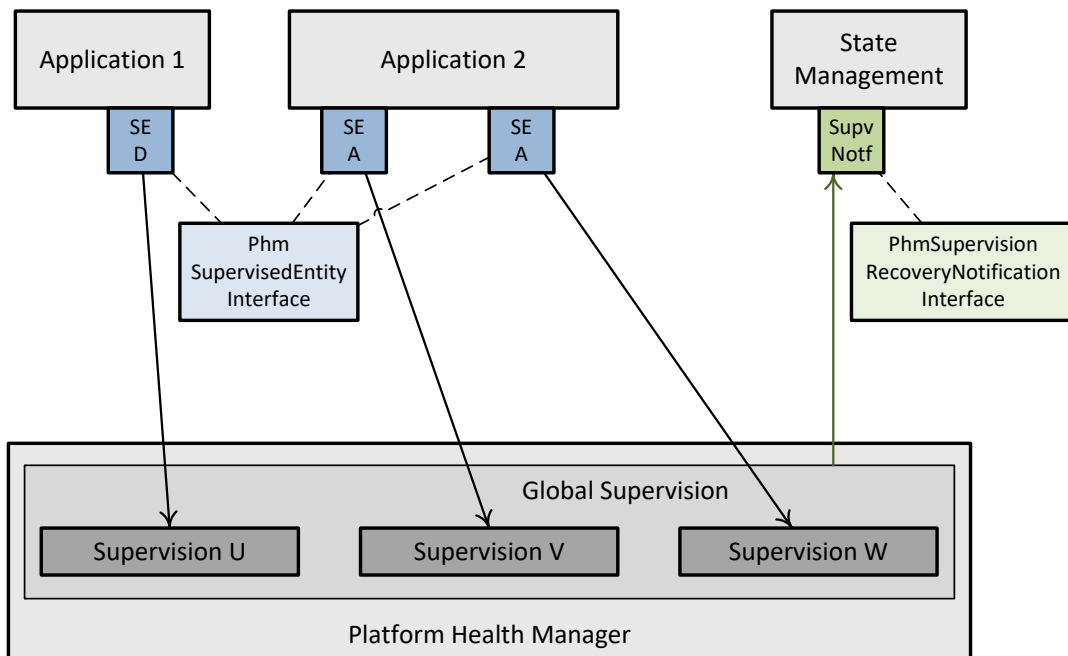


Figure 3.50: Example of a Phm monitoring and recovery setup

The operation to be called by Phm in the context of [\[TPS_MANI_01280\]](#) and [\[TPS_MANI_03631\]](#) are defined in the Platform Health Management specification document [\[11\]](#).

As already mentioned, the State Management is supposed to implement the recovery actions. This implies that the `PhmSupervisionRecoveryNotificationInterface` and `PhmHealthChannelRecoveryNotificationInterface` can only be used in combination with a `PPortPrototype`. This aspect is clarified by [\[constr_1729\]](#).

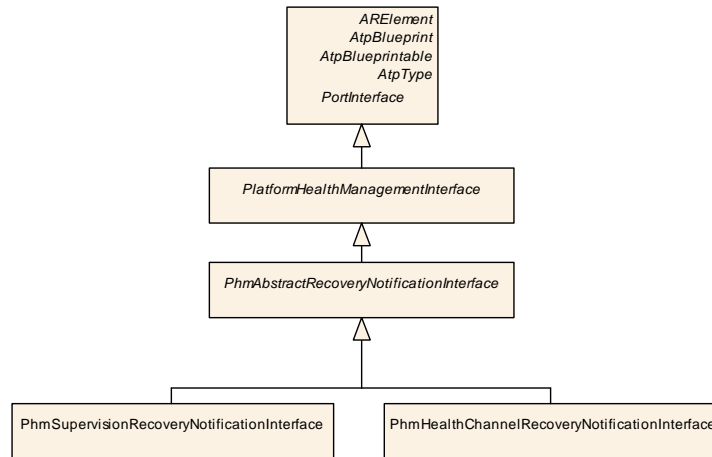


Figure 3.51: Modeling of the `PhmAbstractRecoveryNotificationInterface`

[constr_1729]{DRAFT} **Qualified combinations of `PortPrototypes` and `PhmSupervisionRecoveryNotificationInterface` / `PhmHealthChannelRecoveryNotificationInterface` on State Management software level** [Within the context of an `Executable` of category `APPLICATION_LEVEL` the usage of `PhmSupervisionRecoveryNotificationInterface` and `PhmHealthChannelRecoveryNotificationInterface` is **only** supported for a `PPortPrototype`.]()

Class	PhmSupervisionRecoveryNotificationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class represents a PortInterface that can be taken for implementing a PHM Supervision notification. Tags: atp.recommendedPackage=PlatformHealthManagementInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PhmAbstractRecoveryNotificationInterface , PlatformHealthManagementInterface , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.76: PhmSupervisionRecoveryNotificationInterface

Class	PhmHealthChannelRecoveryNotificationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class represents a PortInterface that can be taken for implementing a PHM HealthChannel notification. Tags: atp.recommendedPackage=PlatformHealthManagementInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PhmAbstractRecoveryNotificationInterface , PlatformHealthManagementInterface , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.77: PhmHealthChannelRecoveryNotificationInterface

Class	<i>PhmAbstractRecoveryNotificationInterface</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This abstract meta-class provides the abstract ability to define a PortInterface for the Recovery Notification by Platform Health Management.			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PlatformHealthManagementInterface , PortInterface , Referrable			
Subclasses	PhmHealthChannelRecoveryNotificationInterface , PhmSupervisionRecoveryNotificationInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.78: PhmAbstractRecoveryNotificationInterface

3.11 Diagnostic Interface

3.11.1 Overview

On the *AUTOSAR adaptive platform*, dedicated [PortInterfaces](#) are defined for the interaction of application-layer software with the *AUTOSAR Diagnostic Manager*.

In contrast to the conventions on the *AUTOSAR classic Platform*, these [PortInterfaces](#) and, by extension, the standardized `ara::diag` API **are only used on the application side** of this communication relation.

The interfaces on the side of the *AUTOSAR Diagnostic Manager* (and thus the part of the implementation of the [PortPrototype](#) that faces the *AUTOSAR Diagnostic Manager*) are **entirely proprietary**. This aspect is depicted in [Figure 3.52](#).

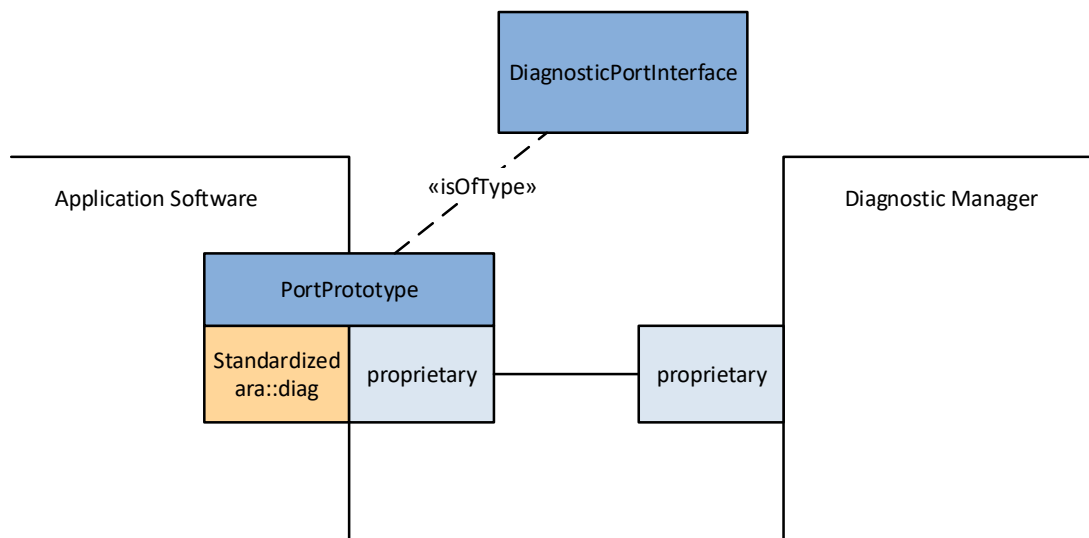


Figure 3.52: Standardized vs. proprietary parts in the implementation of `ara::diag`

This arrangement tries to provide the application programmer with the simplest possible API from the application’s point of view. At the same time it hides a lot of the complexity of the interaction between application and Diagnostic Manager behind a solid abstraction layer.

[TPS_MANI_01242]{DRAFT} **PortInterfaces** used for communication with the AUTOSAR Diagnostic Manager [All PortInterfaces used for this purpose are derived from the abstract meta-class DiagnosticPortInterface. A DiagnosticPortInterface does not implement a service-oriented communication pattern, in particular there is no explicit service discovery on the API level involved.](RS_MANI_00061)

The specializations of DiagnosticPortInterface cover the various aspects of diagnostic communication, e.g. the implementation of diagnostic routines, the reporting of diagnostic events or the access to a Diagnostic Data Identifier (DID).

Figure 3.53 depicts all meta-classes that directly inherit from DiagnosticPortInterface.

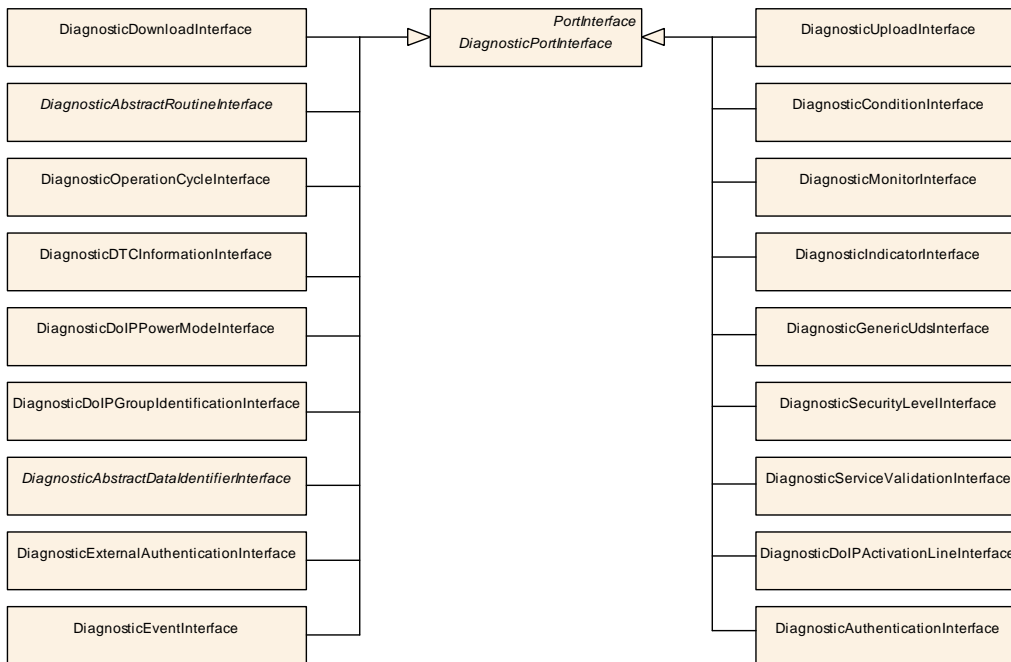


Figure 3.53: Modeling of PortInterfaces for diagnostic purposes

Class	<i>DiagnosticPortInterface</i> (abstract)
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface
Note	This meta-class serves as an abstract base-class for all diagnostics-related PortInterfaces.
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable





Class	<i>DiagnosticPortInterface</i> (abstract)			
Subclasses	DiagnosticAbstractDataIdentifierInterface , DiagnosticAbstractRoutineInterface , DiagnosticAuthenticationInterface , DiagnosticComControlInterface , DiagnosticConditionInterface , DiagnosticDTCInformationInterface , DiagnosticDoIPActivationLineInterface , DiagnosticDoIPEntityIdentificationInterface , DiagnosticDoIPGroupIdentificationInterface , DiagnosticDoIPPowerModeInterface , DiagnosticDoIPTriggerVehicleAnnouncementInterface , DiagnosticDownloadInterface , DiagnosticEcuResetInterface , DiagnosticEventInterface , DiagnosticExternalAuthenticationInterface , DiagnosticGenericUdsInterface , DiagnosticIndicatorInterface , DiagnosticMonitorInterface , DiagnosticOperationCycleInterface , DiagnosticRequestFileTransferInterface , DiagnosticSecurityLevelInterface , DiagnosticServiceValidationInterface , DiagnosticSovdPortInterface , DiagnosticUploadInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.79: DiagnosticPortInterface

3.11.2 Diagnostic Routine Interface

The convention for the creation of diagnostic routines is to establish at most three methods for each diagnostic routine:

- Start the execution of the routine.
- Stop the execution of the routine.
- Request the results of the routine's execution.

In response to this convention the [DiagnosticRoutineInterface](#) is modeled to aggregate [ClientServerOperation](#) in three dedicated roles: `start`, `stop`, and `requestResult`.

[constr_1696]{DRAFT} [ClientServerOperation](#) aggregated by [DiagnosticRoutineInterface](#) [Any [ClientServerOperation](#) aggregated by a [DiagnosticRoutineInterface](#) shall not define the following attributes:

- `fireAndForget`
- `possibleApError`
- `possibleApErrorSet`

]()

The arguments to the diagnostic routine shall be modeled as the arguments of the respective [ClientServerOperations](#) aggregated in the roles `start`, `stop`, and `requestResult`.

In addition to the modeling of "typed" diagnostic routines using the [DiagnosticRoutineInterface](#) it is possible to use the [DiagnosticRoutineGenericInterface](#) to define a diagnostic routine for which no further formalization is provided.

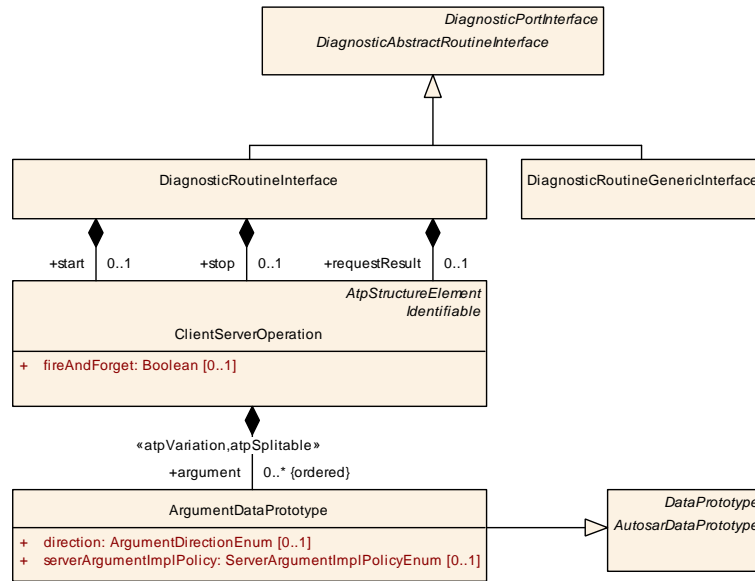


Figure 3.54: Modeling of DiagnosticRoutineInterface

Class	DiagnosticRoutineInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a routine-focused PortInterface for diagnostics on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticAbstractRoutineInterface , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
requestResult	ClientServerOperation	0..1	aggr	This represents the request result method of the diagnostic routine.
start	ClientServerOperation	0..1	aggr	This represents the start method of the diagnostic routine.
stop	ClientServerOperation	0..1	aggr	This represents the stop method of the diagnostic routine.

Table 3.80: DiagnosticRoutineInterface

Class	DiagnosticRoutineGenericInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a generic Routine-focused PortInterface for diagnostics on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticAbstractRoutineInterface , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.81: DiagnosticRoutineGenericInterface

This means that implicitly there are still up to three methods defined for the already mentioned roles of a diagnostic routine.

However, the methods inside the context of such a generic diagnostic routine would always use plain byte arrays as the arguments and therefore a formalization within the AUTOSAR meta-model does not make sense any longer.

Meta-class `DiagnosticAbstractRoutineInterface` serves as the abstract base class to all routine-related `DiagnosticPortInterfaces` on the *AUTOSAR adaptive platform*.

[constr_10031]{DRAFT} Existence of `DiagnosticRoutineInterface.start`
 [Attribute `DiagnosticRoutineInterface.start` shall exist **at the time when the creation of the manifest is finished.**]()

Class	<code>DiagnosticAbstractRoutineInterface</code> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class serves as the abstract base class of PortInterfaces dedicated to routine execution on the AUTOSAR adaptive platform.			
Base	<code>ARElement</code> , <code>ARObject</code> , <code>AtpBlueprint</code> , <code>AtpBlueprintable</code> , <code>AtpClassifier</code> , <code>AtpType</code> , <code>CollectableElement</code> , <code>DiagnosticPortInterface</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PackageableElement</code> , <code>PortInterface</code> , <code>Referrable</code>			
Subclasses	<code>DiagnosticRoutineGenericInterface</code> , <code>DiagnosticRoutineInterface</code>			
Aggregated by	<code>ARPackage.element</code>			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.82: DiagnosticAbstractRoutineInterface

3.11.3 Interface to Data Identifier and Element of Data Identifier

The ability to access diagnostic-relevant **data** in the application software is formalized in another abstract sub-class of `DiagnosticPortInterface`: `DiagnosticAbstractDataIdentifierInterface`.

Meta-class `DiagnosticAbstractDataIdentifierInterface`, in turn, defines three concrete subclasses that represent the concrete abilities to access diagnostic-related data in the application software.

[TPS_MANI_01243]{DRAFT} Semantics of `DiagnosticDataIdentifierInterface`
 [`DiagnosticDataIdentifierInterface` is used to access the content of an entire DID at once.

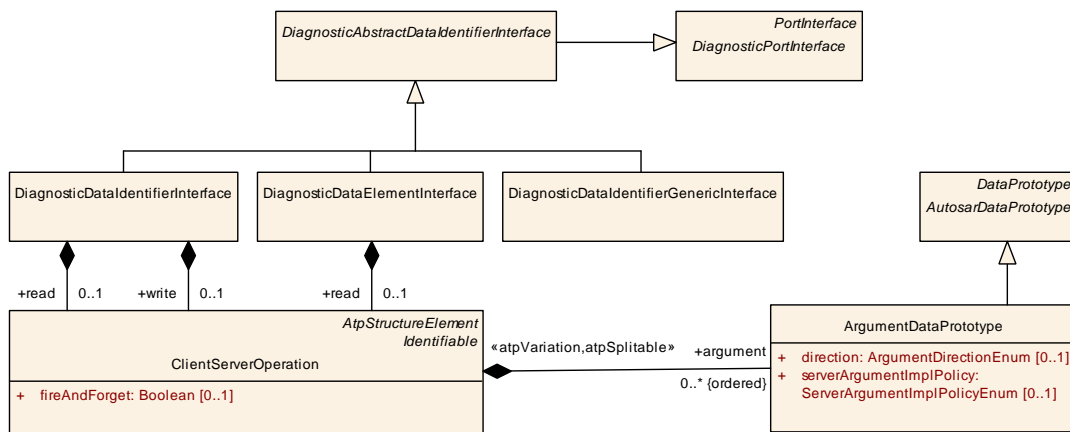
For this purpose up to two `ClientServerOperations` are aggregated in the roles `read` and `write`, depending on the concrete use case for a specific `DiagnosticDataIdentifierInterface`.](*RS_MANI_00061*)

[constr_10030]{DRAFT} Existence of `DiagnosticDataIdentifierInterface.read`
 [Attribute `DiagnosticDataIdentifierInterface.read` shall exist **at the time when the creation of the manifest is finished.**]()

Class	DiagnosticAbstractDataIdentifierInterface (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class serves as the abstract base class of PortInterfaces dedicated to the access of diagnostic data identifiers on the AUTOSAR adaptive platform.			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Subclasses	DiagnosticDataElementInterface , DiagnosticDataIdentifierGenericInterface , DiagnosticDataIdentifierInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.83: DiagnosticAbstractDataIdentifierInterface

Class	DiagnosticDataIdentifierInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a DID-focused PortInterface for diagnostics on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticAbstractDataIdentifierInterface , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
read	ClientServerOperation	0..1	aggr	This represents the method to read the content of a diagnostic data identifier.
write	ClientServerOperation	0..1	aggr	This represents the method to write the contents of a diagnostic data identifier.

Table 3.84: DiagnosticDataIdentifierInterface

Figure 3.55: Modeling of DiagnosticDataIdentifierInterface

[TPS_MANI_01244]{DRAFT} **Semantics of DiagnosticDataElementInterface**
 [DiagnosticDataElementInterface is used to access the content of an element within a given DID.

For this purpose, a ClientServerOperations is aggregated in the role read.]
 (RS_MANI_00061)

Please note that the [DiagnosticDataElementInterface](#) *intentionally* does not support a write operation because the consistency of the data in principle cannot be ensured if it is send to the application software piecemeal. Different [Processes](#) may be configured to receive the data but it cannot be ensured that all processes are up and running when data is transmitted.

Class	DiagnosticDataElementInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a element-of-DID-focused PortInterface for diagnostics on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticAbstractDataIdentifierInterface , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
read	ClientServerOperation	0..1	aggr	This represents the method to read the content of an element of a diagnostic data identifier.

Table 3.85: DiagnosticDataElementInterface

[TPS_MANI_01245]{DRAFT} Semantics of [DiagnosticDataIdentifierGenericInterface](#) [[DiagnosticDataIdentifierGenericInterface](#) is used to access the content of an entire DID at once.

For this purpose methods will be defined with a read and write semantics, but these methods will always only provide arguments that are byte-arrays.

Therefore, a further formalization of these methods for reading and writing data within the context of the AUTOSAR meta-model does not make sense and is therefore omitted.] ([RS_MANI_00061](#))

Class	DiagnosticDataIdentifierGenericInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a generic DID-focused PortInterface for diagnostics on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticAbstractDataIdentifierInterface , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.86: DiagnosticDataIdentifierGenericInterface

Please note that it is necessary to put some restrictions on the [argument unless](#) a given [DiagnosticDataIdentifierInterface](#) or [DiagnosticDataElementInterface](#) aggregates **only one** [ClientServerOperation](#) in **either** the role [read](#) **or** [write](#).

[constr_1697]{DRAFT} **Restriction for `ClientServerOperation` aggregated by a `DiagnosticDataIdentifierInterface` or `DiagnosticDataElementInterface`** [If meta-classes `DiagnosticDataIdentifierInterface` or `DiagnosticDataElementInterface` aggregate two `ClientServerOperations` then

- The two `ClientServerOperations` shall have the same number of `arguments`.
- The `arguments` on the n^{th} position in the collection of `arguments` shall have identical properties, except the `direction`. In particular, the following conditions shall be fulfilled with respect to attribute `direction`:
 - Any `ArgumentDataPrototype` aggregated by a `ClientServerOperation` that is itself aggregated in either the role `DiagnosticDataIdentifierInterface.read` or `DiagnosticDataElementInterface.read` shall set attribute `direction` to `out`.
 - Any `ArgumentDataPrototype` aggregated by a `ClientServerOperation` that is itself aggregated in the role `DiagnosticDataIdentifierInterface.write` shall set attribute `direction` to `in`.

]()

3.11.4 Interface to diagnostic Events

AUTOSAR defines several subclasses of `DiagnosticPortInterface` that are dedicated to the handling of diagnostic events.

[TPS_MANI_01246]{DRAFT} **Semantics of `DiagnosticMonitorInterface`** [Meta-class `DiagnosticMonitorInterface` represents the ability to report diagnostic events to the AUTOSAR Diagnostic Manager.] ([RS_MANI_00061](#))

Class	DiagnosticMonitorInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a monitor-focused PortInterface for diagnostics on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.87: DiagnosticMonitorInterface

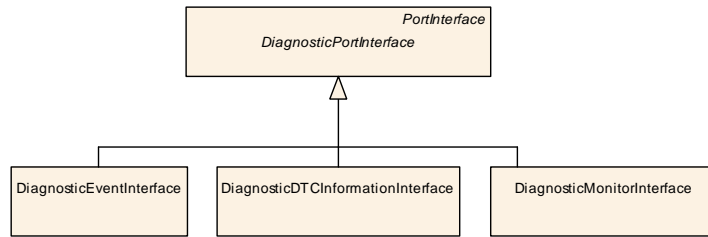


Figure 3.56: Modeling of DiagnosticEventInterface

[TPS_MANI_01247]{DRAFT} Semantics of DiagnosticDTCInformationInterface [Meta-class `DiagnosticDTCInformationInterface` represents the ability to retrieve information about a given diagnostic trouble code.] ([RS_MANI_00061](#))

Class	DiagnosticDTCInformationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to access the properties of DTCs on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.88: DiagnosticDTCInformationInterface

[TPS_MANI_01248]{DRAFT} Semantics of DiagnosticEventInterface [Meta-class `DiagnosticEventInterface` represents the ability to retrieve information about a given diagnostic event.] ([RS_MANI_00061](#))

Class	DiagnosticEventInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to access the properties of diagnostic events on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.89: DiagnosticEventInterface

3.11.5 Interface to diagnostic Condition

[TPS_MANI_01249]{DRAFT} Semantics of DiagnosticConditionInterface [AUTOSAR supports different diagnostic conditions, i.e. enable condition and clear

condition. This aspect is represented in the definition of the [DiagnosticConditionInterface](#) for the *AUTOSAR adaptive platform*.] ([RS_MANI_00061](#))

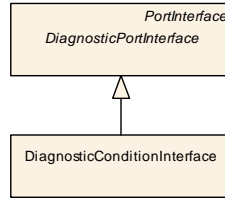


Figure 3.57: Modeling of [DiagnosticConditionInterface](#)

The [DiagnosticConditionInterface](#) does not require any further details in its formalization.

Class	DiagnosticConditionInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to process requests for diagnostic conditions on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.90: DiagnosticConditionInterface

3.11.6 Indicator Interface

[[TPS_MANI_01250](#)]{DRAFT} **Semantics of [DiagnosticIndicatorInterface](#)**
 [The usage of the [DiagnosticIndicatorInterface](#) is foreseen for software that implements a diagnostic indicator (i.e. a warning light on the dashboard).] ([RS_MANI_00061](#))

Class	DiagnosticIndicatorInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to implement indicator functionality on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.91: DiagnosticIndicatorInterface

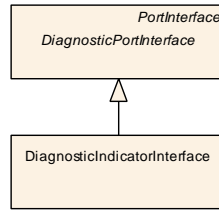


Figure 3.58: Modeling of `DiagnosticIndicatorInterface`

The `DiagnosticIndicatorInterface` does not require any further details in its formalization.

3.11.7 Security Level Interface

[TPS_MANI_01251]{DRAFT} **Semantics of `DiagnosticSecurityLevelInterface`** [The usage of the `DiagnosticSecurityLevelInterface` is foreseen for software that implements the checks for the clearance of a given security level.] ([RS_MANI_00061](#))

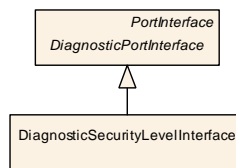


Figure 3.59: Modeling of `DiagnosticSecurityLevelInterface`

Class	DiagnosticSecurityLevelInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a security-level-focused PortInterface for diagnostics on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.92: DiagnosticSecurityLevelInterface

The `DiagnosticSecurityLevelInterface` does not require any further details in its formalization.

3.11.8 Service Validation Interface

[TPS_MANI_01252]{DRAFT} **Semantics of DiagnosticServiceValidationInterface** [The usage of the [DiagnosticServiceValidationInterface](#) is foreseen for software that implements the checks for clearance on manufacturer or supplier level.] ([RS_MANI_00061](#))

The [DiagnosticServiceValidationInterface](#) does not require any further details in its formalization.

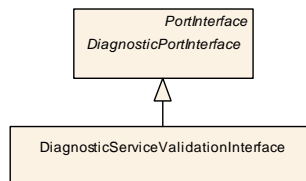


Figure 3.60: Modeling of [DiagnosticServiceValidationInterface](#)

Class	DiagnosticServiceValidationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to process requests for service validation on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.93: DiagnosticServiceValidationInterface

3.11.9 Operation Cycle Interface

[TPS_MANI_01253]{DRAFT} **Semantics of DiagnosticOperationCycleInterface** [The usage of the [DiagnosticOperationCycleInterface](#) is foreseen for software that implements the manages the operation cycles.] ([RS_MANI_00061](#))

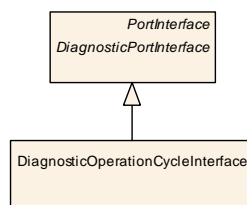


Figure 3.61: Modeling of [DiagnosticOperationCycleInterface](#)

Class	DiagnosticOperationCycleInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to process requests for operation cycles on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.94: DiagnosticOperationCycleInterface

The [DiagnosticOperationCycleInterface](#) does not require any further details in its formalization.

3.11.10 Generic UDS Interface

[TPS_MANI_01254]{DRAFT} **Semantics of [DiagnosticGenericUdsInterface](#)**
[The AUTOSAR diagnostic communication API also foresees the existence of one [DiagnosticPortInterface](#) that support the implementation of a completely generic handler of a UDS service.] ([RS_MANI_00061](#))

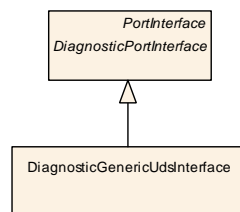


Figure 3.62: Modeling of [DiagnosticGenericUdsInterface](#)

Class	DiagnosticGenericUdsInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a generic UDS PortInterface for diagnostics on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.95: DiagnosticGenericUdsInterface

The [DiagnosticGenericUdsInterface](#) does not require any further details in its formalization.

3.11.11 DoIP Interfaces

[TPS_MANI_01255]{DRAFT} Semantics of DoIP DiagnosticPortInterfaces

[The AUTOSAR diagnostic communication API also foresees the existence of *DiagnosticPortInterfaces* to implement functionalities in the context of DoIP operation.

Specifically, the following concrete sub-classes of *DiagnosticPortInterface* are defined to support the implementation of functionalities in the context of DoIP:

- *DiagnosticDoIPGroupIdentificationInterface*
- *DiagnosticDoIPPowerModeInterface*
- *DiagnosticDoIPActivationLineInterface*
- *DiagnosticDoIPTriggerVehicleAnnouncementInterface*
- *DiagnosticDoIPEntityIdentificationInterface*

](RS_MANI_00061)

Class	DiagnosticDoIPGroupIdentificationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to implement the DoIP Group Identification on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>AtpBlueprint</i> , <i>AtpBlueprintable</i> , <i>AtpClassifier</i> , <i>AtpType</i> , <i>CollectableElement</i> , <i>DiagnosticPortInterface</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>PortInterface</i> , <i>Referrable</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.96: DiagnosticDoIPGroupIdentificationInterface

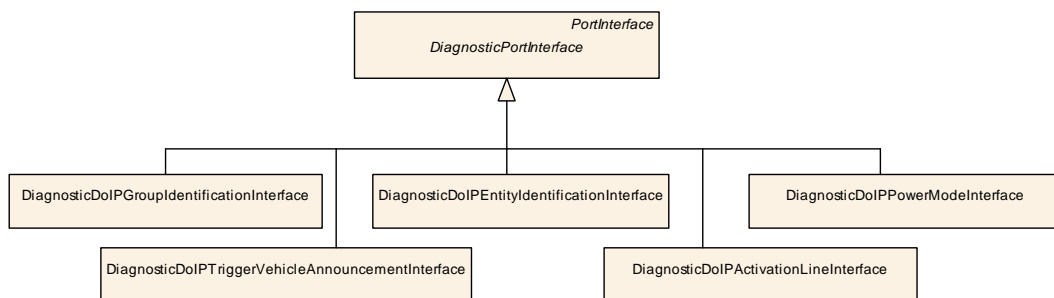


Figure 3.63: Modeling of DoIP DiagnosticPortInterfaces

Class	DiagnosticDoIPPowerModelInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to implement the DoIP Power Mode on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.97: DiagnosticDoIPPowerModelInterface

Class	DiagnosticDoIPActivationLineInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to implement the DoIPActivationLine on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.98: DiagnosticDoIPActivationLineInterface

Class	DiagnosticDoIPTriggerVehicleAnnouncementInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to implement the DoIPTriggerVehicle Announcement on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.99: DiagnosticDoIPTriggerVehicleAnnouncementInterface

Class	DiagnosticDoIPEntityIdentificationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to implement the DoIP Entity Identification on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			





Class	DiagnosticDoIPEntityIdentificationInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.100: DiagnosticDoIPEntityIdentificationInterface

The [DiagnosticDoIPGroupIdentificationInterface](#), [DiagnosticDoIPPowerModeInterface](#), [DiagnosticDoIPActivationLineInterface](#), [DiagnosticDoIPEntityIdentificationInterface](#) and [DiagnosticDoIPTriggerVehicleAnnouncementInterface](#) do not require any further details in its formalization.

3.11.12 Diagnostic Interfaces for Upload and Download

[TPS_MANI_01265]{DRAFT} **Semantics of [DiagnosticDownloadInterface](#) and [DiagnosticDownloadInterface](#)** [The AUTOSAR diagnostic communication API also foresees the existence of [DiagnosticPortInterfaces](#) to implement upload and download via diagnostic channels.

Specifically, the following concrete sub-classes of [DiagnosticPortInterface](#) are defined to support the implementation of upload and download:

- [DiagnosticUploadInterface](#)
- [DiagnosticDownloadInterface](#)

]([RS_MANI_00061](#))

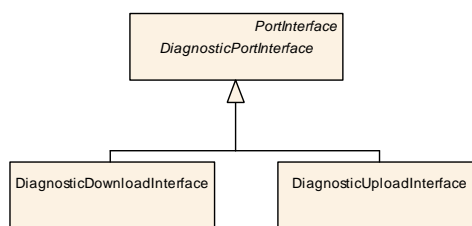


Figure 3.64: Modeling of [DiagnosticUploadInterface](#) and [DiagnosticDownloadInterface](#)

Class	DiagnosticUploadInterface
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface
Note	This meta-class represents the ability to implement a PortInterface to process requests for uploading data using diagnostic channels on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces





Class	DiagnosticUploadInterface			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.101: DiagnosticUploadInterface

Class	DiagnosticDownloadInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to process requests for downloading data using diagnostic channels on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.102: DiagnosticDownloadInterface

The [DiagnosticUploadInterface](#) and [DiagnosticDownloadInterface](#) do not require any further details in its formalization.

3.11.13 Interface to support managing the EcuReset

[TPS_MANI_01332]{DRAFT} **Semantics of [DiagnosticEcuResetInterface](#)**
[Meta-class [DiagnosticEcuResetInterface](#) represents the ability to support the handling of a request to reset the machine.

This interface will typically be used by the state manager on the AUTOSAR adaptive platform.] ([RS_MANI_00061](#))

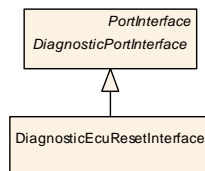


Figure 3.65: Modeling of [DiagnosticEcuResetInterface](#)

Class	DiagnosticEcuResetInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a focused PortInterface for handling the diagnostic service EcuReset on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.103: DiagnosticEcuResetInterface

3.11.14 Diagnostic Authentication Interface

[TPS_MANI_01359]{DRAFT} **Semantics of DiagnosticAuthenticationInterface** [The ability to support the diagnostic authentication in the application software is formalized in another sub-class of [DiagnosticPortInterface](#): [DiagnosticAuthenticationInterface](#).] ([RS_MANI_00061](#))

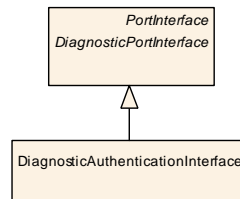


Figure 3.66: Modeling of DiagnosticAuthenticationInterface

Class	DiagnosticAuthenticationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a focused PortInterface for handling the diagnostic service "authentication" on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.104: DiagnosticAuthenticationInterface

3.11.15 Diagnostic External Authentication Interface

[TPS_MANI_01353]{DRAFT} **Semantics of DiagnosticExternalAuthenticationInterface** [The ability to support the authentication of a diagnostic client in the

application software is formalized in another sub-class of `DiagnosticPortInterface`: `DiagnosticExternalAuthenticationInterface`.] ([RS_MANI_00061](#))

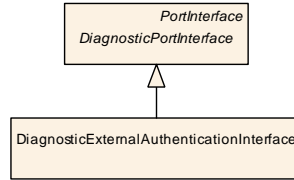


Figure 3.67: Modeling of `DiagnosticExternalAuthenticationInterface`

Class	DiagnosticExternalAuthenticationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a focused PortInterface for handling the diagnostic client authentication (i.e. convey the Authentication state to the Diagnostic Server instance of the DM) on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.105: DiagnosticExternalAuthenticationInterface

3.11.16 Diagnostic Communication Control Interface

[[TPS_MANI_01363](#)]{DRAFT} **Semantics of `DiagnosticComControlInterface`**
[The ability to support the activation and deactivation of communication with a diagnostic client is formalized in another sub-class of `DiagnosticPortInterface`: `DiagnosticComControlInterface`.] ([RS_MANI_00061](#))

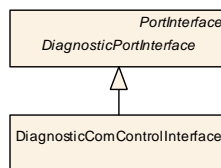


Figure 3.68: Modeling of `DiagnosticComControlInterface`

Class	DiagnosticComControlInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a focused PortInterface for handling the diagnostic service communication control on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			





Class	DiagnosticComControlInterface			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.106: DiagnosticComControlInterface

3.11.17 Diagnostic Request File Transfer Interface

[TPS_MANI_01373]{DRAFT} **Semantics of [DiagnosticRequestFileTransferInterface](#)** [The usage of the [DiagnosticRequestFileTransferInterface](#) is foreseen for software that implements a handler for requests for file transfer.] ([RS_MANI_00061](#))

The [DiagnosticRequestFileTransferInterface](#) does not require any further details in its formalization.

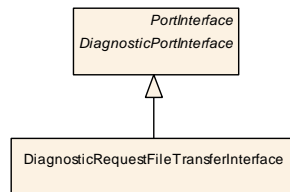


Figure 3.69: Modeling of [DiagnosticRequestFileTransferInterface](#)

Class	DiagnosticRequestFileTransferInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class represents the ability to implement a PortInterface to process requests for file transfer using diagnostic channels on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.107: DiagnosticRequestFileTransferInterface

3.11.18 Diagnostic Port Interfaces for SOVD

[TPS_MANI_01394]{DRAFT} **Support for the authorization of SOVD clients** [The ability to support the authorization of SOVD clients is formalized in meta-class `DiagnosticSovdAuthorizationInterface`, modeled as a sub-class of abstract base class `DiagnosticSovdPortInterface`. Application Software exposes a `PPortPrototype` for the support of authorization.] ([RS_MANI_00061](#), [RS_MANI_00070](#))

[TPS_MANI_01395]{DRAFT} **Support for the proximity challenge in the context of SOVD** [The ability to support the proximity challenge in the context of SOVD is formalized in meta-class `DiagnosticSovdProximityChallengeInterface`, modeled as a sub-class of abstract base class `DiagnosticSovdPortInterface`. Application Software exposes a `PPortPrototype` for the proximity challenge.] ([RS_MANI_00061](#), [RS_MANI_00070](#))

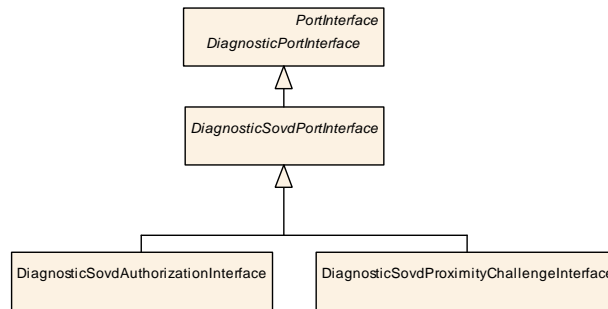


Figure 3.70: Modeling of sub-classes of `DiagnosticSovdPortInterface`

Class	<i>DiagnosticSovdPortInterface</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This abstract meta-class acts as a base class for all diagnostics-related PortInterfaces used in the context of SOVD. Tags: atp.Status=candidate			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Subclasses	DiagnosticSovdAuthorizationInterface , DiagnosticSovdProximityChallengeInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.108: DiagnosticSovdPortInterface

Class	DiagnosticSovdAuthorizationInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class is used to type a PPortPrototype for implementing the SOVD authorization. Tags: atp.Status=candidate atp.recommendedPackage=DiagnosticPortInterfaces			





Class	DiagnosticSovdAuthorizationInterface			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , DiagnosticSovdPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.109: DiagnosticSovdAuthorizationInterface

Class	DiagnosticSovdProximityChallengeInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface::DiagnosticPortInterface			
Note	This meta-class is used to type a PPortPrototype for implementing the SOVD proximity challenge. Tags: atp.Status=candidate atp.recommendedPackage=DiagnosticPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , DiagnosticPortInterface , DiagnosticSovdPortInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.110: DiagnosticSovdProximityChallengeInterface

3.12 Crypto Interfaces

3.12.1 Interaction with Crypto Software

[TPS_MANI_03253]{DRAFT} **Interaction with crypto software** [Interaction with crypto software on an instance of the application software shall be modeled on the basis of the existence of [RPortPrototypes](#) typed by a [PortInterface](#) that is derived from the abstract meta-class [CryptoInterface](#).] ([RS_MANI_00031](#))

In contrast to the conventions on the AUTOSAR classic Platform, these [CryptoInterfaces](#) are only used on the application side of this communication relation.

The Crypto API is described in [15]. The model-path to an [RPortPrototype](#) that is referencing a [CryptoInterface](#) is provided by the `ara::core::InstanceSpecifier` that defines the logical local name used by the application developer in the API call. This local `ara::core::InstanceSpecifier` is translated at runtime with the information from the deployment model to a specific crypto object, e.g. `CryptoKeySlot` in a `CryptoKeyStorage`.

Class	<i>CryptoInterface</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	This meta-class provides the abstract ability to define a PortInterface for the support of crypto use cases. Tags: atp.Status=candidate			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Subclasses	CryptoCertificateInterface , CryptoKeySlotInterface , CryptoProviderInterface , CryptoTrustMasterInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.111: CryptoInterface

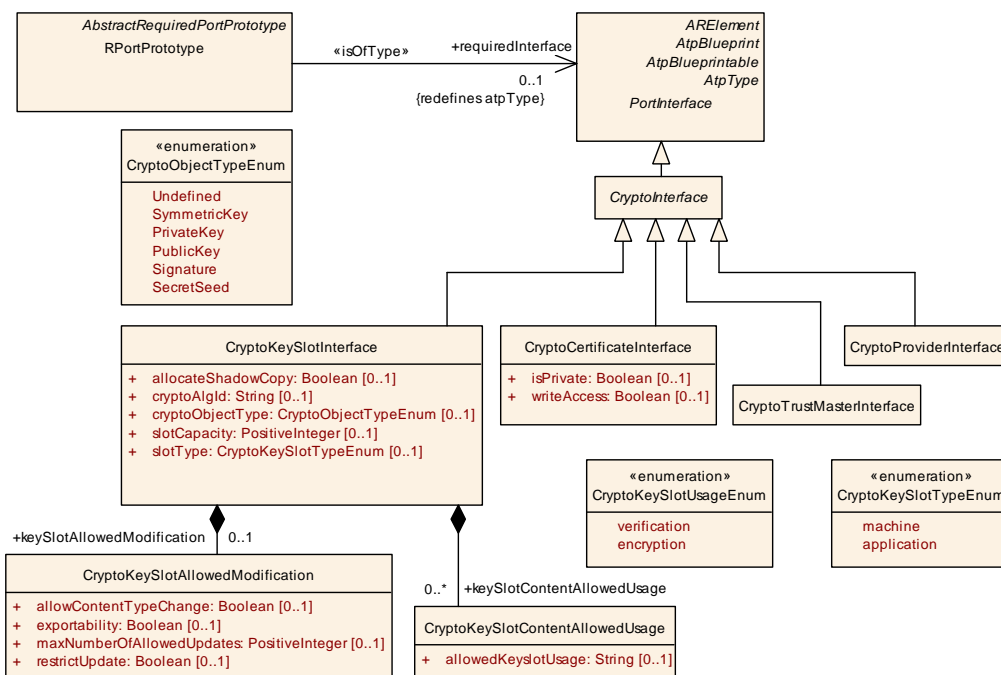


Figure 3.71: CryptoInterfaces for modeling of the interaction of the Application with the Crypto software

Figure 3.71 depicts all meta-classes that directly inherit from `CryptoInterface`.

3.12.2 Crypto Key Slot Interface

[TPS_MANI_03254]{DRAFT} Modeling of application that uses and modifies a Crypto Key [Application software that uses and modifies a Crypto Key is modeled as a `AdaptiveApplicationSwComponentType` with an `RPortPrototype` that is typed by a `CryptoKeySlotInterface` that has the `slotType` value set to `application`.] ([RS_MANI_00031](#))

[TPS_MANI_03255]{DRAFT} Modeling of Key Manager application that manages a Crypto Key that is used by Stack Services [An Key Manager Application that manages a Crypto Key that is used by Stack Services like COM, Persistency or Diagnostic

is modeled as a [AdaptiveApplicationSwComponentType](#) with an [RPortPrototype](#) that is typed by a [CryptoKeySlotInterface](#) that has the [slotType](#) value set to [machine.](#)] ([RS_MANI_00031](#))

Class	CryptoKeySlotInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	This meta-class provides the ability to define a PortInterface for Crypto Key Slots. Tags: atp.Status=candidate atp.recommendedPackage=CryptoInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , CryptoInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
allocateShadow Copy	Boolean	0..1	attr	This attribute defines whether a shadow copy of this Key Slot shall be allocated to enable rollback of a failed Key Slot update campaign (see interface BeginTransaction). Tags: atp.Status=candidate
cryptoAlgId	String	0..1	attr	This attribute defines a crypto algorithm restriction (kAlgId Any means without restriction). The algorithm can be specified partially: family & length, mode, padding. Future Crypto Providers can support some crypto algorithms that are not well known/ standardized today, therefore AUTOSAR doesn't provide a concrete list of crypto algorithms' identifiers and doesn't suppose usage of numerical identifiers. Instead of this a provider supplier should provide string names of supported algorithms in accompanying documentation. The name of a crypto algorithm shall follow the rules defined in the specification of cryptography for Adaptive Platform. Tags: atp.Status=candidate
cryptoObjectType	CryptoObjectTypeEnum	0..1	attr	Object type that can be stored in the slot. If this field contains "Undefined" then mSlotCapacity must be provided and larger then 0 Tags: atp.Status=candidate
keySlotAllowed Modification	CryptoKeySlotAllowed Modification	0..1	aggr	Restricts how this keySlot may be used Tags: atp.Status=candidate
keySlotContent AllowedUsage	CryptoKeySlotContent AllowedUsage	*	aggr	Restriction of allowed usage of a key stored to the slot. Tags: atp.Status=candidate
slotCapacity	PositiveInteger	0..1	attr	Capacity of the slot in bytes to be reserved by the stack vendor. One use case is to define this value in case that the cryptoObjectType is undefined and the slot size can not be deduced from cryptoObjectType and cryptoAlgId. "0" means slot size can be deduced from cryptoObjectType and cryptoAlgId. Tags: atp.Status=candidate
slotType	CryptoKeySlotType Enum	0..1	attr	This attribute defines whether the keySlot is exclusively used by the Application; or whether it is used by Stack Services and managed by a Key Manager Application. Tags: atp.Status=candidate

Table 3.112: CryptoKeySlotInterface

<i>Enumeration</i>	CryptoKeySlotTypeEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign
Note	This enumeration defines the options for the usage of a Key Slot in the platform. Tags: atp.Status=candidate
Aggregated by	CryptoKeySlot.slotType , CryptoKeySlotInterface.slotType
Literal	Description
application	KeySlot is used and modified exclusively by the Application. Tags: atp.EnumerationLiteralIndex=1 atp.Status=candidate
machine	Key slot is used by platform modules only. The application manages the key but is not able to use the key. Tags: atp.EnumerationLiteralIndex=0 atp.Status=candidate

Table 3.113: CryptoKeySlotTypeEnum

<i>Enumeration</i>	CryptoObjectTypeEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign
Note	Enumeration of all types of crypto objects, i.e. types of content that can be stored to a key slot. Tags: atp.Status=candidate
Aggregated by	CryptoKeySlot.cryptoObjectType , CryptoKeySlotInterface.cryptoObjectType
Literal	Description
PrivateKey	cryp::PrivateKey object Tags: atp.EnumerationLiteralIndex=2 atp.Status=candidate
PublicKey	cryp::PublicKey object Tags: atp.EnumerationLiteralIndex=3 atp.Status=candidate
SecretSeed	cryp::SecretSeed object Tags: atp.EnumerationLiteralIndex=5 atp.Status=candidate
Signature	cryp::Signature object (asymmetric digital signature or symmetric MAC/HMAC) Tags: atp.EnumerationLiteralIndex=4 atp.Status=candidate
SymmetricKey	cryp::SymmetricKey object Tags: atp.EnumerationLiteralIndex=1 atp.Status=candidate
Undefined	Object type unknown Tags: atp.EnumerationLiteralIndex=0 atp.Status=candidate

Table 3.114: CryptoObjectTypeEnum

Please note that the assignment of a [CryptoKeySlot](#) to a [CryptoProvider](#) is described in the deployment model (Machine Manifest). With this mapping also the assignment of the [CryptoKeySlot](#) to a [CryptoPrimitive](#) of a [CryptoProvider](#) is established.

But the application developer is able to restrict the usage of the [CryptoKeySlot](#) to a specific cryptographic algorithm with the attribute [cryptoAlgId](#).

To support crypto algorithms that are not well known/ standardized today, AUTOSAR doesn't provide a concrete list of crypto algorithm's identifiers and doesn't suppose usage of numerical identifiers.

Instead of this a provider supplier should provide string names of supported algorithms in accompanying documentation. The name of a crypto algorithm shall follow the rules defined in the specification of cryptography for Adaptive Platform.

In addition the application developer is able to define further requirements for the usage of the [CryptoKeySlot](#). With the attribute [cryptoObjectType](#) the crypto objects that are allowed to be stored in the key slot can be specified.

The allowed modifications of the key slot can be specified by [keySlotAllowedModification](#). The allowed usage of the key slot content can be specified by [keySlotContentAllowedUsage](#).

The Integrator needs to take the defined settings in the Application Design model into account if the assignment to the [CryptoKeySlot](#) in the Crypto Storage is performed. Please note that the Application Design model settings are transferred into the deployment model and are therefore also available at run-time as described in chapter [10.10.2](#).

Class	CryptoKeySlotAllowedModification			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	This meta-class restricts the allowed modification of a key stored in the key slot. Tags: atp.Status=candidate			
Base	<i>ARObject</i>			
Aggregated by	CryptoKeySlot.keySlotAllowedModification , CryptoKeySlotInterface.keySlotAllowedModification			
Attribute	Type	Mult.	Kind	Note
allowContent TypeChange	Boolean	0..1	attr	This attribute describes whether the key content type can be changed (true) or not (false), e.g. changing the key from symmetric to RSA. Tags: atp.Status=candidate
exportability	Boolean	0..1	attr	This attribute describes whether the key slot content is allowed to be exported or not. Tags: atp.Status=candidate
maxNumberOf AllowedUpdates	PositiveInteger	0..1	attr	This attribute describes the maximum updates that are allowed to the slot. Tags: atp.Status=candidate





Class	CryptoKeySlotAllowedModification			
restrictUpdate	Boolean	0..1	attr	This attribute defines whether restrictions on the number of updates are defined or not. False: no restriction is placed on the number of updates. True: restrictions are placed on the number of updates with the attribute maxNumberOfAllowedUpdates. Tags: atp.Status=candidate

Table 3.115: CryptoKeySlotAllowedModification

Class	CryptoKeySlotContentAllowedUsage			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	This meta-class restricts the allowed usage of a key stored in the key slot. Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	CryptoKeySlot.keySlotContentAllowedUsage, CryptoKeySlotInterface.keySlotContentAllowedUsage			
Attribute	Type	Mult.	Kind	Note
allowedKeyslotUsage	String	0..1	attr	This attribute defines for which operations the KeySlot may be used. Tags: atp.Status=candidate

Table 3.116: CryptoKeySlotContentAllowedUsage

[constr_5238]{DRAFT} [CryptoKeySlotAllowedModification.restrictUpdate](#) and the relationship to [maxNumberOfAllowedUpdates](#) [If the [CryptoKeySlotAllowedModification.restrictUpdate](#) is set to true then [CryptoKeySlotAllowedModification.maxNumberOfAllowedUpdates](#) shall be set to a value.]()

[constr_5239]{DRAFT} **Predefined values for [CryptoKeySlotContentAllowedUsage.allowedKeyslotUsage](#)** [The following values for [CryptoKeySlotContentAllowedUsage.allowedKeyslotUsage](#) are predefined by AUTOSAR:

- ALLOW-DATA-ENCRYPTION,
- ALLOW-DATA-DECRYPTION,
- ALLOW-SIGNATURE,
- ALLOW-VERIFICATION,
- ALLOW-KEY-AGREEMENT,
- ALLOW-KEY-DIVERSIFY,
- ALLOW-DRNG-INIT,
- ALLOW-KDF-MATERIAL,
- ALLOW-KEY-EXPORTING,
- ALLOW-KEY-IMPORTING,

- ALLOW-EXACT-MODE-ONLY,
- ALLOW-DERIVED-DATA-ENCRYPTION,
- ALLOW-DERIVED-DATA-DECRYPTION,
- ALLOW-DERIVED-SIGNATURE,
- ALLOW-DERIVED-VERIFICATION,
- ALLOW-DERIVED-DIVERSIFY,
- ALLOW-DERIVED-DRNG-INIT,
- ALLOW-DERIVED-KDF-MATERIAL,
- ALLOW-DERIVED-KEY-EXPORTING,
- ALLOW-DERIVED-KEY-IMPORTING,
- ALLOW-DERIVED-EXACT-MODE-ONLY

]()

3.12.3 Crypto Certificate Interface

[TPS_MANI_03256]{DRAFT} Modeling of application that accesses a Crypto Certificate [Application software that accesses a Crypto Certificate is modeled as a [AdaptiveApplicationSwComponentType](#) with an [RPortPrototype](#) that is typed by a [CryptoCertificateInterface](#).] ([RS_MANI_00031](#))

Class	CryptoCertificateInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	This meta-class provides the ability to define a PortInterface for a CryptoCertificate. Tags: atp.Status=candidate atp.recommendedPackage=CryptoInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , CryptoInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
isPrivate	Boolean	0..1	attr	This attribute controls the possibility to access the content of the CryptoCertificateSlot by Find() interfaces of the X509 Provider. Tags: atp.Status=candidate
writeAccess	Boolean	0..1	attr	This attribute defines whether the application has write-access to the CryptoCertificate (True) or only read-access (False). Tags: atp.Status=candidate

Table 3.117: CryptoCertificateInterface

3.12.4 Crypto Provider Interface

[TPS_MANI_03257]{DRAFT} **Modeling of application that accesses a Crypto Provider** [Application software that accesses a Crypto Provider is modeled as a [AdaptiveApplicationSwComponentType](#) with an [RPortPrototype](#) that is typed by a [CryptoProviderInterface](#).] ([RS_MANI_00031](#))

Please note that the [CryptoProviderInterface](#) shall be used if the Application needs to access a Crypto Provider to execute keyless operations, e.g. Hashing, Random Number Generation. For cryptographic transformations that require keys the [CryptoKeySlotInterface](#) may be used.

Class	CryptoProviderInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	This meta-class provides the ability to define a PortInterface for a CryptoProvider. Tags: atp.Status=candidate atp.recommendedPackage=CryptoInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , CryptoInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.118: CryptoProviderInterface

3.12.5 Crypto TrustMaster Interface

[TPS_MANI_03258]{DRAFT} **Modeling of application designed as trust-master** [Application software designed as trust-master is modeled as a [AdaptiveApplicationSwComponentType](#) with an [RPortPrototype](#) that is typed by a [CryptoTrustMasterInterface](#).] ([RS_MANI_00031](#))

An Application requires TrustMaster privileges to set global (machine-wide) root-of-trust certificates. Note: such a certificate may not be private.

Class	CryptoTrustMasterInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	This meta-class provides the ability to define a PortInterface for TrustMaster. Tags: atp.Status=candidate atp.recommendedPackage=CryptoInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , CryptoInterface , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.119: CryptoTrustMasterInterface

3.12.6 Linking of Crypto Certificate to a Crypto Key Slot

It is possible to model a link between a Crypto Certificate and a Crypto KeySlot in the Application Design with the meta-class `SwcServiceDependency` that aggregates `CryptoCertificateKeySlotNeeds` in the role `serviceNeeds` and `RoleBasedPortAssignments` that refer to an `RPortPrototype` that is typed by a `CryptoCertificateInterface` and an `RPortPrototype` that is typed by a `CryptoKeySlotInterface`.

[TPS_MANI_03259]{DRAFT} Linking of Crypto Certificate to a Crypto Key Slot [

ServiceNeeds kind `CryptoCertificateKeySlotNeeds`

RoleBasedPortAssignment valid roles:

- `CryptoKeySlotInterface` [1]
- `CryptoCertificateInterface` [1]

RoleBasedDataAssignment

N/A

RepresentedPortGroups

N/A

](RS_MANI_00031)

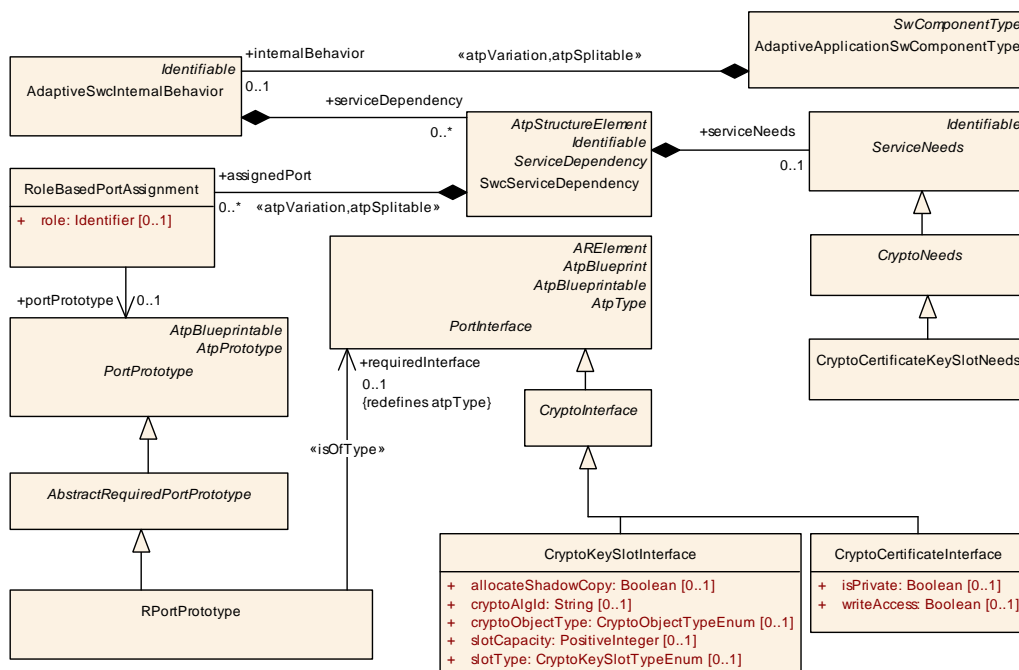


Figure 3.72: Linking of Crypto Certificate with Crypto Key Slot in Application Design

Class	<i>CryptoNeeds</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	Specifies the abstract needs on the configuration of Crypto. Tags: atp.Status=candidate			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable , ServiceNeeds			
Subclasses	CryptoCertificateKeySlotNeeds			
Aggregated by	BswServiceDependency.serviceNeeds, SwcServiceDependency.serviceNeeds			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.120: CryptoNeeds

Class	CryptoCertificateKeySlotNeeds			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CryptoDesign			
Note	This meta-class shall be taken to indicate that the SwcServiceDependency modeled with this kind of ServiceNeeds defines a relationship between a CryptoKeySlot and a CryptoCertificate. Tags: atp.Status=candidate			
Base	ARObject, CryptoNeeds , Identifiable , MultilanguageReferrable , Referrable , ServiceNeeds			
Aggregated by	BswServiceDependency.serviceNeeds, SwcServiceDependency.serviceNeeds			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.121: CryptoCertificateKeySlotNeeds

The following figure 3.73 shows an example how the [SwcServiceDependency](#) is used to create a relation between a Crypto Certificate and a Crypto KeySlot.

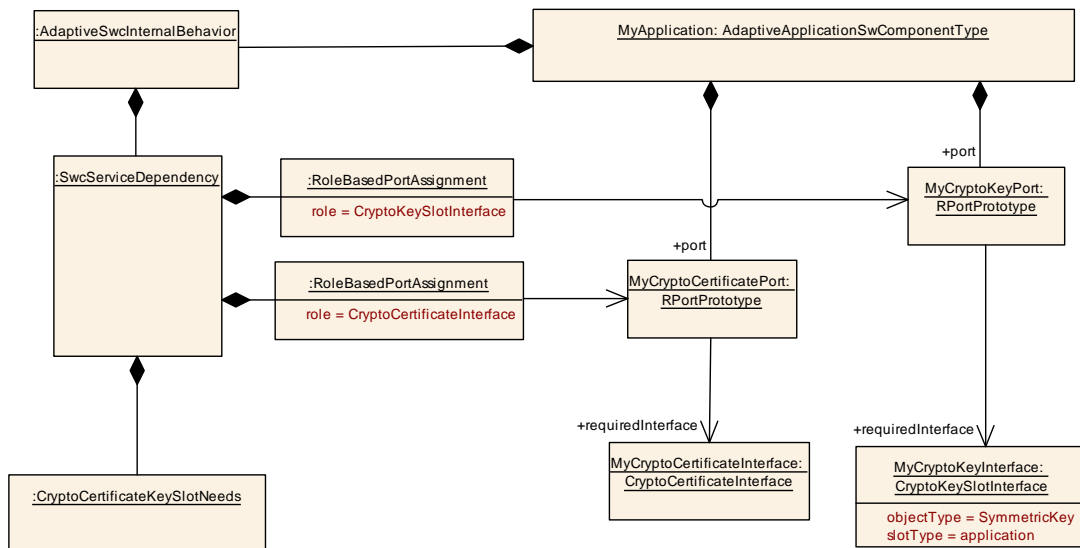


Figure 3.73: Example that shows a link between a Port typed by [CryptoKeySlotInterface](#) and a Port typed by [CryptoCertificateInterface](#)

3.13 Raw Data Stream Interface

In some cases it is necessary for the application software to be able to process raw binary data streams sent over a communication channel. Obviously, SOME/IP serialization does not make sense in such a scenario, as would the modeling of `AutosarDataTypes`, i.e. the creation of a `ServiceInterface`.

Therefore, a different mechanism that actively supports the requirements of raw data streaming is available on the *AUTOSAR adaptive platform*.

As far as the application software is concerned, the interaction with a raw data stream is based on the usage of an `RPortPrototype` typed by either a `RawDataStreamClientInterface` or a `RawDataStreamServerInterface`.

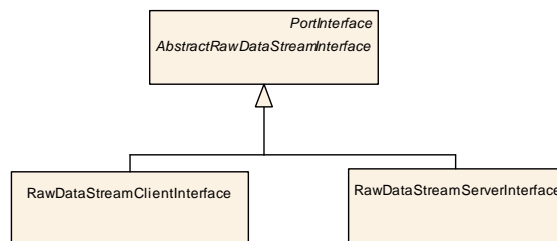


Figure 3.74: Modeling of PortInterfaces for raw data stream

This kind of `PortInterface` does neither support nor require any elements with a modeled data type, i.e. an `AutosarDataType`.

Class	AbstractRawDataStreamInterface (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class serves as an abstract base class for PortInterfaces related to raw data streams.			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Subclasses	RawDataStreamClientInterface , RawDataStreamServerInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.122: AbstractRawDataStreamInterface

Class	RawDataStreamClientInterface
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface
Note	<p>This meta-class represents the necessary capabilities for raw data streaming on the client side, i.e. the streaming of data that do not undergo any serialization. Each <code>RawDataStreamClientInterface</code> supports the following capabilities without further modeling:</p> <ul style="list-style-type: none"> • connect: set up the communication channel • shutdown: close the communication channel • write: send data down the communication channel • read: access incoming data on the communication channel <p>Tags:atp.recommendedPackage=RawDataStreamInterfaces</p>





Class	RawDataStreamClientInterface			
Base	ARElement , ARObject , AbstractRawDataStreamInterface , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.123: RawDataStreamClientInterface

Class	RawDataStreamServerInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class represents the necessary capabilities for raw data streaming on the server side, i.e. the streaming of data that do not undergo any serialization. Each RawDataStreamServerInterface supports the following capabilities without further modeling: <ul style="list-style-type: none"> • waitForConnection: wait until a communication channel is set up. • shutdown: close the communication channel • write: send data down the communication channel • read: access incoming data on the communication channel Tags: atp.recommendedPackage=RawDataStreamInterfaces			
Base	ARElement , ARObject , AbstractRawDataStreamInterface , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.124: RawDataStreamServerInterface

3.14 Security Event Report Interface

On the *AUTOSAR adaptive platform*, a dedicated [PortInterface](#) for the interaction of application-layer software with the [AUTOSAR Intrusion Detection System Manager](#) is defined.

The name of this sub-class of abstract meta-class [PortInterface](#) is [SecurityEventReportInterface](#).

Class	SecurityEventReportInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the ability to define a PortInterface for the reporting of security events in the context of the intrusion detection system. Tags: atp.Status=candidate atp.recommendedPackage=SecurityEventReportInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			





Class	SecurityEventReportInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.125: SecurityEventReportInterface

[TPS_MANI_01340]{DRAFT} **Semantics of SecurityEventReportInterface**
 [Each RPortPrototype typed by a SecurityEventReportInterface is able to report exactly one security event.] (RS_MANI_00068)

[TPS_MANI_01338]{DRAFT} **Semantics of SecurityEventReportToSecurityEventDefinitionMapping**
 [The modeling of the association between a specific security event and the corresponding RPortPrototype typed by a SecurityEventReportInterface is created by means of the SecurityEventReportToSecurityEventDefinitionMapping.] (RS_MANI_00068)

Class	SecurityEventReportToSecurityEventDefinitionMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class represents the ability to map a PortPrototype for reporting a security event to the actual security event that shall be reported by this PortPrototype. Tags: atp.Status=candidate atp.recommendedPackage=SecurityEventReportToSecurityEventDefinitionMappings			
Base	ARElement, ARObjct, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
reported SecurityEvent	AbstractRequiredPort Prototype	0..1	iref	This identifies the mapped security event. Tags: atp.Status=candidate InstanceRef implemented by: RPortInComposition InstanceRef
securityEvent Definition	SecurityEventDefinition	0..1	ref	This reference identifies the definition of the security event. Tags: atp.Status=candidate

Table 3.126: SecurityEventReportToSecurityEventDefinitionMapping

This meta-class maps the RPortPrototype to a SecurityEventDefinition that itself is part of the so-called Security Extract.

[TPS_MANI_01339]{DRAFT} **Existence of the SecurityEventReportToSecurityEventDefinitionMapping is motivated by the AUTOSAR methodology**
 [The existence of the SecurityEventReportToSecurityEventDefinitionMapping is motivated by the AUTOSAR methodology. At the point in time when a given SecurityEventReportInterface is defined it could be that the corresponding SecurityEventDefinition is not yet defined.

So it is possible to add this association later. Another reason for the existence of the mapping class is that a specific piece of application software may report different

specific security events defined by different OEMs, depending on the deployment of the application software.

Of course, the semantics of the security event all always be either identical or at least comparable, it could still happen that the Id of a security event might change depending on the specific project or simply because different OEMs use different Ids for semantically identical security events.] ([RS_MANI_00068](#))

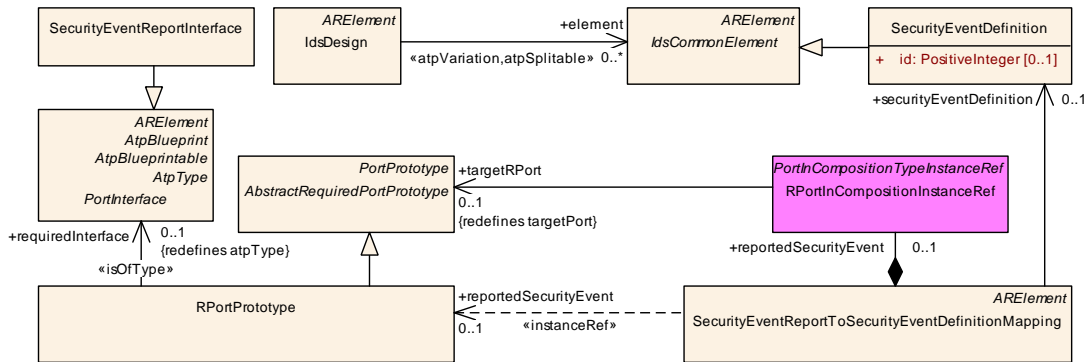


Figure 3.75: Specification of the SecurityEventReportInterface and SecurityEventReportToSecurityEventDefinitionMapping

3.15 Log And Trace Interface

On the AUTOSAR adaptive platform, a dedicated PortInterface named LogAndTraceInterface is defined for the interaction of application-layer software with the AUTOSAR Logging and Tracing Functional Cluster.

Class	LogAndTraceInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the ability to implement a PortInterface for support of Logging or Tracing. Tags: atp.recommendedPackage=PortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 3.127: LogAndTraceInterface

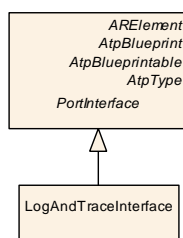


Figure 3.76: Specification of the LogAndTraceInterface

[TPS_MANI_03284]{DRAFT} **Semantics of [LogAndTraceInterface](#)** [Each [RPortPrototype](#) typed by a [LogAndTraceInterface](#) is able to forward logging information onto the external Dlt Log Viewer.] ([RS_MANI_00037](#))

[constr_5290]{DRAFT} **[PPortPrototype](#) is not allowed to be typed by [LogAndTraceInterface](#)** [A [PPortPrototype](#) is not allowed to reference a [LogAndTraceInterface](#) in the role [providedInterface](#).] ()

Please note that the mapping of an [RPortPrototype](#) typed by a [LogAndTraceInterface](#) to a [DltLogSink](#) is described in the deployment model in chapter 10.6.2.

Class	LTMessaggeCollectionToPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace			
Note	This mapping element assigns a collection of Log or Trace messages to a PortPrototype of an application. Tags: atp.recommendedPackage=LTMessaggeCollectionToPortPrototypeMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
logAndTraceMessageCollectionSet	LogAndTraceMessageCollectionSet	0..1	ref	Reference to a Collection of Log or Trace messages
rPortPrototype	RPortPrototype	0..1	ref	Reference to the RPortPrototype to which Log or Trace messages are assigned.

Table 3.128: LTMessaggeCollectionToPortPrototypeMapping

Class	LogAndTraceMessageCollectionSet			
Package	M2::AUTOSARTemplates::LogAndTraceExtract			
Note	Collection of DltMessages Tags: atp.recommendedPackage=LogAndTraceMessageCollectionSets			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dltMessage	DltMessage	*	aggr	Collection of DltMessages in the DltMessageCollection Set. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dltMessage.shortName, dltMessage.variationPoint.shortLabel vh.latestBindingTime=systemDesignTime

Table 3.129: LogAndTraceMessageCollectionSet

[constr_5291]{DRAFT} **Allowed usage of [LTMessaggeCollectionToPortPrototypeMapping.rPortPrototype](#)** [An [LTMessaggeCollectionToPortPrototypeMapping](#) shall (in the role [rPortPrototype](#)) only refer to a [RPortPrototype](#) that is typed by a [LogAndTraceInterface](#).] ()

[TPS_MANI_03285]{DRAFT} **Semantics of [LTMessaggeCollectionToPortPrototypeMapping](#)** [With the [LTMessaggeCollectionToPortPrototypeMapping](#) it

is possible to describe at application design time a collection of Log or Trace messages that will be used by the application.] ([RS_MANI_00023](#))

3.16 Firewall Interface

On the *AUTOSAR adaptive platform*, a dedicated `PortInterface` named `FirewallStateSwitchInterface` is defined for the interaction of application-layer software with the Firewall Cluster.

Class	FirewallStateSwitchInterface			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface			
Note	This meta-class provides the ability to implement a PortInterface for interaction with the Firewall mode. Tags: atp.Status=candidate atp.recommendedPackage=FirewallStateSwitchPortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
firewallStateMachine	ModeDeclarationGroupPrototype	*	aggr	The state machine of this firewall interface. Tags: atp.Status=candidate

Table 3.130: FirewallStateSwitchInterface

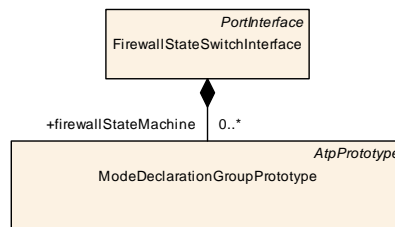


Figure 3.77: Specification of the `FirewallStateSwitchInterface`

[TPS_MANI_03321]{DRAFT} **Semantics of `FirewallStateSwitchInterface`** [The `RPortPrototype` typed by a `FirewallStateSwitchInterface` provides the functionality to switch the firewall state.] ()

[TPS_MANI_03295]{DRAFT} **Semantics of `FirewallStateSwitchInterface`. `firewallStateMachine`** [The `ModeDeclarationGroupPrototype` aggregated in the `FirewallStateSwitchInterface` in the role `firewallStateMachine` defines the state machine of the Firewall Cluster.] ()

3.17 Interaction Endpoint for Application

The interaction of software-components with the outside world can take several forms, e.g. service-oriented communication or the interaction with a persistent data storage.

A formal representation of the interaction needs to be described as an anchor point for adding various additional configuration attributes that make sense in this context but would not make sense in the context of a [PortInterface](#).

There is a model element that already has a long-standing tradition in the AUTOSAR meta-model for exactly the described purpose: the [PortPrototype](#).

The following sub-chapters discuss the interaction by means of [PortPrototypes](#) with software “outside” a given software-component with the focus on different kinds of interaction that require different ways to further contribute model elements for configuration.

3.17.1 Service-oriented Communication

The service-oriented communication by means of [PortPrototypes](#) does **not** support the concept of a communication endpoint that is both required and provided **at the same time**. This motivates the existence of [\[constr_1473\]](#).

[constr_1473]{DRAFT} No support for PRPortPrototype [A [ServiceInterface](#) shall not be referenced by a [PRPortPrototype](#) in the role [providedRequiredInterface](#).]()

[TPS_MANI_01039]{DRAFT} Representation of provided service [A **provided service** shall be modeled by means of an [PPortPrototype](#) that is typed by a [ServiceInterface](#).] ([RS_MANI_00002](#))

[TPS_MANI_01040]{DRAFT} Representation of required service [A **required service** shall be modeled by means of an [RPortPrototype](#) that is typed by a [ServiceInterface](#).] ([RS_MANI_00002](#))

For more background regarding the rationale of [\[constr_1473\]](#), please refer to [\[1\]](#).

Please note that the utilization of service discovery on the *AUTOSAR adaptive platform* means that opposite communication ends **are by design not known upfront**.

As a consequence, it is in general not possible to use [AssemblySwConnectors](#) to model a pre-defined relation between two communication endpoints modeled as [PortPrototypes](#).

Independent of the issue described above, it is still necessary to provide means for configuration of a given [PortPrototype](#) on different levels:

- The [PortPrototype](#) itself (i.e. as a whole) may need to be customized, independently of the kind or number of elements aggregated by the corresponding [ServiceInterface](#). This aspect is discussed in section [3.17.4](#).
- The usage of elements of the corresponding [ServiceInterface](#) may need to be configured for a given [PortPrototype](#). This aspect is discussed in section [3.17.5](#).

3.17.2 Interaction with Persistent Key-Value Storage

The usage of `PortPrototype`s for the purpose of interacting with *persistent key-value storage* is less restricted than in the case of service-oriented communication. In other words, it is perfectly valid to use a `PRPortPrototype` where applicable.

[TPS_MANI_01073]{DRAFT} **Semantics of `PortPrototype` typed by `PersistencyKeyValueStorageInterface`** [The usage of a specific sub-class of `PortPrototype` typed by `PersistencyKeyValueStorageInterface` indicates the intended semantics of interaction:

- The usage of a `RPortPrototype` indicates that the persistent data can only be **read from** the persistent storage.
- The usage of a `PPortPrototype` indicates that the persistent data can only be **written to** the persistent storage.
- The usage of a `PRPortPrototype` indicates that the persistent data can be **read from** as well as **written to** the persistent storage.

]([RS_MANI_00027](#))

Please note that the `PersistencyKeyValueStorageInterface` is described in chapter 3.8.2.

3.17.3 Interaction with Persistent File Storage

Interaction with **persistent file storage** can involve the ability to read from and write to a file by the same application. Therefore, the existence of a `PRPortPrototype` typed by a `PersistencyFileStorageInterface` shall be supported.

[TPS_MANI_01081]{DRAFT} **Semantics of `PortPrototype` typed by `PersistencyFileStorageInterface`** [The usage of a specific sub-class of `PortPrototype` typed by `PersistencyFileStorageInterface` indicates the intended semantics of interaction:

- The usage of a `RPortPrototype` indicates that the corresponding file(s) can be **opened for read access**.
- The usage of a `PPortPrototype` indicates that the corresponding file(s) can be **opened or created for write access**. Also, there is the ability to **delete** a file.
- The usage of a `PRPortPrototype` indicates that the corresponding file(s) can be **opened or created for read and write access**. Also, there is the ability to **delete** a file.

]([RS_MANI_00027](#))

Please note that the `PersistencyFileStorageInterface` is described in chapter 3.8.3.

3.17.4 Port Prototype Props

As mentioned before, in some cases a qualification of the semantics of `PortPrototype` is necessary. For this purpose, AUTOSAR typically defines a *props* class of some kind. The same approach applies in this situation as well.

In particular, `PortPrototype` aggregates the abstract meta-class `PortPrototypeProps`, that in turn starts an inheritance tree of derived meta-classes that have the ability to qualify sub-classes of `PortPrototype` accordingly.

[constr_3642]{DRAFT} Restriction of aggregation of `PortPrototypeProps` to the Adaptive Platform [The aggregation of `PortPrototypeProps` is only supported in the context of a `SwComponentType` that is (transitively) referenced by `rootSwComponentPrototype`.]()

One example for this approach is the definition of the meta-class `RPortPrototypeProps`, sketched in Figure 3.78.

[constr_3359]{DRAFT} `RPortPrototypeProps` are related only to `RPortPrototypes` [The `RPortPrototypeProps` shall be aggregated only by a `RPortPrototype` in the role `portPrototypeProps`.]()

[TPS_MANI_01057]{DRAFT} Semantics of `RPortPrototypeProps.searchIntention` [The value of the attribute `RPortPrototypeProps.searchIntention` clarifies whether the search for a corresponding offer shall be done as a search for all or else as a search for a specific ID.

Typically, a search for any results in a collection of offers while the search for a given id results in just a single offer.] ([RS_MANI_00002](#))

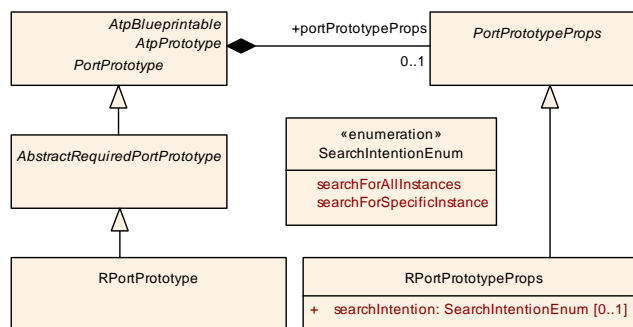


Figure 3.78: Modeling of the `RPortPrototypeProps` for `RPortPrototype`

Class	<code>PortPrototypeProps</code> (abstract)
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure
Note	This meta-class represents the ability to define a further qualification of semantics of sub-classes of <code>PortPrototype</code> .
Base	<code>AObject</code>
Subclasses	<code>RPortPrototypeProps</code>





Class	PortPrototypeProps (abstract)			
Aggregated by	PortPrototype.portPrototypeProps			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.131: PortPrototypeProps

Class	RPortPrototypeProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure			
Note	PortPrototypeProps for a RPort.			
Base	<i>AObject</i> , PortPrototypeProps			
Aggregated by	PortPrototype.portPrototypeProps			
Attribute	Type	Mult.	Kind	Note
searchIntention	SearchIntentionEnum	0..1	attr	This attribute is used to specify the intention of the developer of the enclosing software-component in terms of whether the respective PortPrototype shall be use to search for a specific service instance or all instances of the given service. Please note that the value of this attribute does not create a binding contract. The actual search behavior is defined as part of the service instance manifest.

Table 3.132: RPortPrototypeProps

Enumeration	SearchIntentionEnum			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign			
Note	This meta-class allows for the definition of a dedicated search intention from the application's point of view.			
Aggregated by	RPortPrototypeProps.searchIntention			
Literal	Description			
searchForAllInstances	This value represents the intention to search for all instances of the given service. Tags: atp.EnumerationLiteralIndex=0			
searchForSpecificInstance	This value represents the intention to search for a specific instance of the given service. Tags: atp.EnumerationLiteralIndex=1			

Table 3.133: SearchIntentionEnum

3.17.5 Port Prototype ComSpec

[TPS_MANI_01053]{DRAFT} Usage of ComSpecs on the AUTOSAR adaptive platform [The aspect of further qualification of elements of the [ServiceInterface](#) used to type given [PortPrototype](#) is implemented by means of [ComSpecs](#), i.e. specific sub-classes of the abstract meta-classes [RPortComSpec](#) and [PPortComSpec](#).

However, the support for [ComSpecs](#) on the *AUTOSAR adaptive platform* only covers a **limited selection** of attributes of a specific [ComSpec](#).] ([RS_MANI_00002](#))

The details about supported attributes of either a [RPortComSpec](#) or [PPortComSpec](#) are described in this chapter.

The configuration of transformation capabilities in the context of a [ComSpec](#) is possible by means of subclasses of meta-class [TransformationComSpecProps](#).

Class	TransformationComSpecProps (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	TransformationComSpecProps holds all the attributes for transformers that are port specific.			
Base	ARObject , Describable			
Subclasses	EndToEndTransformationComSpecProps , UserDefinedTransformationComSpecProps			
Aggregated by	ClientComSpec.transformationComSpecProps , ReceiverComSpec.transformationComSpecProps , ServerComSpec.transformationComSpecProps			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.134: TransformationComSpecProps

Class	UserDefinedTransformationComSpecProps			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	The UserDefinedTransformationComSpecProps is used to specify port specific configuration properties for custom transformers.			
Base	ARObject , Describable , TransformationComSpecProps			
Aggregated by	ClientComSpec.transformationComSpecProps , ReceiverComSpec.transformationComSpecProps , ServerComSpec.transformationComSpecProps			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.135: UserDefinedTransformationComSpecProps

Class	EndToEndTransformationComSpecProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer			
Note	The class EndToEndTransformationComSpecProps specifies port specific configuration properties for EndToEnd transformer attributes.			
Base	ARObject , Describable , TransformationComSpecProps			
Aggregated by	ClientComSpec.transformationComSpecProps , ReceiverComSpec.transformationComSpecProps , ServerComSpec.transformationComSpecProps			
Attribute	Type	Mult.	Kind	Note
clearFromValidToInvalid	Boolean	0..1	attr	Clear monitoring window on transition from state Valid to state Invalid.
disableEndToEndCheck	Boolean	0..1	attr	Disables/Enables the E2E check. The E2Eheader is removed from the payload independent from the setting of this attribute.
disableEndToEndStateMachine	Boolean	0..1	attr	Disables the E2EStateMachine (only E2E check functionality is performed)
e2eProfileCompatibilityProps	E2EProfileCompatibilityProps	0..1	ref	Reference to additional settings for the E2E state machine.





Class	EndToEndTransformationComSpecProps			
maxDeltaCounter	PositiveInteger	0..1	attr	Maximum allowed difference between two counter values of two consecutively received valid messages. For example, if the receiver gets data with counter 1 and MaxDeltaCounter is 3, then at the next reception the receiver can accept Counters with values 2, 3 or 4.
maxErrorStateInit	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last WindowSize checks, for the state E2E_SM_INIT. The minimum value is 0.
maxErrorStateInvalid	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last WindowSize checks, for the state E2E_SM_INVALID. The minimum value is 0.
maxErrorStateValid	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last WindowSize checks, for the state E2E_SM_VALID. The minimum value is 0.
minOkStateInit	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_INIT. The minimum value is 1.
minOkStateInvalid	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_INVALID. The minimum value is 1.
minOkStateValid	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_VALID. The minimum value is 1.
windowSizeInit	PositiveInteger	0..1	attr	Size of the monitoring window of state Init for the E2E state machine.
windowSizeInvalid	PositiveInteger	0..1	attr	Size of the monitoring window of state Invalid for the E2E state machine.
windowSizeValid	PositiveInteger	0..1	attr	Size of the monitoring window of state Valid for the E2E state machine.

Table 3.136: EndToEndTransformationComSpecProps

[TPS_MANI_01327]{DRAFT} Value of [EndToEndTransformationComSpecProps.disableEndToEndCheck](#) vs. value of [EndToEndTransformationComSpecProps.disableEndToEndStateMachine](#) [If the value of attribute [EndToEndTransformationComSpecProps.disableEndToEndCheck](#) is set to True, then the value of attribute [EndToEndTransformationComSpecProps.disableEndToEndStateMachine](#) shall be ignored.](RS_MANI_00028)

3.17.5.1 Port Prototypes typed by Service Interfaces

3.17.5.1.1 Receiver ComSpec

The [ReceiverComSpec](#) needs an attribute that indicates whether the enclosing [AdaptiveApplicationSwComponentType](#) has an intention to actually access the

referenced `dataElement`. This attribute represents a security feature related to identity and access management [16].

Specifically, this aspect is typically summarized as a capability of the software, i.e. the `AdaptiveApplicationSwComponentType` expresses its capability with respect to the specific `dataElement`. The term "capability" is an integral part of the jargon in the domain of identity and access management.

However, outside the identity and access management domain, this terminology is sometimes hard to motivate. What could be motivated is that the `AdaptiveApplicationSwComponentType` expresses its *intent* to actually access the `dataElement`.

From that perspective, the process of adding an event to a `ServiceInterface` adds the capability to use the `dataElement`. But whether the software that uses the `ServiceInterface` actually intends to access the `dataElement` can be expressed by an attribute in the `ReceiverComSpec` named `receiverIntent`.

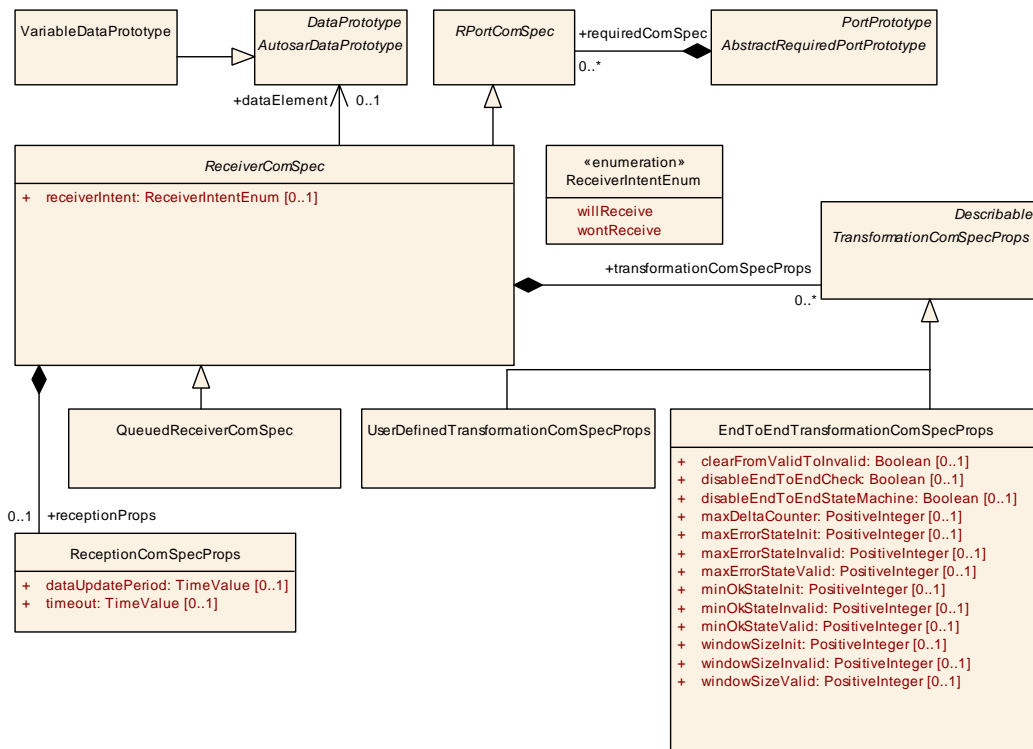


Figure 3.79: Modeling of the `ReceiverComSpec` on the AUTOSAR adaptive platform

Class	<code>ReceiverComSpec</code> (abstract)
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication
Note	Receiver-specific communication attributes (RPortPrototype typed by ServiceInterface) that are relevant for events and field notifiers.
Base	<code>ARObject</code> , <code>RPortComSpec</code>
Subclasses	<code>NonqueuedReceiverComSpec</code> , <code>QueuedReceiverComSpec</code>
Aggregated by	<code>AbstractRequiredPortPrototype.requiredComSpec</code> , <code>PortPrototypeBlueprint.requiredComSpec</code>





Class	ReceiverComSpec (abstract)			
Attribute	Type	Mult.	Kind	Note
dataElement	AutosarDataPrototype	0..1	ref	Data element these attributes belong to.
receiverIntent	ReceiverIntentEnum	0..1	attr	This attribute represents the expressed intent of the receiver. The receiver may decide to claim that existing resources of a ServiceInterface are expressly not used by this specific receiver. The conceptual background of this claim may be driven by security, safety, etc. Tags: atp.Status=candidate
receptionProps	ReceptionComSpec Props	0..1	aggr	"This aggregation represents the definition transmission props in the context of the enclosing ReceiverComSpec.
transformation ComSpecProps	TransformationCom SpecProps	*	aggr	This references the TransformationComSpecProps which define port-specific configuration for data transformation.

Table 3.137: ReceiverComSpec

Class	QueuedReceiverComSpec			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Communication attributes specific to queued receiving.			
Base	ARObject , RPortComSpec , ReceiverComSpec			
Aggregated by	AbstractRequiredPortPrototype.requiredComSpec , PortPrototypeBlueprint.requiredComSpec			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.138: QueuedReceiverComSpec

[TPS_MANI_01106]{DRAFT} **Specification of intentions for the receiver of events or field notifiers** [The attribute [ReceiverComSpec.receiverIntent](#) can be used to specify whether the software actually intends to access the referenced [events](#) or [field](#) notifier or whether it explicitly states that it is not interested in the value.] ([RS_MANI_00034](#))

Enumeration	ReceiverIntentEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ComSpec
Note	This meta-class represents the intent to specify how a given ServiceInterface is used from the perspective of a given event receiver. Tags: atp.Status=candidate
Aggregated by	ReceiverComSpec.receiverIntent
Literal	Description
willReceive	The receiver will receive the event or field notifier. Tags: atp.EnumerationLiteralIndex=0 atp.Status=candidate
wontReceive	The receiver won't receive the event or field notifier. Tags: atp.EnumerationLiteralIndex=1 atp.Status=candidate

Table 3.139: ReceiverIntentEnum

[TPS_MANI_03132]{DRAFT} **Semantics of E2E attributes in ReceiverComSpec**
 [The `EndToEndTransformationComSpecProps` shall be used for the specification of `RPortPrototype`-specific configuration options related to end-to-end protection of events or field notifiers.] (*RS_MANI_00028*)

3.17.5.1.2 Sender ComSpec

The `SenderComSpec` is modeled in the same way as described in the Software Component Template [1].

[TPS_MANI_03210]{DRAFT} **Specification of event specific communication attributes**
 [The meta-class `QueuedSenderComSpec` can be used to specify communication attributes that are relevant for an `event` on the sender side.] (*RS_MANI_00002*)

[TPS_MANI_03211]{DRAFT} **Specification of field specific communication attributes**
 [The meta-class `FieldSenderComSpec` can be used to specify communication attributes that are relevant for a `field` on the sender side.] (*RS_MANI_00002*)

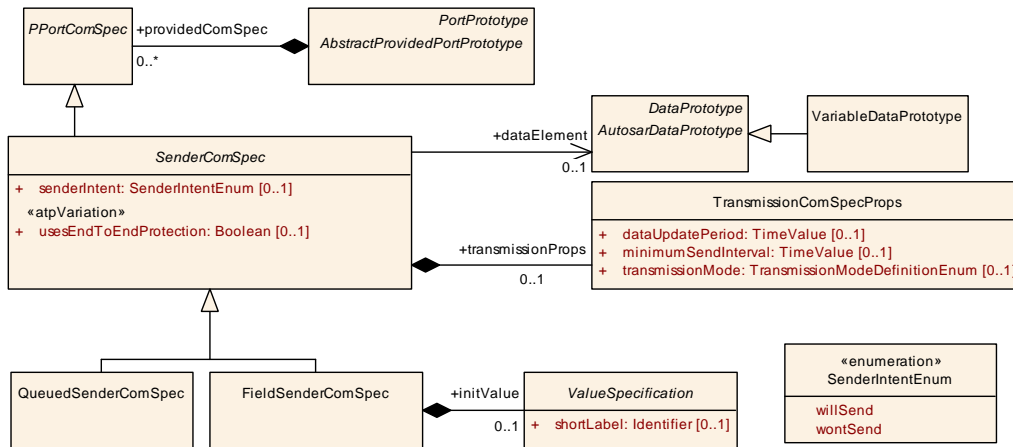


Figure 3.80: Modeling of the `SenderComSpec` on the AUTOSAR adaptive platform

Class	<code>SenderComSpec</code> (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Communication attributes for a sender port (<code>PPortPrototype</code> typed by <code>ServiceInterface</code>) that are relevant for events and field notifiers.			
Base	<code>ARObject</code> , <code>PPortComSpec</code>			
Subclasses	<code>FieldSenderComSpec</code> , <code>NonqueuedSenderComSpec</code> , <code>QueuedSenderComSpec</code>			
Aggregated by	<code>AbstractProvidedPortPrototype.providedComSpec</code> , <code>PortPrototypeBlueprint.providedComSpec</code>			
Attribute	Type	Mult.	Kind	Note
dataElement	<code>AutosarDataPrototype</code>	0..1	ref	Data element these quality of service attributes apply to.





Class	SenderComSpec (abstract)			
senderIntent	SenderIntentEnum	0..1	attr	This attribute represents the expressed intent of the sender. The sender may decide to claim that existing resources of a ServiceInterface are expressly not used by this specific sender. The conceptual background of this claim may be driven by security, safety, etc. Tags: atp.Status=candidate
transmission Props	TransmissionComSpec Props	0..1	aggr	This aggregation represents the definition transmission props in the context of the enclosing SenderComSpec.
usesEndToEnd Protection	Boolean	0..1	attr	This indicates whether the corresponding dataElement shall be transmitted using end-to-end protection. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime

Table 3.140: SenderComSpec

Class	QueuedSenderComSpec			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Communication attributes specific to distribution of events (PPortPrototype, SenderReceiverInterface and dataElement carries an "event").			
Base	ARObject , PPortComSpec , SenderComSpec			
Aggregated by	AbstractProvidedPortPrototype.providedComSpec , PortPrototypeBlueprint.providedComSpec			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.141: QueuedSenderComSpec

Class	FieldSenderComSpec			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ComSpec			
Note	Port specific communication attributes for a Field that is defined in a ServiceInterface.			
Base	ARObject , PPortComSpec , SenderComSpec			
Aggregated by	AbstractProvidedPortPrototype.providedComSpec , PortPrototypeBlueprint.providedComSpec			
Attribute	Type	Mult.	Kind	Note
initValue	ValueSpecification	0..1	aggr	Initial value for a Field that is set before the Service Interface is offered.

Table 3.142: FieldSenderComSpec

[constr_10152]{DRAFT} Multiplicity of reference in the role [FieldSenderComSpec.initValue](#) [For each [FieldSenderComSpec](#), the reference in the role [initValue](#) shall exist **at the time before the generation of the ara API starts.**.]()

[TPS_MANI_03212]{DRAFT} Specification of initial value for a [field](#) [The attribute [FieldSenderComSpec.initValue](#) can be used to specify an initial Value for a [field](#).]([RS_MANI_00002](#))

A [field](#) has a valid value at any time as described in [subsection 3.4.4](#). [ara::com](#) ensures that a service implementation providing a field has a field value before the field becomes visible to potential consumers.

This is explained in more detail in [17] where it is defined that the initial field value shall be set at least once via `Update()` by the application code before `OfferService()` gets called.

Custom-code (e.g. component model above `ara::com`) may use the defined `initValue` to call `Field.Update(initValue)`.

[TPS_MANI_01107]{DRAFT} Specification of intentions for the sender of `events` or `field` notifiers [The attribute `SenderComSpec.senderIntent` can be used to specify whether the software actually intends to send the referenced `events` or `field` notifier.] ([RS_MANI_00034](#))

Enumeration	SenderIntentEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ComSpec
Note	This meta-class represents the intent to specify how a given <code>ServiceInterface</code> is used from the perspective of a given event sender. Tags:atp.Status=candidate
Aggregated by	SenderComSpec.senderIntent
Literal	Description
willSend	The sender will send the event or field notifier. Tags: atp.EnumerationLiteralIndex=0 atp.Status=candidate
wontSend	The sender won't send the event or field notifier. Tags: atp.EnumerationLiteralIndex=1 atp.Status=candidate

Table 3.143: SenderIntentEnum

3.17.5.1.3 Client ComSpec

The `ClientComSpec` undergoes extensions for the *AUTOSAR adaptive platform*, namely the ability to refer to the getter and setter method of a `field` and the definition of intentions.

[TPS_MANI_01108]{DRAFT} Specification of intentions for the caller of a `methods` or `field` setter/getter [The attribute `ClientComSpec.clientIntent` can be used to specify whether the software actually intends to call the referenced `methods` or getter/setter of a referenced `field`.] ([RS_MANI_00034](#))

[TPS_MANI_01324]{DRAFT} Semantics of E2E attributes in `ClientComSpec` [The `EndToEndTransformationComSpecProps` shall be used for the specification of `RPortPrototype`-specific configuration options related to end-to-end protection of `methods`.] ([RS_MANI_00028](#))

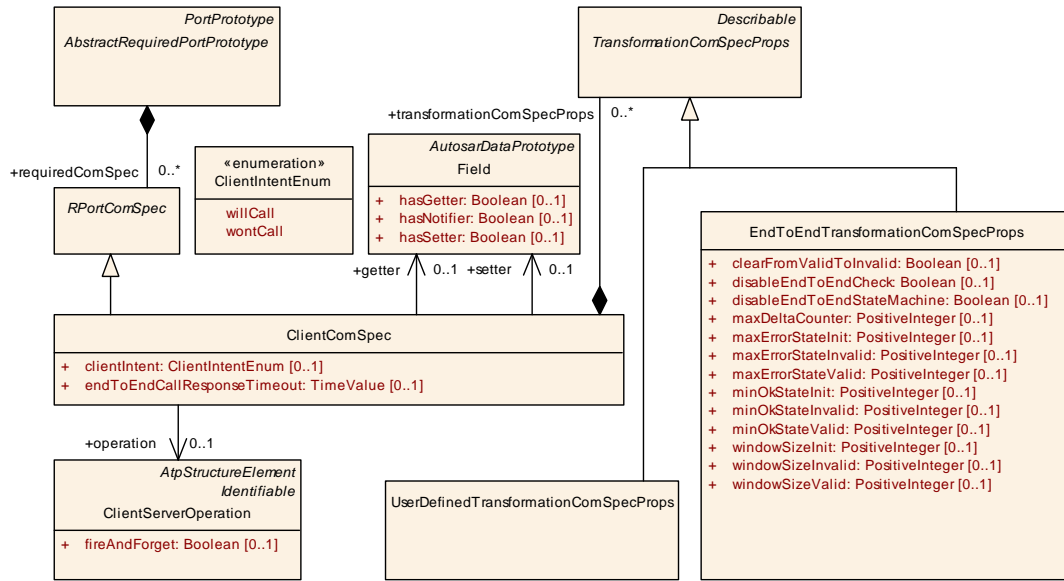


Figure 3.81: Modeling of the `ClientComSpec` on the *AUTOSAR adaptive platform*

Class	ClientComSpec			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Client-specific communication attributes (RPortPrototype typed by ServiceInterface) that are relevant for methods and field getters and setters.			
Base	ARObject, RPortComSpec			
Aggregated by	AbstractRequiredPortPrototype.requiredComSpec, PortPrototypeBlueprint.requiredComSpec			
Attribute	Type	Mult.	Kind	Note
clientIntent	ClientIntentEnum	0..1	attr	This attribute represents the expressed intent of the client. The client may decide to claim that existing resources of a ServiceInterface are expressly not used by this specific client. The conceptual background of this claim may be driven by security, safety, etc. Tags: atp.Status=candidate
endToEndCallResponseTimeout	TimeValue	0..1	attr	This attribute defines the maximum time interval in which the application shall expect the servers's response (time between the sending of the call invocation until the arrival of the server's response).
getter	Field	0..1	ref	The existence of this reference indicates that the ClientComSpec refers to the getter of a Field. Tags: atp.Status=draft
operation	ClientServerOperation	0..1	ref	This represents the corresponding ClientServerOperation.
setter	Field	0..1	ref	The existence of this reference indicates that the ClientComSpec refers to the setter of a Field. Tags: atp.Status=draft
transformationComSpecProps	TransformationComSpecProps	*	aggr	This references the TransformationComSpecProps which define port-specific configuration for data transformation.

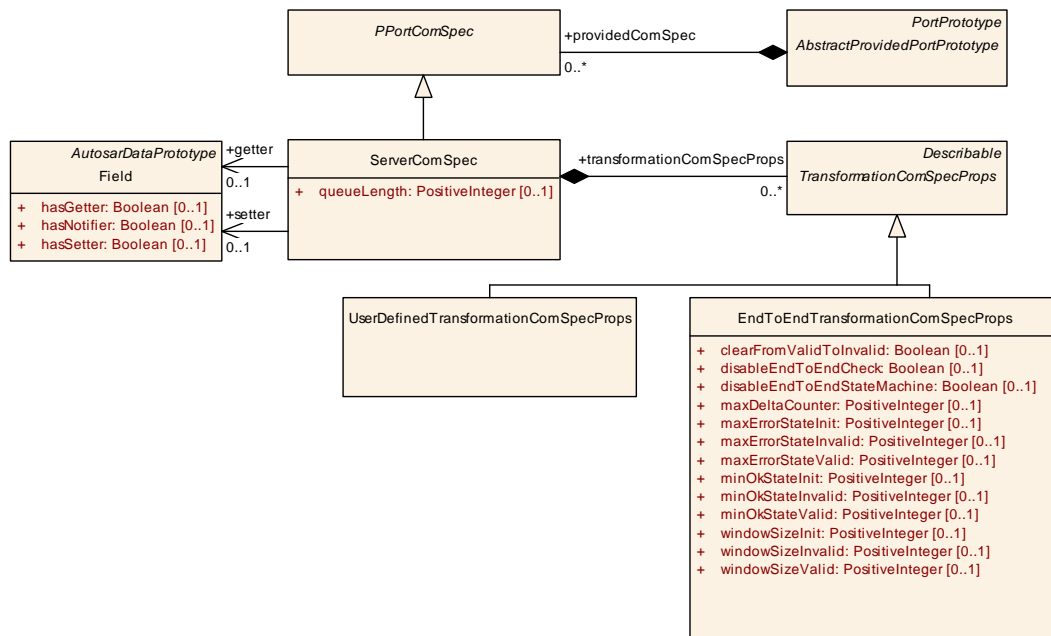
Table 3.144: ClientComSpec

Enumeration	ClientIntentEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ComSpec
Note	This meta-class represents the intent to specify how a given ServiceInterface is used from the perspective of a given client. Tags: atp.Status=candidate
Aggregated by	ClientComSpec.clientIntent
Literal	Description
willCall	The client will call this method. Tags: atp.EnumerationLiteralIndex=0 atp.Status=candidate
wontCall	The client won't call this method. Tags: atp.EnumerationLiteralIndex=1 atp.Status=candidate

Table 3.145: ClientIntentEnum

3.17.5.1.4 Server ComSpec

The [ServerComSpec](#) undergoes extensions for the AUTOSAR adaptive platform, namely the ability to refer to the `getter` and `setter` `method` of a `field` and the definition of intentions.


Figure 3.82: Modeling of the [ServerComSpec](#) on the *AUTOSAR adaptive platform*

[TPS_MANI_01325]{DRAFT} Semantics of E2E attributes in [ServerComSpec](#) [The [EndToEndTransformationComSpecProps](#) shall be used for the specification of [PPortPrototype](#)-specific configuration options related to end-to-end protection of `methods`.] ([RS_MANI_00028](#))

Class	ServerComSpec			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Server-specific communication attributes (PPortPrototype typed by ServiceInterface) that are relevant for methods and field getters and setters.			
Base	ARObject, PPortComSpec			
Aggregated by	AbstractProvidedPortPrototype.providedComSpec, PortPrototypeBlueprint.providedComSpec			
Attribute	Type	Mult.	Kind	Note
getter	Field	0..1	ref	The existence of this reference indicates that the Server ComSpec refers to the getter of a Field. Tags: atp.Status=draft
operation	ClientServerOperation	0..1	ref	Operation these communication attributes apply to.
queueLength	PositiveInteger	0..1	attr	Length of call queue on the server side.
setter	Field	0..1	ref	The existence of this reference indicates that the Server ComSpec refers to the setter of a Field. Tags: atp.Status=draft
transformation ComSpecProps	TransformationCom SpecProps	*	aggr	This references the TransformationComSpecProps which define port-specific configuration for data transformation.

Table 3.146: ServerComSpec

3.17.5.1.5 Communication behavior to be implemented by the Application Software

In order to support periodic data transmission and reception (the main reason for this is to be able to perform periodic invocation of the EndToEnd transformation), the application software needs to implement the period in its program flow. But there may also be other reasons why the application shall take care of the periodicity.

The period of the invocation of transmission and reception APIs can be defined using the [TransmissionComSpecProps](#) and [ReceptionComSpecProps](#) available at the [SenderComSpec](#) and [ReceiverComSpec](#).

As the [TransmissionComSpecProps](#) and [ReceptionComSpecProps](#) define what the expected communication behavior is, the values can also be utilized by communication (network) measurement tools to verify whether the application code actually implements the attributes properly.

The attribute [ReceptionComSpecProps.dataUpdatePeriod](#) defines the time period in which the receiving application shall call the reception API to check for new data.

The attribute [ReceptionComSpecProps.timeout](#) defines the time after which the application shall assume that the to be received data reception has timed out.

The attribute [TransmissionComSpecProps.dataUpdatePeriod](#) defines the time period in which the sending application shall call the send API.

The attributes `TransmissionComSpecProps.minimumSendInterval` and `TransmissionComSpecProps.transmissionMode` define values which influence the transmission behavior, implemented by the application code.

The attribute `End2EndEventProtectionProps.dataUpdatePeriod` also defines an expected period to be implemented by the application software for EndToEnd protection.

More specifically, the attribute `End2EndEventProtectionProps.dataUpdatePeriod` represents a network perspective, especially when no application software is defined yet and thus no `SenderComSpec` and `ReceiverComSpec` are available.

3.17.5.2 Port Prototypes typed by Persistency Data Interfaces

[TPS_MANI_01314]{DRAFT} Further qualification of properties of **PortPrototypes** typed by **PersistencyKeyValueStorageInterfaces** [For **PortPrototypes** typed by **PersistencyKeyValueStorageInterfaces** it is possible to define further qualifying attributes for the required side.

For this purpose meta-class `PersistencyDataRequiredComSpec` is provided.] (*RS_MANI_00027*)

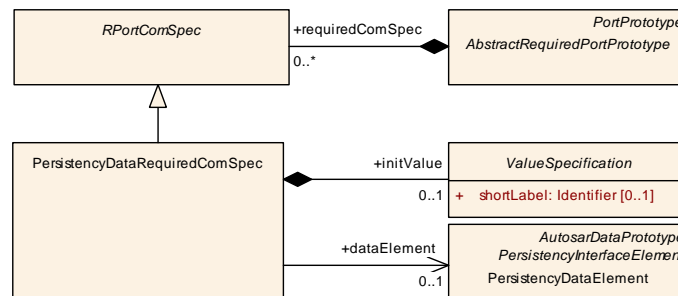


Figure 3.83: Modeling of ComSpec for persistency

[TPS_MANI_01160]{DRAFT} Definition of initial value for **PersistencyDataElement** [The definition of an initial value for a `PersistencyDataElement` can be done on the level of a `PortPrototype` by means of `PersistencyDataRequiredComSpec.initValue`] (*RS_MANI_00027*)

Class	PersistencyDataRequiredComSpec			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ComSpec			
Note	This meta-class represents the ability to define port-specific attributes for supporting use cases of data persistency on the required side.			
Base	<i>ARObject</i> , <i>RPortComSpec</i>			
Aggregated by	<i>AbstractRequiredPortPrototype.requiredComSpec</i> , <i>PortPrototypeBlueprint.requiredComSpec</i>			
Attribute	Type	Mult.	Kind	Note
dataElement	PersistencyDataElement	0..1	ref	This reference represents the <code>PersistencyDataElement</code> for which the <code>PersistencyDataRequiredComSpec</code> applies.





Class	PersistencyDataRequiredComSpec			
initValue	ValueSpecification	0..1	aggr	This aggregation represents the definition of an initial value for the PersistencyDataElement referenced by the enclosing PersistencyDataRequiredComSpec

Table 3.147: PersistencyDataRequiredComSpec

[constr_10153]{DRAFT} Multiplicity of reference in the role `PersistencyDataRequiredComSpec.dataElement` [For each `PersistencyDataRequiredComSpec`, the reference in the role `dataElement` shall exist **at the time before the generation of the ara API starts.**]()

[constr_10081]{DRAFT} Existence of initial values in the definition of `PersistencyDataRequiredComSpec` [For each `PersistencyDataRequiredComSpec`, if the value of attribute `dataElement.updateStrategy` is set to the value `delete`, then attribute `PersistencyDataRequiredComSpec.initValue` shall not exist.]()

3.18 Executable

3.18.1 Overview

An `Executable` represents an executable program in the AUTOSAR meta-model. An explanation of the semantics of the attributes of `Executable` can be found in the following sub-sections.

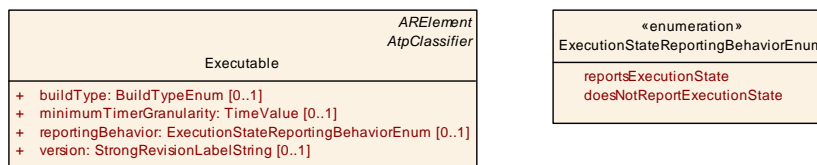


Figure 3.84: Modeling of the `Executable`

Class	Executable			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure			
Note	This meta-class represents an executable program. Tags: atp.recommendedPackage=Executables			
Base	<code>ARElement</code> , <code>ARObject</code> , <code>AtpClassifier</code> , <code>CollectableElement</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PackageableElement</code> , <code>Referrable</code>			
Aggregated by	<code>ARPackage.element</code>			
Attribute	Type	Mult.	Kind	Note
buildType	<code>BuildTypeEnum</code>	0..1	attr	This attribute describes the buildType of a module and/or platform implementation.
implementation Props	<code>ExecutableImplementationProps</code>	*	aggr	This aggregation contains the collection of implementation-specific properties necessary to properly build the enclosing Executable.





Class	Executable			
minimumTimerGranularity	TimeValue	0..1	attr	This attribute describes the minimum timer resolution (TimeValue of one tick) that is required by the Executable.
reportingBehavior	ExecutionState ReportingBehavior Enum	0..1	attr	this attribute controls the execution state reporting behavior of the enclosing Executable.
rootSwComponentPrototype	RootSwComponent Prototype	0..1	aggr	This represents the root SwCompositionPrototype of the Executable. This aggregation is required (in contrast to a direct reference of a SwComponentType) in order to support the definition of instanceRefs in Executable context.
version	StrongRevisionLabel String	0..1	attr	Version of the executable.

Table 3.148: Executable

Enumeration	BuildTypeEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModuleImplementation
Note	This enumeration defines the possible buildTypes a software module may be implemented.
Aggregated by	Executable.buildType
Literal	Description
buildTypeDebug	Used for debugging. Tags:atp.EnumerationLiteralIndex=1
buildTypeRelease	Used for releasing. Tags:atp.EnumerationLiteralIndex=0

Table 3.149: BuildTypeEnum

3.18.2 Category

[constr_1605]{DRAFT} Standardized values of attribute Executable.category
 [The following values for attribute Executable.category are standardized by AUTOSAR:

- PLATFORM_LEVEL: the Executable represents software on the platform level (i.e. conceptually located *on the level of* the middleware).
- APPLICATION_LEVEL: the Executable represents software on the application level (i.e. conceptually located *above* the middleware).

]()

3.18.3 Root Software Component Prototype

[TPS_MANI_01010]{DRAFT} Root element for a hierarchical software-component
 [Executable aggregates meta-class RootSwComponentPrototype in the role

`rootSwComponentPrototype` to provide a root element for an arbitrarily nested hierarchy of software-components represented by the reference `RootSwComponentPrototype.applicationType`.] (*RS_MANI_00001, RS_MANI_00004*)

Please note that the aggregation of `RootSwComponentPrototype` by `Executable` is the basis for the applicability of an `<<instanceRef>>` reference into the hierarchy of software-components that represent the functionality of the `Executable`.

This modeling approach is similar to the modeling of a `System` on the *AUTOSAR classic platform*.

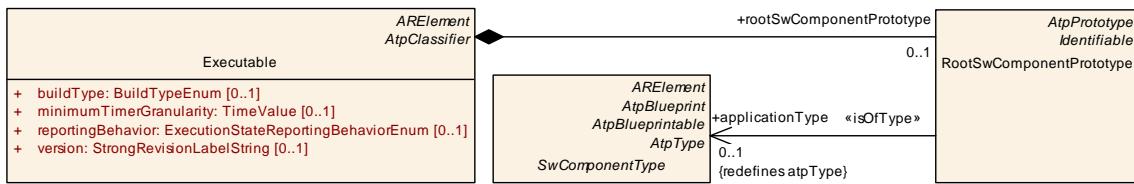


Figure 3.85: Modeling of the `RootSwComponentPrototype` in the context of `Executable`

[TPS_MANI_03056]{DRAFT} **Optionality of `Executable.rootSwComponentPrototype`** [The aggregation `Executable.rootSwComponentPrototype` has been made optional in order to support the implementation of *platform modules* that do not utilize any service oriented communication and don't require any further formalization.] (*RS_MANI_00023*)

[constr_1492]{DRAFT} **`SwComponentType` referenced in the role `Executable.rootSwComponentPrototype.applicationType`** [Any `SwComponentType` referenced in the role `Executable.rootSwComponentPrototype.applicationType`, or used to type a `SwComponentPrototype` nested inside the `SwComponentType` referenced in the role `Executable.rootSwComponentPrototype.applicationType` shall **only** be either a `CompositionSwComponentType` or an `AdaptiveApplicationSwComponentType`.] ()

Class	RootSwComponentPrototype			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure			
Note	The <code>RootSwCompositionPrototype</code> represents the top-level-composition of software components within an <code>Executable</code> . The contained <code>SwComponentPrototypes</code> are fully specified by their <code>SwComponentTypes</code> (including <code>PortPrototypes</code> , <code>PortInterfaces</code> , <code>VariableDataPrototypes</code> , etc.).			
Base	<code>ARObject</code> , <code>AtpFeature</code> , <code>AtpPrototype</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>			
Aggregated by	<code>AtpClassifier.atpFeature</code> , <code>Executable.rootSwComponentPrototype</code>			
Attribute	Type	Mult.	Kind	Note
applicationType	<code>SwComponentType</code>	0..1	tref	This <code>SwComponentType</code> acts as the Type of the <code>RootSwComponentPrototype</code> . Stereotypes: <code>isOfType</code>

Table 3.150: `RootSwComponentPrototype`

The example depicted in Figure 3.86 exemplifies the statement of [constr_1492]. The example shows a component hierarchy that consists of `SwComponentPrototypes` that are excursively typed by either a `CompositionSwComponentType` or an `AdaptiveApplicationSwComponentType`.

Class	SwComponentType (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	Base class for AUTOSAR software components.			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	AdaptiveApplicationSwComponentType , AtomicSwComponentType , CompositionSwComponentType , ParameterSwComponentType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
port	PortPrototype	*	aggr	The PortPrototypes through which this SwComponent Type can communicate. The aggregation of PortPrototype is subject to variability with the purpose to support the conditional existence of PortPrototypes. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=port.shortName, port.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
portGroup	PortGroup	*	aggr	A port group being part of this component. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=portGroup.shortName, portGroup.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
swComponent Documentation	SwComponent Documentation	0..1	aggr	This adds a documentation to the SwComponentType. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=swComponentDocumentation, swComponentDocumentation.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=-10

Table 3.151: SwComponentType

Class	CompositionSwComponentType			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Composition			
Note	A CompositionSwComponentType aggregates SwComponentPrototypes (that in turn are typed by SwComponentTypes) as well as SwConnectors for primarily connecting SwComponentPrototypes among each others and towards the surface of the CompositionSwComponentType. By this means, hierarchical structures of software-components can be created. Tags: atp.recommendedPackage=SwComponentTypes			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , SwComponentType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	CompositionSwComponentType			
component	SwComponent Prototype	*	aggr	The instantiated components that are part of this composition. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=component.shortName, component.variationPoint.shortLabel vh.latestBindingTime=postBuild
connector	SwConnector	*	aggr	SwConnectors have the principal ability to establish a connection among PortPrototypes. They can have many roles in the context of a CompositionSwComponentType. Details are refined by subclasses. The aggregation of SwConnectors is subject to variability with the purpose to support variant data flow. The aggregation is marked as atpSplitable in order to allow the extension of the ECU extract with AssemblySwConnectors between ApplicationSwComponentTypes and ServiceSwComponentTypes during the ECU integration. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=connector.shortName, connector.variationPoint.shortLabel vh.latestBindingTime=postBuild
constantValue Mapping	ConstantSpecification MappingSet	*	ref	Reference to the ConstantSpecificationMapping to be applied for initValues of PPortComSpecs and RPortComSpec. Stereotypes: atpSplitable Tags: atp.Splitkey=constantValueMapping
data Type Mapping	DataTypeMappingSet	*	ref	Reference to the DataTypeMapping to be applied for the used ApplicationDataTypes in ServiceInterfaces. Stereotypes: atpSplitable Tags: atp.Splitkey=dataTypeMapping

Table 3.152: CompositionSwComponentType

While the left part of Figure 3.86 resembles the modeling in the meta-model, the right part uses a simplified notation to give an idea how the nested definition of software-components could look like.

An obvious consequence of [constr_1492] is that no software-component that could be used on the *AUTOSAR classic platform* is allowed on the *AUTOSAR adaptive platform*, i.e. in the context of an `Executable.rootSwComponentPrototype.applicationType`.

Software-components on the *AUTOSAR adaptive platform* are mainly defined by their interaction with the outside world by means of `PortPrototypes` typed by `ServiceInterfaces`. The definition of an internal behavior, with a minor exception, is not foreseen.

This lack of internal structure, in combination with decisions made regarding the scope of the generation of header files, leads to a situation where the implementation of a software component in source code is (in comparison to the situation on the *AUTOSAR classic platform*) way less subject to a strict separation.

In other words, there is no real motivation to implement software-components separately from each other. It would be possible, although not encouraged, to implement all software-components of a given executable program directly within the `Main()` function of the program.

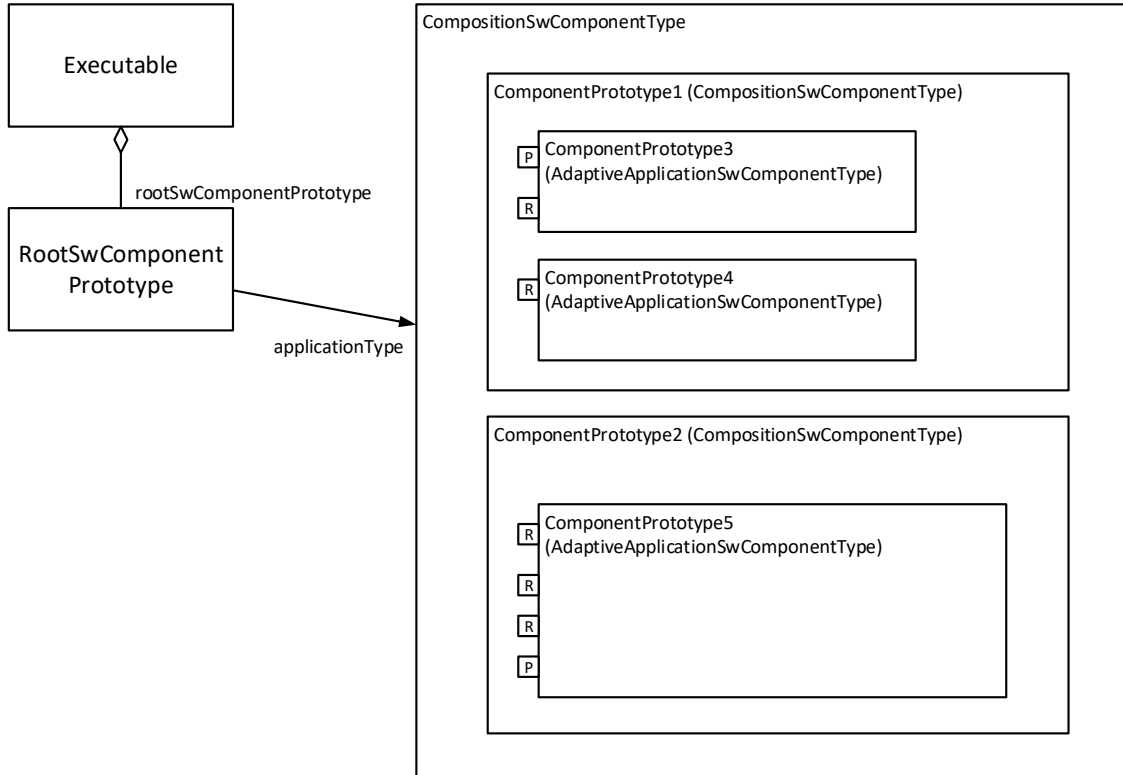


Figure 3.86: Example of the possible structure of an **Executable**

3.18.4 Reporting Behavior

[TPS_MANI_01279]{DRAFT} **Semantics of `Executable.reportingBehavior`**
 [Attribute `Executable.reportingBehavior` shall be used to control the reporting of the execution state of the enclosing `Executable` to the Execution Management. If the attribute does not exist, the `Executable` shall report its execution state to the Execution Management.] (*RS_MANI_00023*)

Enumeration	ExecutionStateReportingBehaviorEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure
Note	This enumeration provides options for controlling of how an Executable reports its execution state to the Execution Management
Aggregated by	<code>Executable.reportingBehavior</code>
Literal	Description





Enumeration	ExecutionStateReportingBehaviorEnum
doesNotReportExecutionState	The Executable shall not report its execution state to the Execution Management. Tags: atp.EnumerationLiteralIndex=1
reportsExecutionState	The Executable shall report its execution state to the Execution Management. Tags: atp.EnumerationLiteralIndex=0

Table 3.153: ExecutionStateReportingBehaviorEnum

3.18.5 Implementation Props

[TPS_MANI_01370]{DRAFT} Semantics of ExecutableImplementationProps

[If an Executable is built for a specific purpose inside the AUTOSAR adaptive platform, i.e. the implementation of a functional cluster, then it may be necessary to add configurations that need to be considered at compile time, e.g. whether the implementation of the logging functional cluster needs access to resources provided by the synchronized time base functional cluster.

The configuration of such implementation-specific properties can be done by means of the Executable.implementationProps, specifically by a sub-class of ExecutableImplementationProps.] (RS_MANI_00001, RS_MANI_00023)

As depicted in Figure 3.87, one example for the utilization of ExecutableImplementationProps is the definition of ExecutableLoggingImplementationProps (see section 3.18.6).

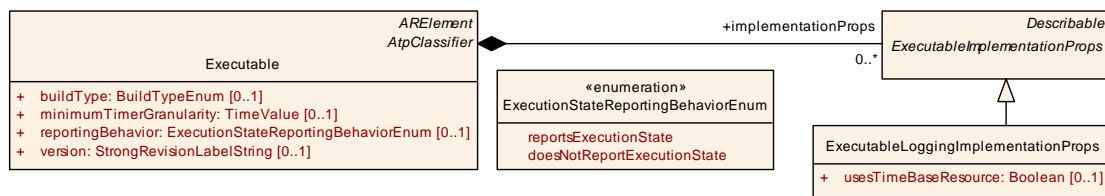


Figure 3.87: Modeling of the ExecutableImplementationProps

Class	<i>ExecutableImplementationProps</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure			
Note	This abstract class has the ability to act as a base class for classes that detail out the implementation-specific properties of an Executable.			
Base	<i>ARObject</i> , <i>Describable</i>			
Subclasses	ExecutableLoggingImplementationProps			
Aggregated by	Executable.implementationProps			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.154: ExecutableImplementationProps

3.18.6 Logging

[TPS_MANI_01383]{DRAFT} **Semantics of ExecutableLoggingImplementationProps** [The implementation properties of an Executable that is implementing (a part of) the logging functional cluster can be configured using the ExecutableLoggingImplementationProps.] (RS_MANI_00001, RS_MANI_00023)

[constr_10113]{DRAFT} **Restriction for the existence of ExecutableLoggingImplementationProps** [The aggregation of ExecutableLoggingImplementationProps in the role Executable.implementationProps is only allowed for an Executable where attribute category is set to the value PLATFORM_LEVEL.] ()

Class	ExecutableLoggingImplementationProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure			
Note	This meta-class contains configuration relevant for the implementation of an Executable used in the context of the LogAndTraceInstantiation.			
Base	ARObject, Describable, ExecutableImplementationProps			
Aggregated by	Executable.implementationProps			
Attribute	Type	Mult.	Kind	Note
usesTimeBaseResource	Boolean	0..1	attr	This attribute indicates that the implementation of the enclosing Executable is required to access resources provided by the synchronized time base functional cluster.

Table 3.155: ExecutableLoggingImplementationProps

3.19 Optional Members in complex Data Structures

3.19.1 Background

The AUTOSAR adaptive platform supports the usage of a TLV⁶ data encoding on the SOME/IP transport layer. TLV is typically used where at least a part of the transmitted data is only *optionally* existing and filled with meaningful values.

In other words: an optional part of a data structure may exist and carry meaningful values in one instance of data transmission and be completely missing in another instance of the data transmission.

The receiving software needs to be able to identify whether the optional part exists and read its value accordingly.

The receiving software also needs to be able to still execute meaningfully if the optional part of such a data structure does not exist in the specific communication instance.

Consequently, it is necessary to be able to precisely identify the parts of a data structure that may become optional for specific instances of data transmission.

⁶This abbreviation stands for tag-length-value

In terms of the AUTOSAR meta-model, the identification could - in principle - be attached at various levels of abstraction:

AutosarDataType In this case the optionality that is primarily only needed for communication purposes would still be existing in all other usages of data types. AUTOSAR still sees use cases for implementing this option, especially in the context of the *AUTOSAR classic platform*.

Admittedly, the definition of different optionality configurations for the same data type may lead to the existence of a bunch of structurally identical data types that only vary in terms of optionality. The existence of variation points may help to mitigate this effect, though.

ServiceInterface In this case the optionality is defined where it is actually required. However, different optionality could - in principle - be defined for *DataPrototypes* typed by the same *AutosarDataType*.

This would lead to an increased effort for the definition of C++ data types in the context of the same *ServiceInterface*. Additional constraints have been identified in the context of the *AUTOSAR classic platform* that finally render this option as not viable.

ComSpec In this case the definition of optionality would even be more specific in comparison to the definition of optionality on the level of *ServiceInterfaces*.

On top of that, the task to define optionality in the vast majority of cases is done by an OEM, whereas the model definition on the level of *ComSpec* requires the existence of *SwComponentTypes* and this definition is in many cases in the domain of a supplier.

As a result of this consideration, AUTOSAR has opted for implementation the concept of defining the optionality on the level of the *AutosarDataType*.

3.19.2 Definition of Optionality

As mentioned before, the concrete definition of optionality on the level of an *Autosar-DataType* is done by the indication of individual elements of the composite *Autosar-DataType*.

More specifically, the definition of optionality needs to be supported for subclasses of *AutosarDataType*, namely on the level of *ApplicationDataType* as well as on the level of *CppImplementationDataType*.

In other words, if *ApplicationDataTypes* with optional elements are used to define a *ServiceInterface* then it is still necessary to convey the optionality down to the level of data type definition that directly affects the language binding of the AUTOSAR model.

Figure 3.88 shows the modeling of optionality on the level of *ApplicationDataType*.

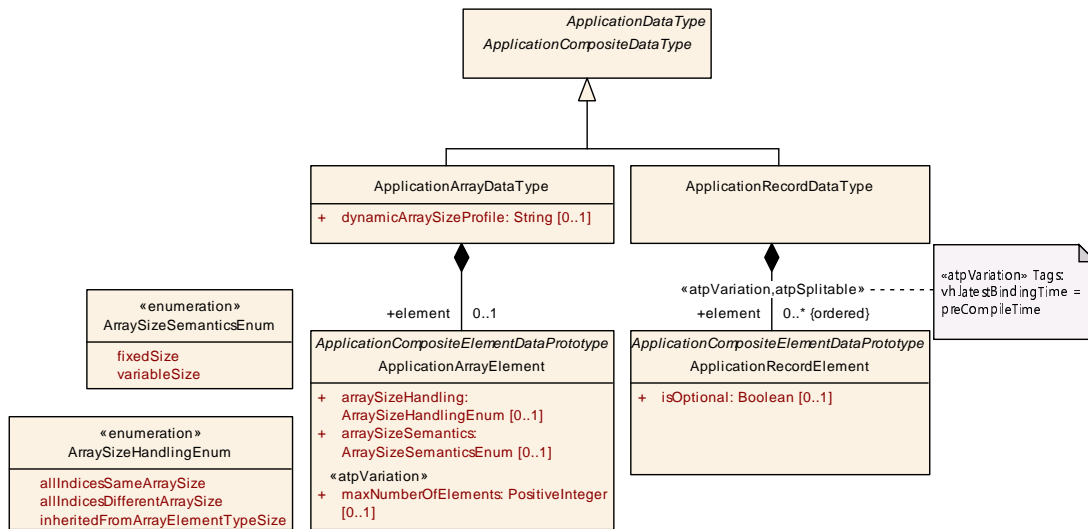


Figure 3.88: Modeling of optionality on the level of **ApplicationDataType**

[TPS_MANI_01184]{DRAFT} **Definition of optional elements on the level of **ApplicationDataType**** [The modeling approach for the definition of optional elements on the level of **ApplicationDataType** is to set the attribute **ApplicationRecordElement.isOptional** to the value **True**.

If the attribute is not set or set to the value **False** then the respective **ApplicationRecordElement** **shall be considered mandatory**.] (*RS_MANI_00030*)

Class	ApplicationRecordDataType			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	An application data type which can be decomposed into prototypes of other application data types. Tags: atp.recommendedPackage=ApplicationDataTypes			
Base	<i>ARElement, ARObject, ApplicationCompositeDataType, ApplicationDataType, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, AutosarDataType, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
element (ordered)	ApplicationRecordElement	*	aggr	Specifies an element of a record. The aggregation of ApplicationRecordElement is subject to variability with the purpose to support the conditional existence of elements inside a ApplicationrecordDataType. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=element.shortName, element.variationPoint.shortLabel vh.latestBindingTime=preCompileTime

Table 3.156: ApplicationRecordDataType

Class	ApplicationRecordElement			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::DataPrototypes			
Note	Describes the properties of one particular element of an application record data type.			
Base	ARObject, ApplicationCompositeElementDataPrototype, AtpFeature, AtpPrototype, DataPrototype , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	ApplicationRecordDataType.element , AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
isOptional	Boolean	0..1	attr	<p>This attribute represents the ability to declare the enclosing ApplicationRecordElement as optional. This means the that, at runtime, the ApplicationRecordElement may or may not have a valid value and shall therefore be ignored.</p> <p>The underlying runtime software provides means to set the ApplicationRecordElement as not valid at the sending end of a communication and determine its validity at the receiving end.</p>

Table 3.157: ApplicationRecordElement

On top of that, it is still possible to use [CppImplementationDataType](#) directly for the definition of a [ServiceInterface](#).

[TPS_MANI_01185]{DRAFT} Definition of optional elements on the level of [CppImplementationDataType](#) [The modeling approach for the definition of optional elements on the level of [CppImplementationDataType](#) is to set the attribute [CppImplementationDataTypeElement.isOptional](#) to the value `True`.

If the attribute is not set or set to the value `False` then the respective [CppImplementationDataTypeElement](#) **shall be considered mandatory.**] ([RS_MANI_00030](#))

The attribute [NotAvailableValueSpecification.defaultPattern](#) has no meaning for the initialization of [DataPrototypes](#) on the *AUTOSAR adaptive platform*. This aspect is covered by [\[TPS_MANI_01333\]](#):

[TPS_MANI_01333]{DRAFT} Attribute [NotAvailableValueSpecification.defaultPattern](#) is not applicable [The attribute [NotAvailableValueSpecification.defaultPattern](#) (if defined) shall be ignored by the adaptive platform.

The rationale for ignoring the [defaultPattern](#) is that the optional data is technically not accessible from application code in case it has not been received.] ([RS_MANI_00030](#))

3.20 Serialization Properties

In Adaptive AUTOSAR, the serialization code is generated out of the service description and is compiled and executed in the application context.

The meta-class [TransformationPropsToServiceInterfaceElementMapping](#) defines the serialization for a [ServiceInterface](#) element and provides the necessary serialization settings with the [TransformationProps](#) element.

The existence of a [TransformationPropsToServiceInterfaceElementMapping](#) demands the existence of serialization code that is linked with the application component object file to an application binary.

The serialization of SOME/IP is based on the [ServiceInterface](#) specification. If an [AutosarDataPrototype](#) that is used within a [ServiceInterface](#) is composite like a structure, union or array then SOME/IP supports the configuration of length fields that will be put in front of the serialized data.

AUTOSAR supports the configuration of such serialization settings on two different levels:

- Modeling on [ServiceInterface](#) element level that is valid for all available occurrences of a [DataPrototype](#) in the [ServiceInterface](#) element. This case is described in detail in chapter [3.20.1](#).
- Fine granular modeling on the level of [DataPrototypes](#) described in this chapter. This case is described in detail in chapter [3.20.2](#).

3.20.1 Default Values for Serialization Properties

[TPS_MANI_03101]{DRAFT} SOME/IP serialization [The [ApSomeipTransformationProps](#) meta-class that is referenced by the [TransformationPropsToServiceInterfaceElementMapping](#) in the role `transformationProps` provides the ability to define a SOME/IP serialization settings for [ServiceInterface](#) elements that are referenced by the [TransformationPropsToServiceInterfaceElementMapping](#) in the role `event`, `trigger`, `method` or `field`.] ([RS_MANI_00008](#), [RS_MANI_00025](#))

[constr_3395]{DRAFT} TransformationPropsToServiceInterfaceElementMapping is restricted to one single ServiceInterface [All [ServiceInterface](#) elements that are referenced by the [TransformationPropsToServiceInterfaceElementMapping](#) in the role `event`, `trigger`, `method` or `field` shall be aggregated by the same [ServiceInterface](#) in the role `event`, `trigger`, `method` or `field`.] ()

[TPS_MANI_03288]{DRAFT} ApSomeipTransformationProps for triggers [If [ApSomeipTransformationProps](#) are assigned to a `trigger` then only the attribute `sessionHandling` is relevant for the SOME/IP transformation. All other attributes of the [ApSomeipTransformationProps](#) are irrelevant for `triggers` and will be ignored by the SOME/IP transformation.] ([RS_MANI_00008](#), [RS_MANI_00025](#))

[TPS_MANI_03103]{DRAFT} Default size for all array and map length fields [The attribute `sizeOfArrayLengthField` of [ApSomeipTransformationProps](#) referenced by [TransformationPropsToServiceInterfaceElementMapping](#) in the role `transformationProps` defines the size of a length field generated by SOME/IP in front of all available variable size arrays (vectors), fixed size arrays and associative_maps defined in [ServiceInterface](#) elements that are referenced by

the TransformationPropsToServiceInterfaceElementMapping in the role event, method or field.](RS_MANI_00008, RS_MANI_00025)

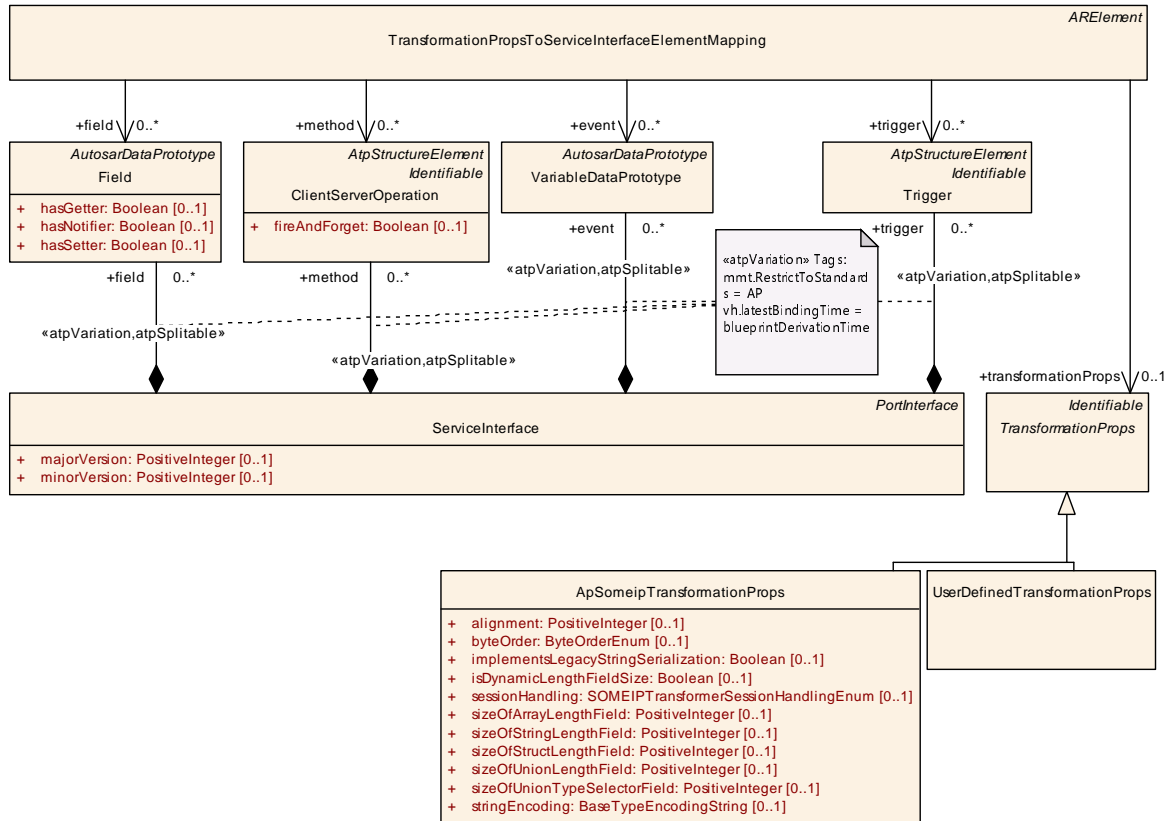


Figure 3.89: Association of serialization properties with a ServiceInterface

[TPS_MANI_03104]{DRAFT} **Default size for all structure length fields** [The attribute `sizeOfStructLengthField` of `ApSomeipTransformationProps` referenced by `TransformationPropsToServiceInterfaceElementMapping` in the role `transformationProps` defines the size of a length field generated by SOME/IP in front of all available structures defined in `ServiceInterface` elements that are referenced by the `TransformationPropsToServiceInterfaceElementMapping` in the role `event, method or field.`](RS_MANI_00008, RS_MANI_00025)

[TPS_MANI_03117]{DRAFT} **Default size for all string length fields** [The attribute `sizeOfStringLengthField` of `ApSomeipTransformationProps` referenced by `TransformationPropsToServiceInterfaceElementMapping` in the role `transformationProps` defines the size of a length field generated by SOME/IP in front of all available strings defined in `ServiceInterface` elements that are referenced by the `TransformationPropsToServiceInterfaceElementMapping` in the role `event, method or field.`](RS_MANI_00008, RS_MANI_00025)

[TPS_MANI_03105]{DRAFT} **Default size for all union length fields** [The attribute `sizeOfUnionLengthField` of `ApSomeipTransformationProps` referenced by `TransformationPropsToServiceInterfaceElementMapping` in the role `transformationProps` defines the size of a length field generated by SOME/IP

in front of all available unions defined in `ServiceInterface` elements that are referenced by the `TransformationPropsToServiceInterfaceElementMapping` in the role `event`, `method` or `field`.](*RS_MANI_0008*, *RS_MANI_00025*)

[TPS_MANI_03106]{DRAFT} Default size for all union type selector fields [The attribute `sizeofUnionTypeSelectorField` of `ApSomeipTransformationProps` referenced by `TransformationPropsToServiceInterfaceElementMapping` in the role `transformationProps` defines the size of a type field generated by SOME/IP in front of all available unions defined in `ServiceInterface` elements that are referenced by the `TransformationPropsToServiceInterfaceElementMapping` in the role `event`, `method` or `field`.](*RS_MANI_0008*, *RS_MANI_00025*)

[TPS_MANI_03107]{DRAFT} Default alignment for all dynamic DataPrototypes [The attribute `alignment` of `ApSomeipTransformationProps` referenced by `TransformationPropsToServiceInterfaceElementMapping` in the role `transformationProps` defines the padding for alignment purposes that will be added by SOME/IP after the serialized data of all variable data length data elements defined in `ServiceInterface` elements that are referenced by the `TransformationPropsToServiceInterfaceElementMapping` in the role `event`, `method` or `field`.](*RS_MANI_0008*, *RS_MANI_00025*)

[TPS_MANI_03108]{DRAFT} Default Byte Order for all DataPrototypes [The attribute `byteOrder` of `ApSomeipTransformationProps` referenced by `TransformationPropsToServiceInterfaceElementMapping` in the role `transformationProps` defines the Byte Order in the serialized data stream resulting from `ServiceInterface` elements that are referenced by the `TransformationPropsToServiceInterfaceElementMapping` in the role `event`, `method` or `field`.](*RS_MANI_0008*, *RS_MANI_00025*)

[constr_1614]{DRAFT} Existence of attribute `TransformationPropsToServiceInterfaceElementMapping.transformationProps.sessionHandling` [The attribute `ApSomeipTransformationProps.sessionHandling` shall only exist if the `TransformationPropsToServiceInterfaceElementMapping` that refers to the respective `ApSomeipTransformationProps` in the role `transformationProps` does **not** refer to a `ClientServerOperation` in the role `method`.]
()

[TPS_MANI_01210]{DRAFT} Default encoding for all DataPrototypes typed by `CppImplementationDataType` of category `STRING` [The attribute `stringEncoding` of a `ApSomeipTransformationProps` referenced by `TransformationPropsToServiceInterfaceElementMapping` in the role `transformationProps` defines the string encoding in the serialized data stream resulting from `ServiceInterface` elements that are referenced by the `TransformationPropsToServiceInterfaceElementMapping` in the role `event`, `method` or `field`.](*RS_MANI_0008*, *RS_MANI_00025*)

[constr_1675]{DRAFT} Existence of attribute `ApSomeipTransformationProps.stringEncoding` [The attribute `TransformationPropsToServiceInterfaceElementMapping.transformationProps.stringEncoding` shall only exist for a `event`, `method` or `field` (referenced by the same `TransformationPropsToServiceInterfaceElementMapping`) that consists of or contains a `DataPrototype` typed by a `CppImplementationDataType` of category `STRING`.]()

Please note that more details about `ApSomeipTransformationProps` can be found in chapter 3.20.2.

[constr_1678]{DRAFT} Allowed values for attribute `ApSomeipTransformationProps.stringEncoding` [Imposed by technical restrictions in the definition of the SOME/IP message format [8], only two possible values of attribute `ApSomeipTransformationProps.stringEncoding` are allowed:

- UTF-8: UCS Transformation Format 8
- UTF-16: Character encoding for Unicode *code points* based on 16 bit *code units* [18]

]()

Class	ApSomeipTransformationProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::SerializationProperties			
Note	SOME/IP serialization properties.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i> , <i>TransformationProps</i>			
Aggregated by	<i>TransformationPropsSet.transformationProps</i>			
Attribute	Type	Mult.	Kind	Note
alignment	PositiveInteger	0..1	attr	Defines the padding for alignment purposes that will be added by the SOME/IP transformer after the serialized data of the variable data length data element. The alignment shall be specified in Bits.
byteOrder	ByteOrderEnum	0..1	attr	Specifies the byte order of data in the serialized data stream.
implements LegacyString Serialization	Boolean	0..1	attr	<p>This attribute indicates that Strings in the SOME/IP message shall NOT be serialized according to the SOME/IP specification for Strings.</p> <p>If this attribute is set to true, BOM and null-termination shall NOT be added in the serialization for Strings in the payload.</p> <p>If this attribute is set to false (or not set) BOM and null-termination shall be added in the serialization for Strings in the payload according to the SOME/IP specification for Strings.</p> <p>NOTE! This attribute is not future safe, and will be removed in an upcoming AUTOSAR release!</p> <p>Tags:atp.Status=obsolete</p>





Class	ApSomeipTransformationProps			
isDynamicLengthFieldSize	Boolean	0..1	attr	This attribute represents the ability to control the setting of the wire type for TLV encoding. If the attribute is set to True then wire type 5-7 shall be used. If the attribute does not exist or is set to False then wire type 4 shall be used.
sessionHandling	SOMEIPTransformer SessionHandlingEnum	0..1	attr	Defines whether the SOME/IP transformer shall use session handling for Sender/Receiver communication.
sizeOfArrayLengthField	PositiveInteger	0..1	attr	Configures the SOME/IP serialization for the referenced dataPrototype in case of a variable size Array (Vector), fixed-size Array or an Associative_Map. It describes the size of the length field (in Bytes) that will be put in front of the Array or Associative_Map in the SOME/IP message.
sizeOfStringLengthField	PositiveInteger	0..1	attr	Configures the SOME/IP serialization for the referenced dataPrototype in case of a String. It describes the size of the length field (in Bytes) that will be put in front of the String in the SOME/IP message.
sizeOfStructLengthField	PositiveInteger	0..1	attr	Configures the SOME/IP serialization for the referenced dataPrototype in case of an Struct. It describes the size of the length field (in Bytes) that will be put in front of the Struct in the SOME/IP message.
sizeOfUnionLengthField	PositiveInteger	0..1	attr	Configures the SOME/IP serialization for the referenced dataPrototype in case of a Union. It describes the size of the length field (in Bytes) that will be put in front of the Union in the SOME/IP message.
sizeOfUnionTypeSelectorField	PositiveInteger	0..1	attr	Configures the SOME/IP serialization for the referenced dataPrototype in case of a Union. It describes the size of the type selector field (in Bytes) that will be put in front of the Union in the SOME/IP message.
stringEncoding	BaseTypeEncoding String	0..1	attr	Configures the encoding for SOME/IP serialization for the referenced dataPrototype in case of an String.

Table 3.158: ApSomeipTransformationProps

[TPS_MANI_03102]{DRAFT} **UserDefined serialization** [The [UserDefinedTransformationProps](#) meta-class that is referenced by the [TransformationPropsToServiceInterfaceElementMapping](#) in the role `transformationProps` provides the ability to define a User defined serialization for [ServiceInterface](#) elements that are referenced by the [TransformationPropsToServiceInterfaceElementMapping](#) in the role `event`, `method` or `field`.] ([RS_MANI_00014](#), [RS_MANI_00025](#))

Please note that [UserDefinedTransformationProps](#) is derived from meta-class [Identifiable](#) and therefore has the ability to describe special data (`sdg`) by which it is possible to define custom structural extensions of an AUTOSAR model in a generic way. For more information about special data please refer to [7].

Class	TransformationPropsToServiceInterfaceElementMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure			
Note	This meta-class represents the ability to associate a ServiceInterface element with TransformationProps. The referenced elements of the Service Interface will be serialized according to the settings defined in the TransformationProps. Tags: atp.recommendedPackage=TransformationPropsToServiceInterfaceElementMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
event	VariableDataPrototype	*	ref	This represents the reference to one or several events of one ServiceInterface.
field	Field	*	ref	This represents the reference to one or several fields of one ServiceInterface.
method	ClientServerOperation	*	ref	This represents the reference to one or several methods of one ServiceInterface.
tlvDataId Definition	TlvDataIdDefinitionSet	*	ref	This reference identifies the TlvDataIdDefinitions relevant for the enclosing TransformationPropsToServiceInterface Mapping.
transformation Props	TransformationProps	0..1	ref	This represents the reference to the applicable Serialization properties.
trigger	Trigger	*	ref	This represents the reference to one or several triggers of one ServiceInterface.

Table 3.159: TransformationPropsToServiceInterfaceElementMapping

Class	UserDefinedTransformationProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer			
Note	The class UserDefinedTransformationProps specifies specific configuration properties of a user defined serializer.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable , TransformationProps			
Aggregated by	TransformationPropsSet.transformationProps			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.160: UserDefinedTransformationProps

3.20.2 Individual Definition of Serialization Properties

[TPS_MANI_03109]{DRAFT} **TransformationProps** on the level of **DataPrototypes** overwrites **TransformationProps** settings on the level of a **ServiceInterface** [The fine granular modeling of **TransformationProps** on the level of **DataPrototypes** overwrites the **TransformationProps** settings defined on the level of a **ServiceInterface** described with the **TransformationPropsToServiceInterfaceElementMapping**.] (*RS_MANI_00025*)

[constr_3361]{DRAFT} **Selective definition of serialization settings** [If a **SomeipDataPrototypeTransformationProps** is defined for a composite **DataPrototype** of an element of a **ServiceInterface** (**method**, **field**, **event**) and if the reference **someipTransformationProps** exists then **SomeipDataPrototypeTransformationProps** that define the reference **someipTransformationProps**

shall be defined for all other composite `DataPrototypes` of the `ServiceInterface` element as well.>()

Consider the following example to illustrate [constr_3361]: Let's assume five composite data types (e.g., `ApplicationCompositeDataTypes`) `DT_0`, `DT_1`, `DT_2`, `DT_3`, and `DT_4` consisting of `DataPrototypes` (`e1_0` to `e1_10`) which in turn are also typed by composite data types, see Figure 3.90.

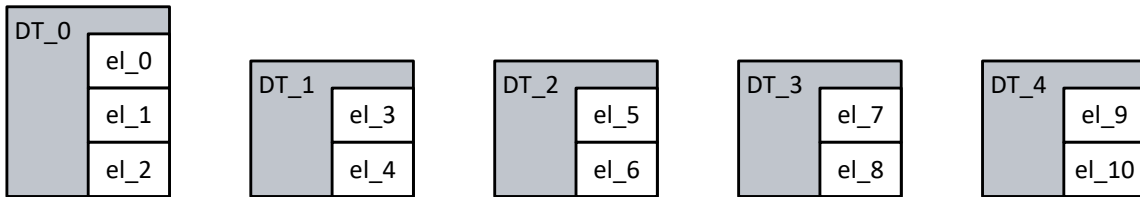


Figure 3.90: Definition of data types used in the example

Further consider a `ServiceInterface` `SI_0` consisting of two `events` `EV_0` and `EV_1` typed by `DT_0` and `DT_1` respectively.

Additionally, `SI_0` provides two `methods` `M_0` and `M_1` where `M_0` has two `arguments` `ARG_0` and `ARG_1` typed by `DT_2` and `DT_3` and `M_1` has one `argument` `ARG_2` typed by `DT_4`. This yields the following hierarchy for `SI_0`, see Figure 3.91.

In this setup [constr_3361] would mandate that if a `SomeipDataPrototypeTransformationProps` were defined for `e1_2`, then `SomeipDataPrototypeTransformationProps` have to be defined for `e1_0` and `e1_1` as well since `e1_0` and `e1_1` are composite `DataPrototypes` of the same `ServiceInterface` element `EV_0` as `e1_2`.

Conversely, [constr_3361], would not mandate that if a `SomeipDataPrototypeTransformationProps` were defined for `e1_2`, then `SomeipDataPrototypeTransformationProps` have to be defined for `e1_3` and `e1_4` as well since `e1_3` and `e1_4` are composite `DataPrototypes` of a different `ServiceInterface` element (`EV_1` instead of `EV_0`) than `e1_2`.

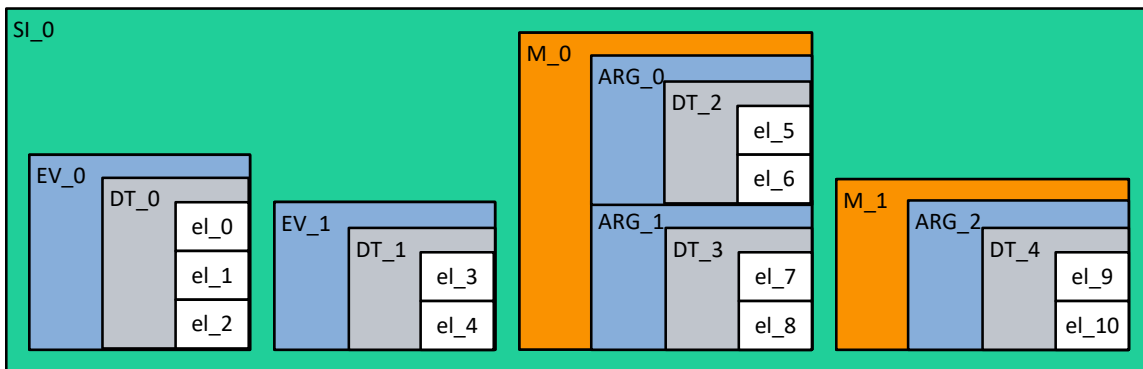


Figure 3.91: Definition of service interface used in the example

Similar for `fields` (since the setter and getter methods of a field are not explicitly modeled as `ClientServerOperation` (with their input and output `argument`) and thus there is only the `Field` itself (which derives from `AutosarDataPrototype`) to reason about.

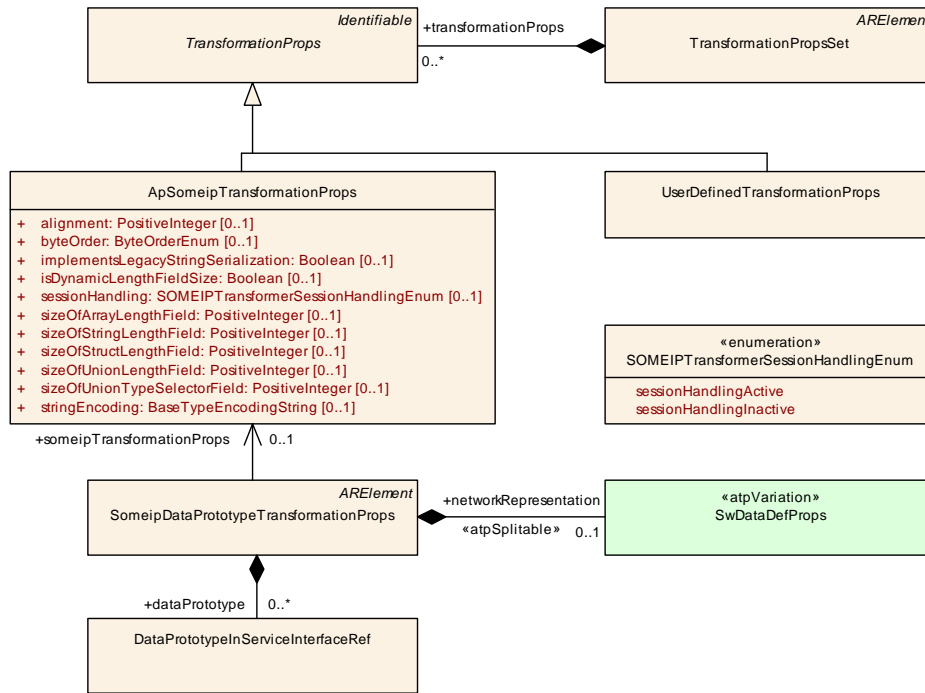


Figure 3.92: Overview about SOME/IP Serialization Properties

As far as `methods` are concerned, [constr_3361] would mandate the following: If in the above example a `SomeipDataPrototypeTransformationProps` were defined for `e1_5`, then `SomeipDataPrototypeTransformationProps` have to be defined for `e1_6`, `e1_7`, and `e1_8` as well since `e1_6`, `e1_7`, and `e1_8` are composite `DataPrototypes` of the same `ServiceInterface` element `M_0` as `e1_5`.

Conversely, [constr_3361] would not mandate that if a `SomeipDataPrototypeTransformationProps` were defined for `e1_5`, then `SomeipDataPrototypeTransformationProps` have to be defined for `e1_9` and `e1_10` as well since `e1_9` and `e1_10` are composite `DataPrototypes` of a different `ServiceInterface` element `M_1` (instead of `M_0`) than `e1_5`.

Class	TransformationPropsSet			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer			
Note	Collection of TransformationProps. Tags: atp.recommendedPackage=TransformationPropsSets			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
transformation Props	TransformationProps	*	aggr	Transformer specific configuration properties.

Table 3.161: TransformationPropsSet

Enumeration	SOMEIPTransformerSessionHandlingEnum
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer
Note	Enables or disable session handling for SOME/IP transformer
Aggregated by	ApSomeipTransformationProps.sessionHandling , SOMEIPTransformationISignalProps.sessionHandlingSR
Literal	Description
sessionHandlingActive	The SOME/IP Transformer shall use session handling Tags: atp.EnumerationLiteralIndex=0
sessionHandlingInactive	The SOME/IP Transformer doesn't use session handling Tags: atp.EnumerationLiteralIndex=1

Table 3.162: SOMEIPTransformerSessionHandlingEnum

[TPS_MANI_03070]{DRAFT} Size of a length field for a chosen array or map [The attribute [sizeOfArrayLengthField](#) of [ApSomeipTransformationProps](#) defines the size of a length field generated by SOME/IP in front of a variable size array (vector), fixed size array or associative_map for which the [SomeipDataPrototypeTransformationProps](#) is defined, i.e. the variable size array (vector), fixed size array or associative_map that is referenced within the aggregated [DataPrototypeInServiceInterfaceRef.](#)] ([RS_MANI_0008](#), [RS_MANI_00024](#))

[constr_3353]{DRAFT} Restriction in usage of [ApSomeipTransformationProps.sizeOfArrayLengthField](#) [The value of the attribute [sizeOfArrayLengthField](#) shall be either 0, 1, 2 or 4.] ()

[constr_3447]{DRAFT} [ApSomeipTransformationProps.sizeOfArrayLengthField](#) that equals 0 [The [sizeOfArrayLengthField](#) value of 0 is only allowed to be used if a fixed size array for which the [SomeipDataPrototypeTransformationProps](#) is defined is referenced within the aggregated [DataPrototypeInServiceInterfaceRef.](#)] ()

The setting of [sizeOfArrayLengthField](#) for fixed size arrays supports a backward compatible extension of such arrays with additional array elements.

[TPS_MANI_03071]{DRAFT} Size of a length field for a chosen structure [The attribute [sizeOfStructLengthField](#) of [ApSomeipTransformationProps](#) defines the size of a length field generated by SOME/IP in front of a structure for which the [SomeipDataPrototypeTransformationProps](#) is defined, i.e. the structure that is referenced within the aggregated [DataPrototypeInServiceInterfaceRef.](#)] ([RS_MANI_0008](#), [RS_MANI_00024](#))

[constr_3354]{DRAFT} Restriction in usage of [ApSomeipTransformationProps.sizeOfStructLengthField](#) [The value of the attribute [sizeOfStructLengthField](#) shall be either 0, 1, 2 or 4.] ()

[TPS_MANI_03116]{DRAFT} Size of a length field for a chosen string [The attribute [sizeOfStringLengthField](#) of [ApSomeipTransformationProps](#) defines the size of a length field generated by SOME/IP in front of a String for which the [SomeipDataPrototypeTransformationProps](#) is defined, i.e. the String that

is referenced within the aggregated [DataPrototypeInServiceInterfaceRef.](#) ([RS_MANI_00008](#), [RS_MANI_00024](#))

[constr_3372]{DRAFT} Restriction in usage of [ApSomeipTransformationProps.sizeOfStringLengthField](#) [The value of the attribute [sizeOfStringLengthField](#) shall be either 0, 1, 2 or 4.]()

[TPS_MANI_03217]{DRAFT} On-the-wire encoding for a chosen string [The attribute [stringEncoding](#) of [ApSomeipTransformationProps](#) defines the on-the-wire encoding of a String for which the [SomeipDataPrototypeTransformationProps](#) is defined, i.e. the String that is referenced within the aggregated [DataPrototypeInServiceInterfaceRef.](#)] ([RS_MANI_00008](#), [RS_MANI_00024](#))

[TPS_MANI_03072]{DRAFT} Size of a length field for a chosen union [The attribute [sizeOfUnionLengthField](#) of [ApSomeipTransformationProps](#) defines the size of a length field generated by SOME/IP in front of a union for which the [SomeipDataPrototypeTransformationProps](#) is defined, i.e. the union that is referenced within the aggregated [DataPrototypeInServiceInterfaceRef.](#)] ([RS_MANI_00008](#), [RS_MANI_00024](#))

[constr_3355]{DRAFT} Restriction in usage of [ApSomeipTransformationProps.sizeOfUnionLengthField](#) [The value of the attribute [sizeOfUnionLengthField](#) shall be either 0, 1, 2 or 4.]()

[TPS_MANI_03073]{DRAFT} Alignment of a dynamic DataPrototype [The attribute [alignment](#) of [ApSomeipTransformationProps](#) defines the padding for alignment purposes that will be added by SOME/IP after the serialized data of the variable data length data element for which the [SomeipDataPrototypeTransformationProps](#) is defined, i.e. the variable data length DataPrototype that is referenced within the aggregated [DataPrototypeInServiceInterfaceRef.](#)] ([RS_MANI_00008](#), [RS_MANI_00024](#))

[constr_3356]{DRAFT} Restriction in usage of [ApSomeipTransformationProps.alignment](#) [The value of the attribute [alignment](#) shall be either 8, 16, 32, 64, 128, or 256.]()

[TPS_MANI_03074]{DRAFT} Size of a type selector field for a chosen union [The attribute [sizeOfUnionTypeSelectorField](#) of [ApSomeipTransformationProps](#) defines the size of a type selector field generated by SOME/IP in front of a union for which the [SomeipDataPrototypeTransformationProps](#) is defined, i.e. the union that is referenced within the aggregated [DataPrototypeInServiceInterfaceRef.](#)] ([RS_MANI_00008](#), [RS_MANI_00024](#))

[constr_3357]{DRAFT} Restriction in usage of [ApSomeipTransformationProps.sizeOfUnionTypeSelectorField](#) [The value of the attribute [sizeOfUnionTypeSelectorField](#) shall be either 1, 2 or 4.]()

[TPS_MANI_03235]{DRAFT} **Usage of [ApSomeipTransformationProps.sessionHandling](#)** [The [sessionHandling](#) attribute defined in an [ApSomeipTransformationProps](#) that is referenced by [SomeipDataPrototypeTransformationProps](#) is not relevant for the [DataPrototypes](#) that are referenced in the [SomeipDataPrototypeTransformationProps](#).] ([RS_MANI_00008](#), [RS_MANI_00024](#))

[TPS_MANI_03278]{DRAFT} **Usage of [ApSomeipTransformationProps.byteOrder](#)** [The [byteOrder](#) attribute defined in an [ApSomeipTransformationProps](#) that is referenced by [SomeipDataPrototypeTransformationProps](#) shall be ignored for the [dataPrototypes](#) for which the [SomeipDataPrototypeTransformationProps](#) apply.] ([RS_MANI_00008](#), [RS_MANI_00024](#))

The [byteOrder](#) attribute defines the byte order of the complete payload in the SOME/IP message and therefore the configuration via [TransformationPropsToServiceInterfaceElementMapping](#) is the only valid option to define the byte order for a [ServiceInterface](#) element. Please note that according to SOME/IP, the header is encoded in network byte order (Big Endian).

The [sessionHandling](#) attribute is used for the activation/deactivation of the Session-Handling for Events/Notifiers and therefore the usage via [TransformationPropsToServiceInterfaceElementMapping](#) is the only valid configuration option.

Class	SomeipDataPrototypeTransformationProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::SerializationProperties			
Note	This meta-class represents the ability to define data transformation props specifically for a SOME/IP serialization for a given DataPrototype. Tags: atp.recommendedPackage=SomeipDataPrototypeTransformationPropss			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataPrototype	DataPrototypeInServiceInterfaceRef	*	aggr	Collection of DataPrototypes for which the settings in SomeipDataPrototypeTransformationProps are valid. For reuse reasons the SomeipDataPrototypeTransformationProps is able to aggregate several DataPrototypes.
network Representation	SwDataDefProps	0..1	aggr	Optional specification of the actual network representation for the referenced primitive DataPrototype. If a network representation is provided then the baseType available in the SwDataDefProps shall be used as input for the serialization/deserialization. If the network Representation is not provided then the baseType of the AbstractImplementationDataType shall be used for the serialization/deserialization. Stereotypes: atpSplitable Tags: atp.Splitkey=networkRepresentation
someip Transformation Props	ApSomeipTransformationProps	0..1	ref	This reference represents the ability to define data transformation props specifically for a SOME/IP serialization.

Table 3.163: SomeipDataPrototypeTransformationProps

The modeling of the reference to a `DataPrototype` in the context of a `PortInterface` that is typed by an `ApplicationDataType` or by a `CppImplementationDataType` is depicted in Figure 11.17.

[TPS_MANI_01136]{DRAFT} AutosarDataPrototype is the target of the DataPrototypeInServiceInterfaceRef [If the target of an `DataPrototypeInServiceInterfaceRef` is an `AutosarDataPrototype` the role `DataPrototypeInServiceInterfaceRef.dataPrototype` shall be used to describe the reference **independently** of whether the `AutosarDataPrototype` is typed by an `ApplicationDataType` or a `CppImplementationDataType` and even **independently** of whether the `AutosarDataType` of the `AutosarDataPrototype` represents a composite data type.] (*RS_MANI_00008, RS_MANI_00024*)

[TPS_MANI_01137]{DRAFT} Applicable use cases for DataPrototypeInServiceInterfaceRef [Table 3.164 contains a comprehensive list of use cases for the usage of `DataPrototypeInServiceInterfaceRef`.] (*RS_MANI_00008, RS_MANI_00024*)

Use case	Role
<code>AutosarDataPrototype</code> typed by an <code>ApplicationDataType</code>	<code>dataPrototype</code>
<code>DataPrototype</code> in <code>AutosarDataPrototype</code> typed by an <code>ApplicationCompositeDataType</code>	<code>dataPrototype</code>
<code>AutosarDataPrototype</code> typed by a <code>CppImplementationDataType</code>	<code>dataPrototype</code>
<code>DataPrototype</code> in <code>AutosarDataPrototype</code> typed by a <code>CppImplementationDataType</code>	<code>elementInImplDatatype</code>

Table 3.164: Possible use cases for the usage of `DataPrototypeInServiceInterfaceRef`

From a careful observation of Table 3.164 it should be clear that there is no valid use case to simultaneously use the two roles `dataPrototype` and `elementInImplDatatype` in the context of the same `DataPrototypeInServiceInterfaceRef`.

[constr_1551]{DRAFT} Existence of DataPrototypeInServiceInterfaceRef.dataPrototype vs. DataPrototypeInServiceInterfaceRef.elementInImplDatatype [For every given `DataPrototypeInServiceInterfaceRef`, either the aggregation `DataPrototypeInServiceInterfaceRef.dataPrototype` or `DataPrototypeInServiceInterfaceRef.elementInImplDatatype` shall exist.]()

The usage of the `SomeipDataPrototypeTransformationProps.networkRepresentation` is explained in more detail in the System Template [19] in [TPS_SYST_02136] and [TPS_SYST_02137].

3.20.3 Assignment of TLV properties

3.20.3.1 Assignment of TLV Data IDs

[TPS_MANI_01097]{DRAFT} **Assignment of TLV data ids** [The assignment of TLV data ids is done in the context of the specification of [TransformationPropsToServiceInterfaceElementMapping](#), namely by means of the attribute [TransformationPropsToServiceInterfaceElementMapping.tlvDataIdDefinition.id.](#)] ([RS_MANI_00030](#))

This approach takes benefit from the fact that the [TlvDataIdDefinition](#) is able to create references to relevant model elements.

The assignment of the TLV data id is therefore done by creating such a reference and assigning a TLV data id to it by means of the attribute [TlvDataIdDefinition.id.](#)

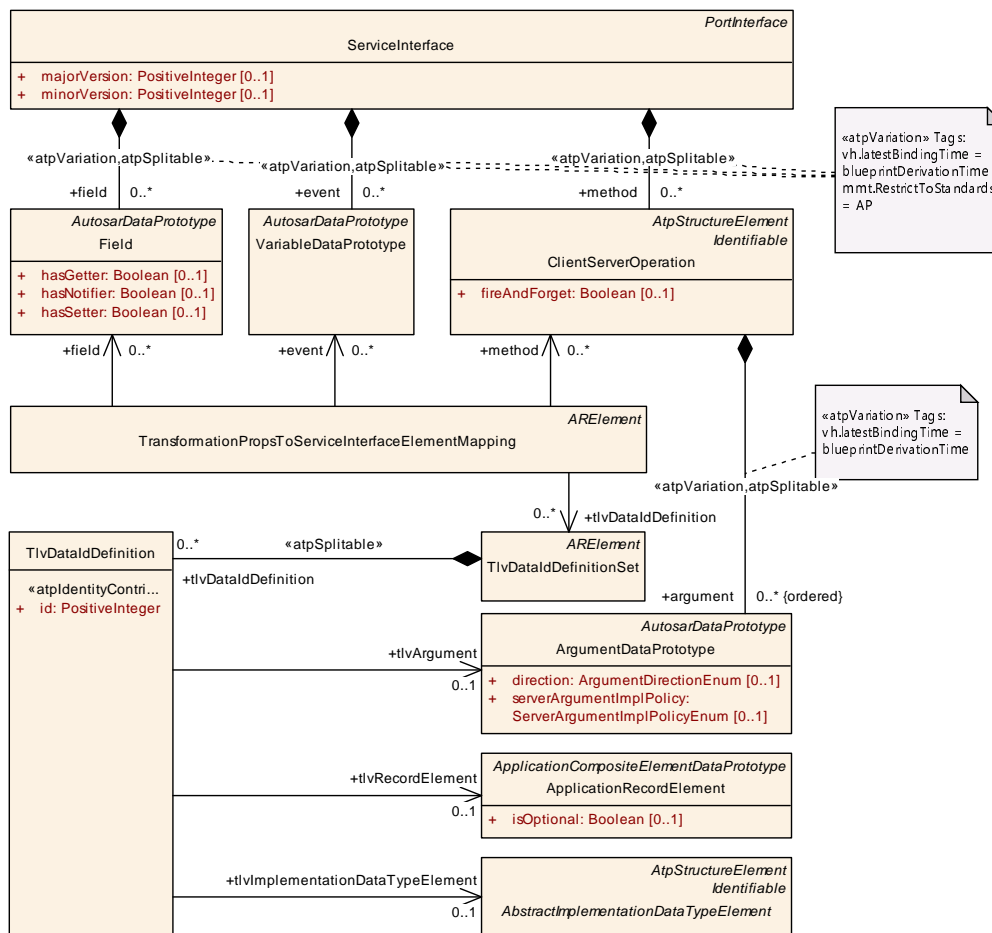


Figure 3.93: Modeling of the TLV data id

Please note that the assignment of TLV data ids is compulsory for an entire data structure that has at least one optional member. In a nutshell, this conclusion (that is also backed by [PRS_SOMEIP_00230], see [8]) is the motivation for the existence of [constr_1594], and [constr_1595].

Please note further that the assignment of TLV data ids is not restricted to data structures with optional members. There is also a use case to support sending the elements of a specific data structure in arbitrary order even if none of the elements is considered optional.

[TPS_MANI_01270]{DRAFT} Reference from [TransformationPropsToServiceInterfaceElementMapping](#) to [TlvDataIdDefinitionSet](#) [The reference from [TransformationPropsToServiceInterfaceElementMapping](#) to [TlvDataIdDefinitionSet](#) means that it is in the hand of the creator of a model to decide whether a global scope should be assumed or whether the definition needs to be customized for a specific case.] ([RS_MANI_00030](#))

Class	TlvDataIdDefinitionSet			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer			
Note	This meta-class acts as a container of TlvDataIdDefinitions to be used in a given context Tags: atp.recommendedPackage=TlvDataDefinitionSets			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
tlvDataIdDefinition	TlvDataIdDefinition	*	aggr	This aggregation represents the collection of TlvDataIdDefinitions aggregated by the TlvDataIdDefinitionSet Stereotypes: atpSplitable Tags: atp.Splitkey=tlvDataIdDefinition.id

Table 3.165: TlvDataIdDefinitionSet

[constr_1594]{DRAFT} Consistent assignment of TLV data ids to [ApplicationRecordDataType](#) [For every [ApplicationRecordDataType](#) where direct members set the attribute [ApplicationRecordElement.isOptional](#) to the value `True` references to **all direct members** of this [ApplicationRecordDataType](#) shall be created on the basis of the definition of [TlvDataIdDefinition](#).]()

[constr_1595]{DRAFT} Consistent assignment of TLV data ids to [CppImplementationDataType](#) or [CppImplementationDataTypeElement](#) [For every [CppImplementationDataType](#) of category `STRUCTURE` where direct members set the attribute [CppImplementationDataTypeElement.isOptional](#) to the value `True` references to **all direct members** of this [CppImplementationDataType](#) shall be created on the basis of the definition of [TlvDataIdDefinition](#).]()

The definition of a [TlvDataIdDefinition](#) that refers to an eligible model element is not limited to scenarios where optional elements are defined. It is also possible to define [TlvDataIdDefinition](#) for arbitrary methods or data structures.

A typical use case could be to prepare the argument list or sub-elements for future extensions. However, if one argument or sub-element is referenced then it is necessary to define references from [TlvDataIdDefinitions](#) to all other arguments or sub-elements as well.

[constr_1593]{DRAFT} Completeness of the existence of a set of [TlvDataIdDefinition.tlvArguments](#) [If the reference [TlvDataIdDefinition.tlvArgument](#) exists for one `argument` of a given [ClientServerOperation](#) then further [TlvDataIdDefinition.tlvArgument](#) shall exist **for all** `arguments` of the given [ClientServerOperation](#) and all affected [TlvDataIdDefinition](#) shall be aggregated by the same [TransformationPropsToServiceInterfaceElementMapping](#).]()

Although it would be possible to apply an optimization in the definition of the TLV configuration such that the TLV configuration could be defined direction-specific⁷, AUTOSAR defines that such a mixed TLV configuration shall not be used.

[constr_1603]{DRAFT} Completeness of the existence of a set of [TlvDataIdDefinition.tlvRecordElements](#) [If the reference [TlvDataIdDefinition.tlvRecordElement](#) exists for one `element` of a given [ApplicationRecordDataType](#) then further [TlvDataIdDefinition.tlvRecordElement](#) shall exist **for all** `elements` of the given [ApplicationRecordDataType](#) and all affected [TlvDataIdDefinition](#) shall be aggregated by the same [TransformationPropsToServiceInterfaceElementMapping](#).]()

[constr_1604]{DRAFT} Completeness of the existence of a set of [TlvDataIdDefinition.tlvImplementationDataTypeElements](#) [If the reference [TlvDataIdDefinition.tlvImplementationDataTypeElement](#) exists for one `subElement` of a given [CppImplementationDataType](#) or [CppImplementationDataTypeElement](#) then further [TlvDataIdDefinition.tlvImplementationDataTypeElement](#) shall exist **for all** `subElements` of the given [CppImplementationDataType](#) or [CppImplementationDataTypeElement](#) and all affected [TlvDataIdDefinition](#) shall be aggregated by the same [TransformationPropsToServiceInterfaceElementMapping](#).]()

Class	TlvDataIdDefinition			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer			
Note	This meta-class represents the ability to define the <code>tlvDataId</code> .			
Base	ARObject			
Aggregated by	TlvDataIdDefinitionSet.tlvDataIdDefinition			
Attribute	Type	Mult.	Kind	Note
id	PositiveInteger	1	attr	This attribute represents the definition of the value of the <code>TlvDataId</code> Stereotypes: <code>atpIdentityContributor</code>
tlvArgument	ArgumentDataPrototype	0..1	ref	This reference assigns a <code>tlvDataId</code> to a given argument of a <code>ClientServerOperation</code> .
tlvImplementationDataTypeElement	AbstractImplementationDataTypeElement	0..1	ref	This reference associates the definition of a TLV data id with a given <code>AbstractImplementationDataTypeElement</code> .
tlvRecordElement	ApplicationRecordElement	0..1	ref	This reference associates the definition of a TLV data id with a given <code>ApplicationRecordElement</code> .

Table 3.166: TlvDataIdDefinition

⁷For example, the usage of TLV encoding for `arguments` with attribute `direction` set to `in`, but **not** for `arguments` with attribute `direction` set to `out`.

The definition of a `TlvDataIdDefinition.id` has the purpose to provide means to unambiguously identify the argument or sub-element. For this purpose, the value of the `id` needs to be unique in the respective context.

[constr_1596]{DRAFT} Scope of the uniqueness of the value of `TlvDataIdDefinition.id` for references to `ArgumentDataPrototype` [For all `TlvDataIdDefinition` that are referencing `ArgumentDataPrototypes` of a given `ClientServerOperation` in the role `tlvArgument`, the attribute `TlvDataIdDefinition.id` **shall exist and have a unique value per communication direction**, i.e. in the context of the collection of all

- `arguments` where attribute `direction` is set to either `in` or `inout`
- `arguments` where attribute `direction` is set to either `out` or `inout`
- `arguments` where attribute `direction` is set to `inout` (if the `method` **only** has `arguments` where attribute `direction` is set to `inout`)

of the respective enclosing `ClientServerOperation`.]()

Rationale for the existence of **[constr_1596]**: `arguments` where attribute `direction` is set to either `in` or `inout` are never sent in the same SOME/IP message as `arguments` where attribute `direction` is set to either `out` or `inout`.

[constr_1597]{DRAFT} Scope of the uniqueness of the value of `TlvDataIdDefinition.id` for references to `ApplicationRecordElement` [For all `TlvDataIdDefinition` that are referencing `ApplicationRecordElements` of a given `ApplicationDataType` in the role `tlvRecordElement` the attribute `TlvDataIdDefinition.id` **shall exist and have a unique value** in the context of respective enclosing `ApplicationRecordDataType`.]()

[constr_1598]{DRAFT} Scope of the uniqueness of the value of `TlvDataIdDefinition.id` for references to `CppImplementationDataTypeElement` [For all `TlvDataIdDefinition` that are referencing `CppImplementationDataTypeElements` of a given `CppImplementationDataType/CppImplementationDataTypeElement` in the role `tlvImplementationDataTypeElement` the attribute `TlvDataIdDefinition.id` **shall exist and have a unique value** in the context of respective enclosing `CppImplementationDataType` or `CppImplementationDataTypeElement`.]()

Obviously, it is necessary to avoid ambiguity with respect to the definition of TLV data ids. Each model element that can be assigned such an id shall only be assigned one id.

[constr_1599]{DRAFT} `TlvDataIdDefinition` referencing `ArgumentDataPrototype` [Each `ArgumentDataPrototype` shall be referenced **at most once** in the role `tlvArgument` in the context of the same `TransformationPropsToServiceInterfaceElementMapping`.]()

[constr_1600]{DRAFT} `TlvDataIdDefinition` referencing `ApplicationRecordElement` [Each `ApplicationRecordElement` shall be referenced **at most**

once in the role `tlvRecordElement` in the context of the same `TransformationPropsToServiceInterfaceElementMapping`.]()

[**constr_1601**]{DRAFT} **TlvDataIdDefinition** referencing **CppImplementationDataTypeElement** [Each `CppImplementationDataTypeElement` shall be referenced **at most once** in the role `tlvImplementationDataTypeElement` in the context of the same `TransformationPropsToServiceInterfaceElementMapping`.]()

[**constr_1748**]{DRAFT} **Existence of references TlvDataIdDefinition.tlvArgument, TlvDataIdDefinition.tlvRecordElement, and TlvDataIdDefinition.tlvImplementationDataTypeElement** [For each `TlvDataIdDefinition`, only one out of the following references shall exist:

- reference to an `ArgumentDataPrototype` in the role `tlvArgument`
- reference to an `ApplicationRecordElement` in the role `tlvRecordElement`
- reference to an `AbstractImplementationDataTypeElement` in the role `tlvImplementationDataTypeElement`.

]()

Class	<i>AbstractImplementationDataTypeElement</i> (abstract)			
Package	M2::AUTOSARTemplates::CommonStructure::ImplementationDataTypes			
Note	This meta-class represents the ability to act as an abstract base class for specific derived meta-classes that support the modeling of <code>ImplementationDataTypes</code> for a particular language binding.			
Base	<i>ARObject</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Subclasses	<code>CppImplementationDataTypeElement</code> , <code>ImplementationDataTypeElement</code>			
Aggregated by	<code>AtpClassifier.atpFeature</code>			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.167: AbstractImplementationDataTypeElement

[**constr_1628**]{DRAFT} **Definition of static length field sizes in case of TLV usage** [If the aggregation `tlvDataIdDefinition` exists for a given `TransformationPropsToServiceInterfaceElementMapping` then attributes

- `sizeofArrayLengthField`,
- `sizeofStringLengthField`,
- `sizeofStructLengthField`, and
- `sizeofUnionLengthField`

shall have a value greater than 0.]()

Rationale for the existence of [**constr_1628**]: The TLV serialization requires the usage of length fields:

- If `wire type 4` is used (for more details, please refer to [TPS_MANI_01186]) then the length field size shall be statically configured.
- If `wire types 5-7` are used (see [TPS_MANI_01186]) then the static configuration of the length field size shall also be present since not all length fields are preceded by a tag, e.g. structures contained in an array or the top-level structure contained in a SOME/IP event.

Without demanding the existence of length fields in such a case the result of a serialization could be ambiguous, i.e. make it impossible for the de-serializer to figure out the data layout⁸.

[constr_1629]{DRAFT} Identical sizes of length fields in case of TLV usage [If the aggregation `tlvDataIdDefinition` exists for a given `TransformationPropsToServiceInterfaceElementMapping` then attributes

- `sizeOfArrayLengthField`,
- `sizeOfStringLengthField`,
- `sizeOfStructLengthField`, and
- `sizeOfUnionLengthField`

shall have an identical value.]()

Rationale for the existence of [constr_1629]: if `wire type 4` is used (for more details, please refer to [TPS_MANI_01186]) and if the receiver encounters a member of a structure or an `argument` with an unknown tag the de-serializer cannot determine the actual data type of the member of the structure or `argument`.

[constr_1630]{DRAFT} No definition of length field sizes on `DataPrototype` level in case of TLV usage [If the reference in the role `tlvDataIdDefinition` exists for a given `TransformationPropsToServiceInterfaceElementMapping` then attributes

- `sizeOfArrayLengthField`,
- `sizeOfStringLengthField`,
- `sizeOfStructLengthField`, and
- `sizeOfUnionLengthField`

shall not be individually defined on the level of a `DataPrototype` (i.e. by means of the reference `SomeipDataPrototypeTransformationProps.someipTransformationProps`) but only on the level of a `ServiceInterface` (i.e. by means of the reference `TransformationPropsToServiceInterfaceElementMapping.transformationProps`).]()

⁸If a structure consists only of optional elements, it would be hard to detect the case where an array element carries such a structure that happens to set all elements to non-available.

Rationale for the existence of [constr_1630]: if `wire type 4` is used (for more details, please refer to [TPS_MANI_01186]) and if the receiver encounters a member or argument with an unknown tag the de-serializer needs to know the size of the length field.

The most reliable way to achieve this is to demand the definition of the size of the length field on the level of the `ServiceInterface`.

3.20.3.2 Assignment of Wire Type Selection

The TLV encoding supports the definition of a so-called `wire type` that controls how the information about the length of length fields shall be interpreted.

The meaning of specific settings of the `wire type` is defined in [8, PRS SOME/IP Protocol].

[TPS_MANI_01186]{DRAFT} **Definition of the applicable `wire type`** [Attribute `ApSomeipTransformationProps.isDynamicLengthFieldSize` shall be used to define the applicable `wire type`.

If the value of attribute `ApSomeipTransformationProps.isDynamicLengthFieldSize` is set to `True` then `wire type 5-7` shall be used.

If the value of attribute `ApSomeipTransformationProps.isDynamicLengthFieldSize` does not exist or is set to `False` then `wire type 4` shall be used.] (*RS_MANI_00030*)

3.21 Process Design

Within the definition of e.g. a diagnostic mapping, the assignment to the `Process` is typically done in a methodological step⁹ that happens when all the diagnostic mapping¹⁰ is already complete.

Therefore, it would be good to implement a proxy for an actual `Process` that can stand in as the target of the relation to a `Process` at design time. This semantics is realized by meta-class `ProcessDesign`.

[TPS_MANI_01228]{DRAFT} **Semantics of meta-class `ProcessDesign`** [Meta-class `ProcessDesign` shall be used whenever a design-time representation is required for a `Process` that is designed in a **later** step in the workflow as part of the deployment specification.] (*RS_MANI_00004*)

⁹i.e. during the creation of the execution manifest

¹⁰From the methodological point of view, the creation of the diagnostic mapping is typically considered a design-time activity.

The integrator would have to take care that an actual `Process` refers to the corresponding `ProcessDesign` such that by means of this reference an AUTOSAR software tool is able to figure out the relation between a diagnostic mapping and a process, provided that each `ProcessDesign` is **only** referenced by a single `Process`.

[constr_1550]{DRAFT} Reference from `Process` to `ProcessDesign` [Each `ProcessDesign` shall only be referenced from a single `Process`.]()

Note that the reference from the `Process` to the `ProcessDesign` acknowledges the fact that the `Process` is typically created later in time¹¹.

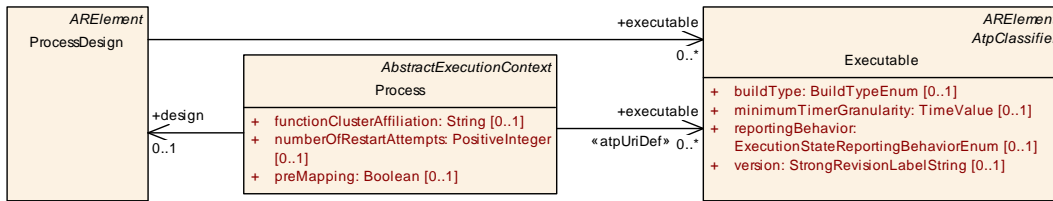


Figure 3.94: Modeling of the `ProcessDesign`

Class	ProcessDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ProcessDesign			
Note	This meta-class has the ability to stand in for a <code>Process</code> at the time when the <code>Process</code> does not yet exist. But its future existence already needs to be considered during design phase and for that a dedicated model element is required. Tags: atp.recommendedPackage=ProcessDesigns			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
deterministic ClientResource Needs	DeterministicClientResourceNeeds	*	aggr	This aggregation represents the collection of applicable resource needs for the design of deterministic clients. Tags: atp.Status=draft
executable	Executable	*	ref	Reference to executable that is executed in the process.

Table 3.168: `ProcessDesign`

[constr_3731]{DRAFT} Upper multiplicity of reference in the role `ProcessDesign.executable` [In the context of `ProcessDesign`, the reference in the role `executable` shall exist at most once **at the time when the sub-system design is complete**.]()

Conceivably, the association of diagnostic mappings with Meta-class `ProcessDesign` may still happen as a finalizing last step of the activity to create the diagnostic mappings. To accommodate for this potential modeling, the reference from a diagnostic mapping to `ProcessDesign` has been decorated by stereotype `<<atpSplittable>>`.

For more information concerning the semantics of this stereotype please refer to the specification of the AUTOSAR Generic Structure Template [7].

¹¹In other words, if references are needed between design-related and deployment-related meta-classes then the direction of these references shall always point from deployment to design.

[constr_1693]{DRAFT} Relation of Executable, ProcessDesign, and Process
 [Any Executable that is referenced by a ProcessDesign shall also be referenced by every Process that references the ProcessDesign.]()

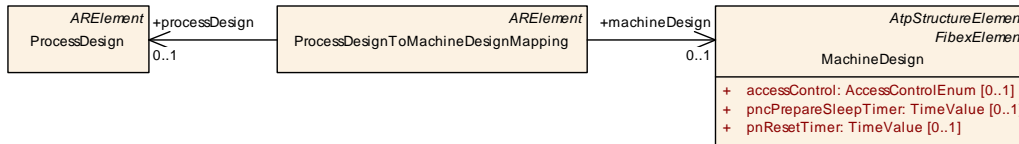


Figure 3.95: Modeling of the ProcessDesignToMachineDesignMapping

[TPS_MANI_01229]{DRAFT} Pre-allocation of a given ProcessDesign on a specific MachineDesign
 [It is also possible to pre-allocate a given ProcessDesign on a specific MachineDesign. For this purpose meta-class ProcessDesignToMachineDesignMapping exists.](*RS_MANI_00004*)

The semantics of meta-class MachineDesign is explained in section 6.

Class	ProcessDesignToMachineDesignMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	This element is used in the design phase to predefine a mapping of a process to a machine. Such a mapping may be overruled in the deployment phase. Tags: atp.recommendedPackage=ProcessDesignToMachineDesignMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
machineDesign	MachineDesign	0..1	ref	This reference identifies the MachineDesign in the context of the ProcessDesignToMachineDesignMapping.
processDesign	ProcessDesign	0..1	ref	This reference identifies the ProcessDesign in the context of the ProcessDesignToMachineDesignMapping.

Table 3.169: ProcessDesignToMachineDesignMapping

[constr_10154]{DRAFT} Multiplicity of reference in the role ProcessDesignToMachineDesignMapping.processDesign
 [For each ProcessDesignToMachineDesignMapping, the reference in the role processDesign shall exist **at the time when the ProcessDesign is complete.**]()

Please note that an intended ProcessDesignToMachineDesignMapping may not be possible for utilization of the target machine and therefore a different ProcessToMachineMapping may be created in the deployment phase.

3.21.1 Deterministic Client Resource

Meta-class ProcessDesign can also be used to add support for the so-called Deterministic Client.

Please note that an explanation of the specific meaning of the term `Deterministic Client` is out of the scope of this document. A detailed explanation can be found in the SWS Execution Management [10].

To formalize the support for the `Deterministic Client`, meta-class `DeterministicClientResourceNeeds` is aggregated at `ProcessDesign`.

Class	DeterministicClientResourceNeeds			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ProcessDesign			
Note	This meta-class specifies process and cycle specific computing resource needs of <code>DeterministicClient</code> library functions. Tags: atp.Status=draft			
Base	<code>ARObject</code> , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	<code>ProcessDesign.deterministicClientResourceNeeds</code>			
Attribute	Type	Mult.	Kind	Note
hardware Platform	String	0..1	attr	This attribute represents a textual identification of the target platform. Tags: atp.Status=draft
initResource	DeterministicClientResource	0..1	aggr	This represents the computing resource needs of a <code>DeterministicClient::WaitForActivation</code> kInit cycle. Tags: atp.Status=draft
runResource	DeterministicClientResource	0..1	aggr	This represents the computing resource needs of a <code>DeterministicClient::WaitForActivation</code> kRun cycle. Tags: atp.Status=draft

Table 3.170: DeterministicClientResourceNeeds

[TPS_MANI_01199]{DRAFT} **Semantics of [DeterministicClientResourceNeeds](#)** [Meta-class `DeterministicClientResourceNeeds` aggregates `DeterministicClientResource` in two roles in order to be able to specify resource needs in two different contexts of the execution of a `Deterministic Client`.] ([RS_MANI_00050](#))

[TPS_MANI_01200]{DRAFT} **Semantics of meta-class [DeterministicClientResource](#)** [Meta-class `DeterministicClientResource` defines several attributes that provide information about the nature of the execution of worker threads. The values of these attributes are given a dimensionless `NormalizedInstruction`.

Nevertheless, the values of the attributes

- `numberOfInstructions`
- `sequentialInstructionsBegin`
- `sequentialInstructionsEnd`

are only valid for a specific hardware platform. The purpose of using `NormalizedInstruction` is to align resource usage of different `Processes` (possibly from different vendors) at integration time.] ([RS_MANI_00050](#))

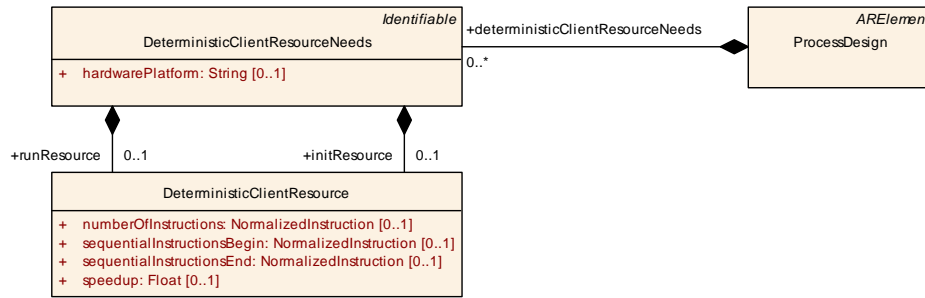


Figure 3.96: Modeling of the **DeterministicClientResourceNeeds**

Class	DeterministicClientResource			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ProcessDesign			
Note	This meta-class specifies computing resource needs of DeterministicClient library functions. Tags: atp.Status=draft			
Base	ARObject			
Aggregated by	DeterministicClientResourceNeeds.initResource, DeterministicClientResourceNeeds.runResource			
Attribute	Type	Mult.	Kind	Note
numberOfInstructions	NormalizedInstruction	0..1	attr	This attribute represents the normalized runtime consumption on the target system within one DeterministicClient::WaitForActivation cycle, assuming the "worst-case" runtime where the workers would be executed sequentially. Tags: atp.Status=draft
sequentialInstructionsBegin	NormalizedInstruction	0..1	attr	Normalized sequential runtime at the beginning of the DeterministicClient::WaitForActivation cycle (which mostly cannot be parallelized), before the main usage of the worker pool starts. Tags: atp.Status=draft
sequentialInstructionsEnd	NormalizedInstruction	0..1	attr	WaitForActivation cycle (which mostly cannot be parallelized), after the main usage of the worker pool has ended. Tags: atp.Status=draft
speedup	Float	0..1	attr	This attribute defines how much faster the calculations within one DeterministicClient::WaitForActivation cycle can be finished if numberOfWorkers are physically available, i.e. if enough cores were available on the machine to perform parallel execution of all workers (sequential runtime / parallelized runtime). Tags: atp.Status=draft

Table 3.171: **DeterministicClientResource**

Primitive	NormalizedInstruction
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ProcessDesign
Note	<p>This meta-class is used to describe runtime budget needs on the target system within Deterministic Client::WaitForActivation cycles. NormalizedInstructions does not reflect the actual number of code instructions, but allows the description of comparative resource needs. NormalizedInstructions is used for configuration of computing resources at integration time.</p> <p>NormalizedInstruction = runtime in sec * clock frequency in Hz</p> <p>Tags: atp.Status=draft xml.xsd.customType=NORMALIZED-INSTRUCTION xml.xsd.pattern=[1-9][0-9]* xml.xsd.type=string</p>

Table 3.172: NormalizedInstruction

3.22 Grant Design

The definition of intents (for example: [ClientComSpec.clientIntent](#)) as described in chapter 3.17.5.1.3 is used to express the intention of the software designer to use (or refrain from using) specific APIs in the application software.

The definition of intents represents one aspect of the identity and Access Management (IAM). Another aspect of the IAM configuration is the definition of the actual permissions granted by the platform software.

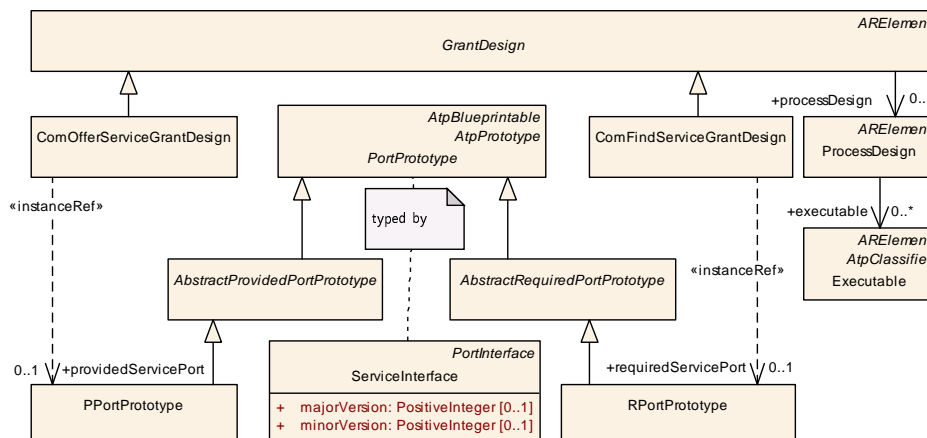


Figure 3.97: Modeling of grant designs for service discovery

The modeling of such grants is done on two levels:

- the definition of [GrantDesign](#) allows for the pre-specification of grants already on the design level. The modeling of [GrantDesign](#) is described in this chapter.
- the definition of [Grant](#) allows for the actual and final specification of grants from the perspective of the platform software. The modeling of [Grant](#) is described in chapter 10.9.

Class	GrantDesign (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign			
Note	This meta-class serves as an abstract base class for the description of grants on design level. Tags: atp.Status=candidate			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	ComFindServiceGrantDesign , ComGrantDesign , ComOfferServiceGrantDesign , RawDataStreamGrantDesign			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
processDesign	ProcessDesign	0..1	ref	This reference identifies the corresponding Process Design that gives context to the GrantDesing. Tags: atp.Status=candidate

Table 3.173: GrantDesign

Abstract meta-class [GrantDesign](#) acts as the base class for the definition of grants on the design level.

Grants are specific for a given [Process](#). In other words, two [Processes](#) created from the same [Executable](#) may be assigned different sets of grants. This specific relation shall also be available on the design level.

[TPS_MANI_01231]{DRAFT} [GrantDesign](#) references [ProcessDesign](#) [Meta-class [GrantDesign](#) references [ProcessDesign](#) as a means to design the set of [Grants](#) for the given [Process](#).] ([RS_MANI_00060](#))

3.22.1 Com Grant Design

Subclasses of [GrantDesign](#) are created to cover specific aspects of grants for communication on the *AUTOSAR adaptive Platform*.

[TPS_MANI_01232]{DRAFT} **Semantics of meta-class [ComOfferServiceGrantDesign](#)** [The existence of a [ComOfferServiceGrantDesign](#) that references a specific [AbstractProvidedPortPrototype](#) in the role [providedServicePort](#) indicates that the design foresees that the referenced [AbstractProvidedPortPrototype](#) shall be granted rights to offer the respective service.] ([RS_MANI_00060](#))

Please note that there is no explicitly modeled intent that corresponds to the existence of the [ComOfferServiceGrantDesign](#). The understanding is that the mere existence of an [AbstractProvidedPortPrototype](#) typed by a [ServiceInterface](#) indicates the intent to offer a service.

[TPS_MANI_01233]{DRAFT} **Semantics of meta-class [ComFindServiceGrantDesign](#)** [The existence of a [ComFindServiceGrantDesign](#) that references a specific [AbstractRequiredPortPrototype](#) in the role [requiredServicePort](#) indicates that the design foresees that the referenced [AbstractRequiredPortPrototype](#) shall be granted rights to find the respective service.] ([RS_MANI_00060](#))

Please note that there is no explicitly modeled intent that corresponds to the existence of the `ComFindServiceGrantDesign`.

The understanding is that the mere existence of an `AbstractRequiredPortPrototype` typed by a `ServiceInterface` indicates the intent to find a service.

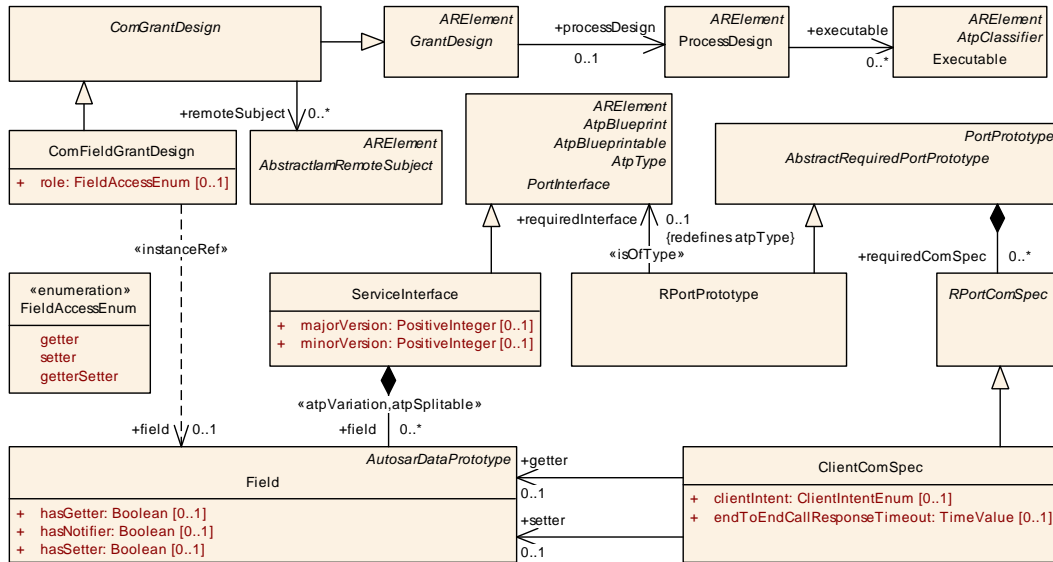


Figure 3.98: Modeling of grant designs for field

Class	ComOfferServiceGrantDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::ComGrant			
Note	This meta-class represents the ability to define a Grant for offering a service. Tags: atp.Status=candidate atp.recommendedPackage=GrantDesigns			
Base	ARElement , ARObject , CollectableElement , GrantDesign , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
providedServicePort	PPortPrototype	0..1	iref	This instanceRef identifies the PPortPrototype on which the service shall be offered. Tags: atp.Status=candidate InstanceRef implemented by: PPortPrototypeInExecutableInstanceRef

Table 3.174: ComOfferServiceGrantDesign

[constr_10155]{DRAFT} Multiplicity of reference in the role `ComOfferServiceGrantDesign.providedServicePort` [For each `ComOfferServiceGrantDesign`, the reference in the role `providedServicePort` shall exist **at the time when the GrantDesign is complete.**]()

Class	ComFindServiceGrantDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::ComGrant			
Note	This meta-class represents the ability to define a Grant for finding a service. Tags: atp.Status=candidate atp.recommendedPackage=GrantDesigns			
Base	ARElement , ARObject , CollectableElement , GrantDesign , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
requiredServicePort	RPortPrototype	0..1	iref	This instanceRef identifies the RPortPrototype on which the service shall be found. Tags: atp.Status=candidate InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 3.175: ComFindServiceGrantDesign

[constr_10156]{DRAFT} Multiplicity of reference in the role [ComFindServiceGrantDesign.requiredServicePort](#) [For each [ComFindServiceGrantDesign](#), the reference in the role [requiredServicePort](#) shall exist **at the time when the GrantDesign is complete.**]()

Class	ComGrantDesign (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::ComGrant			
Note	This meta-class serves as an abstract base class for the description of com grants on design level. Tags: atp.Status=candidate			
Base	ARElement , ARObject , CollectableElement , GrantDesign , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	ComEventGrantDesign , ComFieldGrantDesign , ComMethodGrantDesign , ComTriggerGrantDesign			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
remoteSubject	AbstractIamRemoteSubject	*	ref	This optional reference defines the remoteSubject that is allowed to access the defined Object via the Grant. Tags: atp.Status=candidate

Table 3.176: ComGrantDesign

[constr_3720]{DRAFT} Upper multiplicity of reference in the role [ComGrantDesign.remoteSubject](#) [In the context of [ComGrantDesign](#), the reference in the role [remoteSubject](#) shall exist at most once **at the time when the GrantDesign is complete.**]()

[TPS_MANI_01234]{DRAFT} Semantics of [ComFieldGrantDesign](#) [The existence of a [ComFieldGrantDesign](#) that references a specific [Field](#) in the role [field](#) indicates that the design foresees that the application software shall be granted rights to access the respective [Field](#). The nature of the access, i.e. get vs. set is specified by means of the attribute role.]([RS_MANI_00060](#))

Class	ComFieldGrantDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::ComGrant			
Note	This meta-class represents the ability to define a Grant for a ServiceInterface.field. Tags: atp.Status=candidate atp.recommendedPackage=GrantDesigns			
Base	ARElement , ARObject , CollectableElement , ComGrantDesign , GrantDesign , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
field	Field	0..1	iref	Reference to the affected Field in the context of an Executable. Tags: atp.Status=candidate InstanceRef implemented by: FieldInExecutableInstanceRef
role	FieldAccessEnum	0..1	attr	This attribute provides the ability to further specify the access to the ServiceInterface.field from a design perspective. Tags: atp.Status=candidate

Table 3.177: ComFieldGrantDesign

[constr_10157]{DRAFT} Multiplicity of reference in the role [ComFieldGrantDesign.field](#) [For each [ComFieldGrantDesign](#), the reference in the role [field](#) shall exist **at the time when the GrantDesign is complete.**]()

[constr_10158]{DRAFT} Multiplicity of reference in the role [ComFieldGrantDesign.role](#) [For each [ComFieldGrantDesign](#), the reference in the role [role](#) shall exist **at the time when the GrantDesign is complete.**]()

Enumeration	FieldAccessEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::ComGrant
Note	This meta-class provides values that qualify access to a field.
Aggregated by	ComFieldGrant.role , ComFieldGrantDesign.role
Literal	Description
getter	Access to the getter of the Field. Tags: atp.EnumerationLiteralIndex=0
getterSetter	Access to getter and setter of the field Tags: atp.EnumerationLiteralIndex=2
setter	Access to the setter of the Field. Tags: atp.EnumerationLiteralIndex=1

Table 3.178: FieldAccessEnum

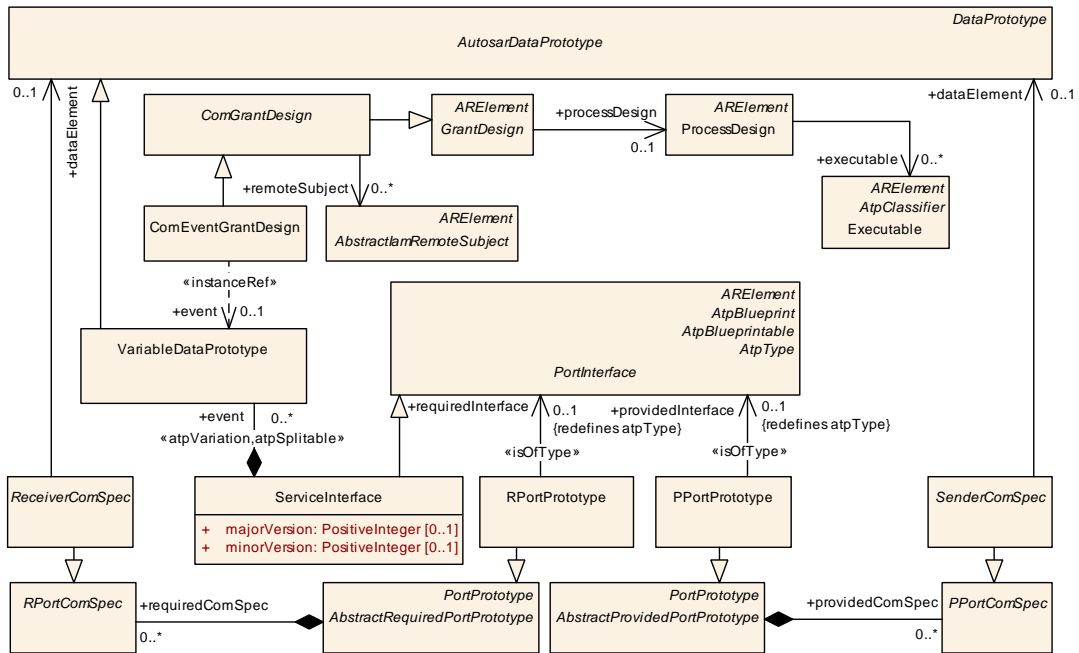


Figure 3.99: Modeling of grant designs for event

[TPS_MANI_01235]{DRAFT} **Semantics of ComEventGrantDesign** [The existence of a **ComEventGrantDesign** that references a specific **VariableDataPrototype** that is aggregated in the role **event** by the enclosing **ServiceInterface** indicates that the design foresees that the application software shall be granted rights to access the respective **event**.] ([RS_MANI_00060](#))

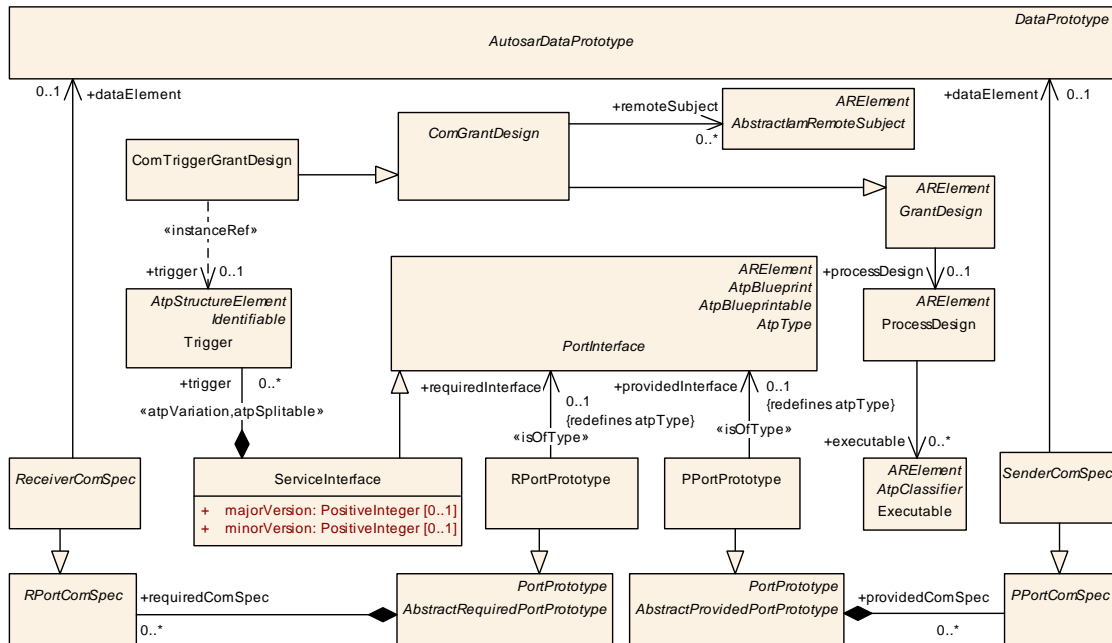


Figure 3.100: Modeling of grant designs for trigger

Class	ComEventGrantDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::ComGrant			
Note	This meta-class represents the ability to define a Grant for a ServiceInterface.event. Tags: atp.Status=candidate atp.recommendedPackage=GrantDesigns			
Base	ARElement , ARObject , CollectableElement , ComGrantDesign , GrantDesign , Identifiable , Multilanguage , Referrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
event	VariableDataPrototype	0..1	iref	This reference represents the affected event. Tags: atp.Status=candidate InstanceRef implemented by: EventInExecutable InstanceRef

Table 3.179: ComEventGrantDesign

[constr_10159]{DRAFT} Multiplicity of reference in the role [ComEventGrantDesign.event](#) [For each [ComEventGrantDesign](#), the reference in the role [event](#) shall exist **at the time when the GrantDesign is complete.**]()

[TPS_MANI_03290]{DRAFT} Semantics of [ComTriggerGrantDesign](#) [The existence of a [ComTriggerGrantDesign](#) that references a specific [Trigger](#) that is aggregated in the role [trigger](#) by the enclosing [ServiceInterface](#) indicates that the design foresees that the application software shall be granted rights to access the respective [trigger](#).] ([RS_MANI_00060](#))

Class	ComTriggerGrantDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::ComGrant			
Note	This meta-class represents the ability to define a Grant for a ServiceInterface.trigger. Tags: atp.Status=candidate atp.recommendedPackage=GrantDesigns			
Base	ARElement , ARObject , CollectableElement , ComGrantDesign , GrantDesign , Identifiable , Multilanguage , Referrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
trigger	Trigger	0..1	iref	This reference represents the affected trigger. Tags: atp.Status=candidate InstanceRef implemented by: TriggerInExecutable InstanceRef

Table 3.180: ComTriggerGrantDesign

[constr_10160]{DRAFT} Multiplicity of reference in the role [ComTriggerGrantDesign.trigger](#) [For each [ComTriggerGrantDesign](#), the reference in the role [trigger](#) shall exist **at the time when the GrantDesign is complete.**]()

[TPS_MANI_01236]{DRAFT} Semantics of [ComMethodGrantDesign](#) [The existence of a [ComMethodGrantDesign](#) that references a specific [ClientServerOperation](#) that is aggregated in the role [method](#) by the enclosing [ServiceInterface](#)

indicates that the design foresees that the application software shall be granted rights to call the respective `method`.] (*RS_MANI_00060*)

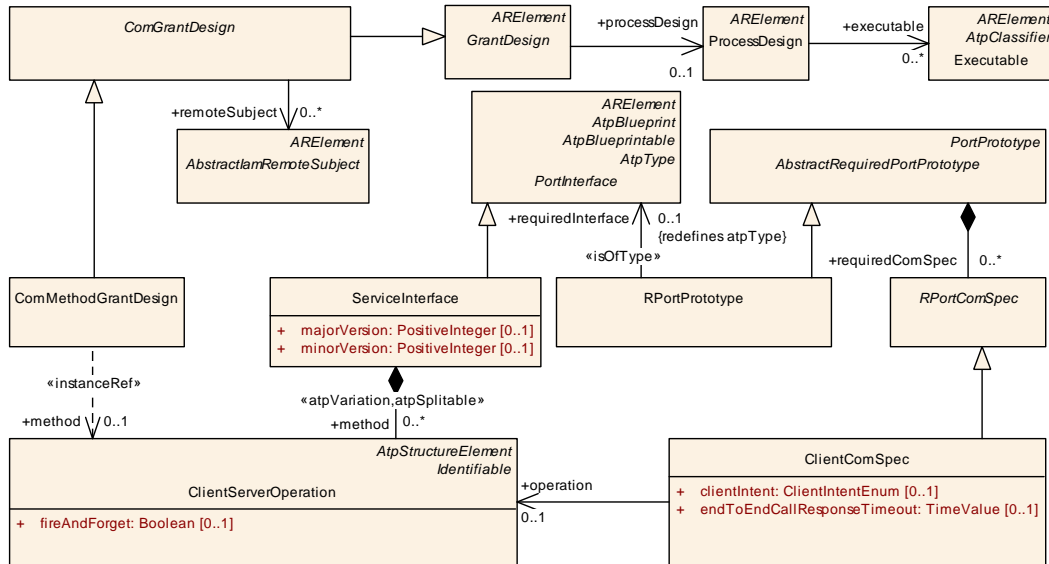


Figure 3.101: Modeling of grant designs for `method`

Class	ComMethodGrantDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::ComGrant			
Note	This meta-class represents the ability to define a Grant for a ServiceInterface.method. Tags: atp.Status=candidate atp.recommendedPackage=GrantDesigns			
Base	ARElement, ARObject, CollectableElement, ComGrantDesign, GrantDesign, Identifiable, Multilanguage Referrable, PackageableElement, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
method	ClientServerOperation	0..1	iref	This reference identifies the corresponding method. Tags: atp.Status=candidate InstanceRef implemented by: RequiredMethodIn ExecutableInstanceRef

Table 3.181: ComMethodGrantDesign

[constr_10161]{DRAFT} **Multiplicity of reference in the role `ComMethodGrantDesign.method`** [For each `ComMethodGrantDesign`, the reference in the role `method` shall exist **at the time when the GrantDesign is complete.**] ()

3.22.2 Grant Design for Raw Streaming Data

The usage of a raw data stream is subject to restrictions imposed by the IAM. Therefore, meta-class `RawDataStreamGrantDesign` exists to support this use case.

[TPS_MANI_01284]{DRAFT} **Granularity of meta-class `RawDataStreamGrantDesign`** [The granularity of the `RawDataStreamGrantDesign` is the entire `AbstractRawDataStreamInterface`. It is not expected that a definition of an IAM policy makes sense on a smaller level, i.e. on the level of `ClientServerOperation` aggregated by a `AbstractRawDataStreamInterface`.] (*RS_MANI_00060*)

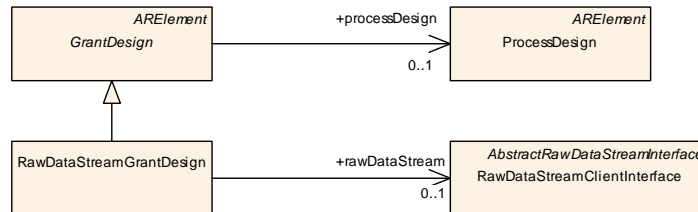


Figure 3.102: Modeling of the `RawDataStreamGrantDesign`

Class	<code>RawDataStreamGrantDesign</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::GrantDesign::RawDataStreamGrant			
Note	This meta-class represents the ability to define the IAM configuration for a <code>RawDataStream</code> on design level. Tags: atp.Status=candidate atp.recommendedPackage=GrantDesigns			
Base	<code>ARElement</code> , <code>ARObject</code> , <code>CollectableElement</code> , <code>GrantDesign</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PackageableElement</code> , <code>Referrable</code>			
Aggregated by	<code>ARPackage.element</code>			
Attribute	Type	Mult.	Kind	Note
rawDataStream	<code>RawDataStreamClientInterface</code>	0..1	ref	This reference identifies the applicable <code>RawDataStream</code> Interface. Tags: atp.Status=candidate

Table 3.182: `RawDataStreamGrantDesign`

3.22.3 Remote access control

The definition of the deployment for the *Identity and Access Manager* and the definition of grants relies on the local enforcement of identity and access permissions. In other words it is possible for example to define that a particular `method` of a `ServiceInterface` is allowed to be called by a local `Process` on the local `Machine`. But it is not possible to restrict the remote `Machines` that are allowed to call this `method`.

The fact that the `Machine` on which the service is running has no mean to make additional checks on the incoming requests enables processing of wrongly issued requests by a healthy remote `Machine` as well as escalation of privileges by an attacker via issuing arbitrary request towards services from a compromised remote `Machine`.

Most of the times it is not possible for a `Machine` to recognize that its communicating peer is compromised because the attacker has access to all the resources of that `Machine` and can run in stealth mode. An effective way to minimize the damage of a compromised remote `Machine` is to enforce additional checks on the incoming

requests at the receiver side ensuring that remote *Machine* cannot go beyond what they could request in a healthy state.

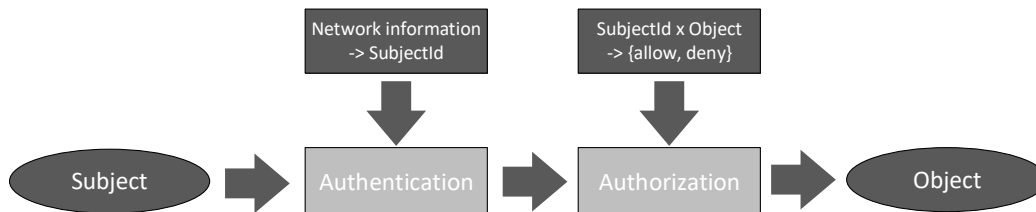


Figure 3.103: Access policy enforcement based on the Subject ID from the network binding

The access control process aims at enforcing policies on the relation between a “Subject” and an “Object”. In the example where an remote *Machine* makes calls to a service interface, the remote *Machine* is the Subject and the *method* of a *ServiceInterface* is the Object.

The access control process comprises of the two main operations, namely, Authentication and Authorization, which are mostly independent. During the authentication process the identity of the subject is verified and an authentic identifier is resolved. Authentication is an essential part of the chain to ensure that different subjects cannot impersonate each other.

In the next step, during Authorization, the identity of the Subject is checked upon the rules and policies defined for the accessing the Object to verify if the Subject’s request is legitimate. These policies shall be defined by the system or the resource owner.

The authentication of the remote subject is based on the network binding. When a secure channel is established, the remote peer has already gone through an authentication protocol. Therefore, the identity information can be forwarded to the IAM to apply the corresponding defined policies that are defined for the requests coming from that channel as depicted in [Figure 3.103](#).

The remote subject is modeled as a specialization of [AbstractIamRemoteSubject](#). The different specializations will be presented in the following sections.

Class	<i>AbstractIamRemoteSubject</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SCREIAM			
Note	This abstract meta-class defines the proxy information about the remote node. Tags: atp.Status=candidate			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	IPSeclamRemoteSubject , IplamRemoteSubject , TislamRemoteSubject			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 3.183: AbstractIamRemoteSubject

With the modeling of `ComGrantDesigns` the permissions that are granted by the platform software are defined. As an option a `ComGrantDesign` is able to reference the `AbstractIamRemoteSubject` in the role `remoteSubject`.

[TPS_MANI_03238]{DRAFT} Definition of `ComMethodGrantDesign.remoteSubject` [If the `ComMethodGrantDesign` references one or several `AbstractIamRemoteSubjects` in the role `remoteSubject` then the design foresees that only the defined `remoteSubjects` shall be granted rights to access the `ClientServerOperation` that is referenced in the role `method` by the same `ComMethodGrantDesign`.] (*RS_MANI_00060*)

[TPS_MANI_03239]{DRAFT} Definition of `ComEventGrantDesign.remoteSubject` [If the `ComEventGrantDesign` references one or several `AbstractIamRemoteSubjects` in the role `remoteSubject` then the design foresees that only the defined `remoteSubjects` shall be granted rights to access the `VariableDataPrototype` that is referenced in the role `event` by the same `ComEventGrantDesign`.] (*RS_MANI_00060*)

[TPS_MANI_03251]{DRAFT} Definition of `ComFieldGrantDesign.remoteSubject` [If the `ComFieldGrantDesign` references one or several `AbstractIamRemoteSubjects` in the role `remoteSubject` then the design foresees that only the defined `remoteSubjects` shall be granted rights to access the `Field` that is referenced in the role `field` by the same `ComFieldGrantDesign`.] (*RS_MANI_00060*)

3.22.3.1 Remote subject in case of TLS

This chapter defines how a `AbstractIamRemoteSubject` is modeled in case of a TLS-based secure channel.

[TPS_MANI_03240]{DRAFT} Modeling of a remote peer in case of TLS-based secure channel [In case of TLS-based secure channel the remote peer is modeled as `TlsIamRemoteSubject` that is identified either by

- a `CryptoServiceCertificate` that is referenced by the `TlsIamRemoteSubject` in the role `acceptedRemoteCertificate`,
- a Pre-shared Key that is referenced by the `TlsIamRemoteSubject` via `TlsCryptoCipherSuite` in the role `acceptedCryptoCipherSuiteWithPsk`.

] (*RS_MANI_00036, RS_MANI_00060*)

Please note that the security of a pre-shared key as authentication in TLS protocol depends on the number of entities sharing the same key. If multiple `Machines` are using the same shared key, one cannot reliably distinguish between those `Machines` because any of them can impersonate the others.

It can only be ensured that no other `Machine` without the knowledge of the pre-shared key can established a secure channel.

The `TlsIamRemoteSubject` may be identified by using certificates in two ways. First, it is possible to directly specify the certificates that the `TlsIamRemoteSubject` may use by referencing them and setting `derivedCertificateAccepted` to false.

This approach requires the presence of the remote certificate on the local Machine. Secondly, by setting `derivedCertificateAccepted` to true it is possible to specify the Common Name (as given in the X509 Certificate) of the `TlsIamRemoteSubject`.

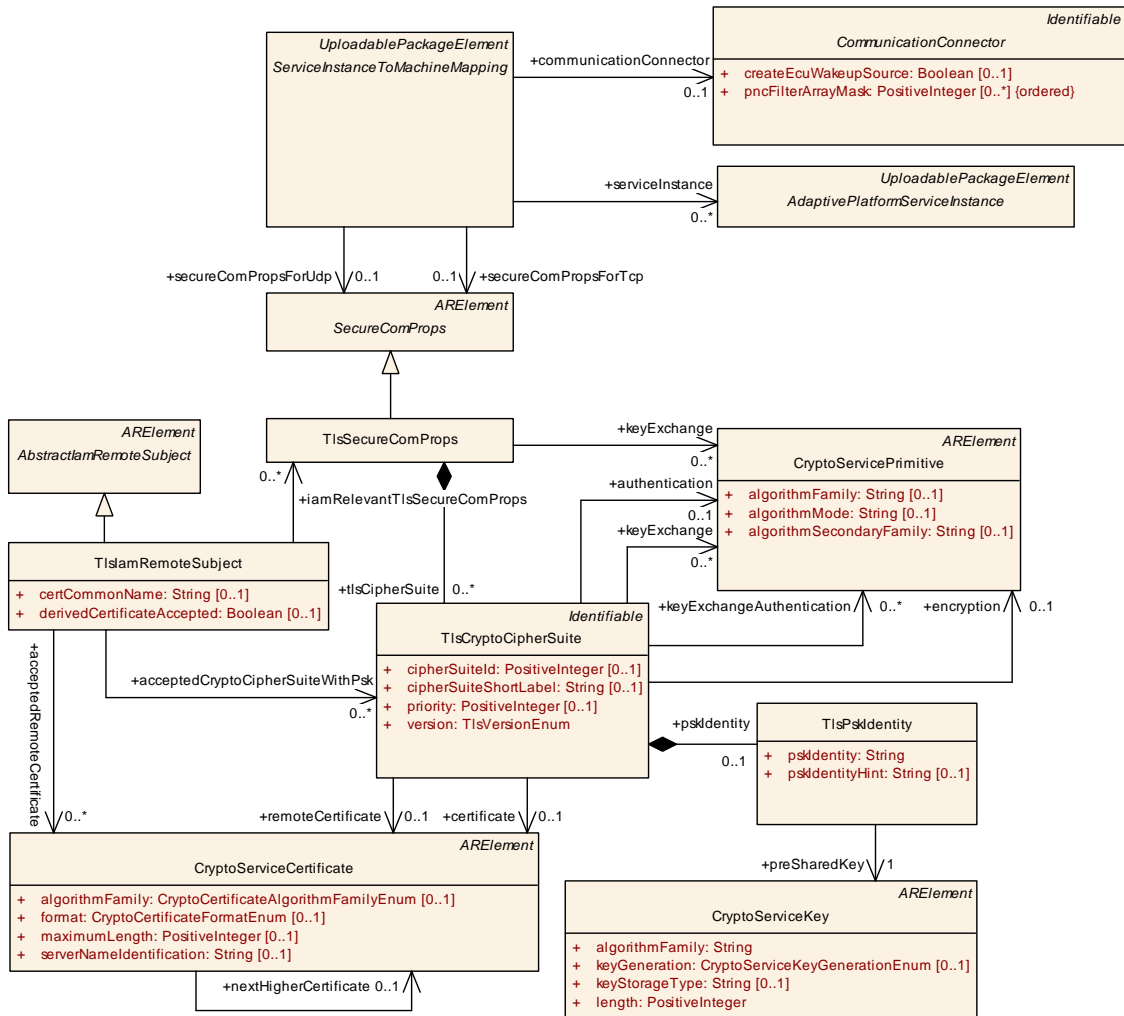


Figure 3.104: Proxy information about the remote node in case of TLS

In that case, the `acceptedRemoteCertificates` define the set of allowed root certificates for the certificate presented by the `TlsIamRemoteSubject`.

The reason for the upper multiplicity is that the OEM may have multiple suppliers for a `Machine` and it shall be allowed to define that in such a case all these `Machines` are allowed to connect even though they have different certificate chains.

[TPS_MANI_03241]{DRAFT} **Modeling of relevant `TlsSecureComProps` for `TlsIamRemoteSubject`** [With the `TlsIamRemoteSubject.iamRelevantTlsSecureComProps` reference it is possible to define all `TlsSecureComProps` that the `TlsIamRemoteSubject` supports to establish a secure channel.] ([RS_MANI_00036](#), [RS_MANI_00060](#))

Class	TlsIamRemoteSubject			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SCREIAM			
Note	This meta-class defines the proxy information about the remote node in case of TLS. Tags: atp.Status=candidate atp.recommendedPackage=IamRemoteSubjects			
Base	ARElement , ARObject , AbstractIamRemoteSubject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
acceptedCryptoCipherSuiteWithPsk	TlsCryptoCipherSuite	*	ref	This reference is used to identify a remote node by means of the preshared Key. Tags: atp.Status=candidate
acceptedRemoteCertificate	CryptoServiceCertificate	*	ref	This reference is used to identify a remote node by means of the certificate. Tags: atp.Status=candidate
certCommonName	String	0..1	attr	This attribute defines the common name (CN) of the certificate of the remote peer. Tags: atp.Status=candidate
derivedCertificateAccepted	Boolean	0..1	attr	This attribute defines whether a derivedCertificate is accepted (true) or not (false). Tags: atp.Status=candidate
iamRelevantTlsSecureComProps	TlsSecureComProps	*	ref	This reference defines the local <code>TlsSecureComProps</code> that are relevant for IAM. Tags: atp.Status=candidate

Table 3.184: TlsIamRemoteSubject

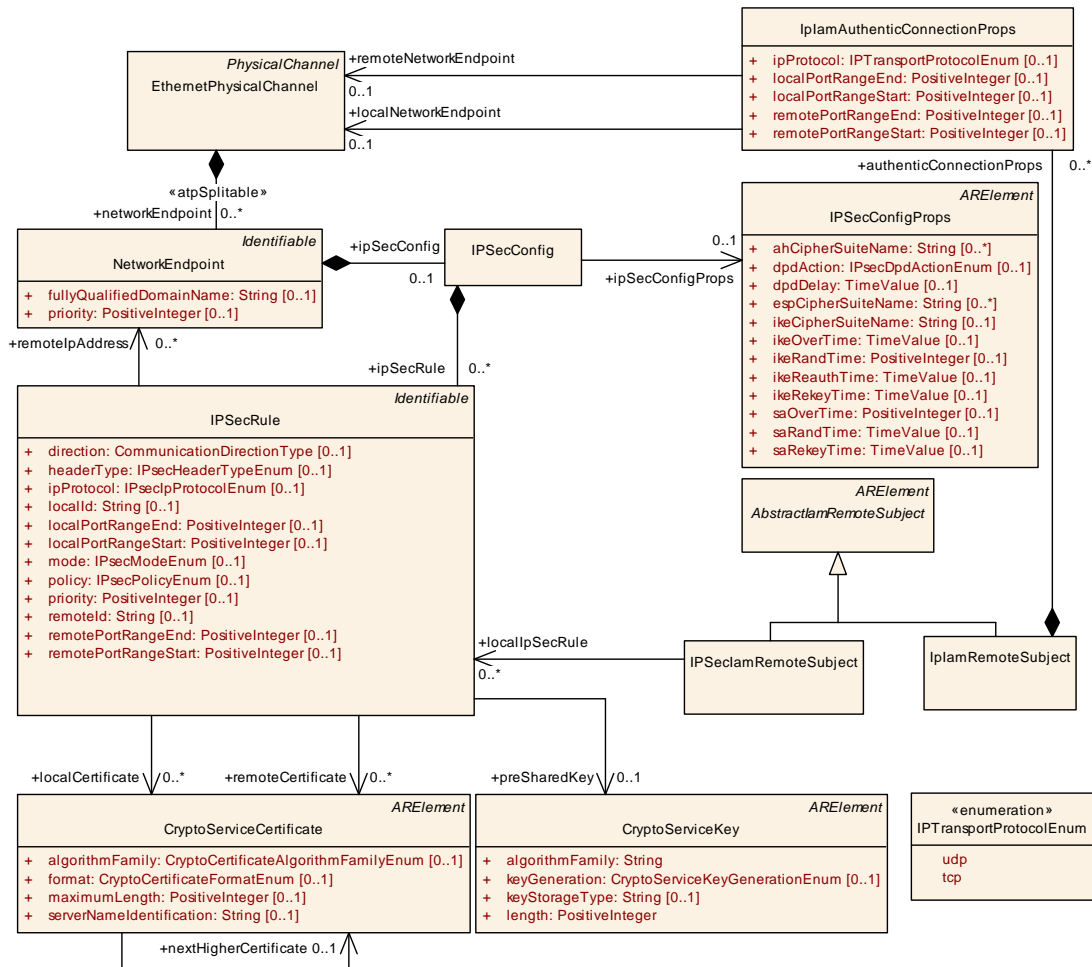
3.22.3.2 Remote subject in case of IPsec

This chapter defines how a `AbstractIamRemoteSubject` is modeled in case of a IPsec-based secure channel.

[TPS_MANI_03242]{DRAFT} **Modeling of a remote peer in case of IPsec-based secure channel** [In case of IPsec-based secure channel the remote peer is modeled as `IPSecIamRemoteSubject` that is identified by `IPSecRules` that are referenced by `localIpSecRule`. The `IPSecRules` define all secure connections that the remote peer is allowed to establish.] ([RS_MANI_00036](#), [RS_MANI_00060](#))

Please note that the local IP Address of the remote peer is defined by the `NetworkEndpoint` that aggregates the `IPSecRules`.

Class	IPSecIamRemoteSubject			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SCREIAM			
Note	This meta-class defines the proxy information about the remote node in case of IPsec. Tags: atp.Status=candidate atp.recommendedPackage=IamRemoteSubjects			
Base	ARElement, ARObject, AbstractIamRemoteSubject, CollectableElement, Identifiable, Multilanguage Referrable, PackageableElement, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
localIpSecRule	IPSecRule	*	ref	This reference is used to describe theRemoteSubjects local IPsecRules. Tags: atp.Status=candidate

Table 3.185: IPSecIamRemoteSubject

Figure 3.105: Proxy information about the remote node in case of IPsec

3.22.3.3 Remote subject in case of IP communication

Please note that it is possible to define a [AbstractIamRemoteSubject](#) that is based on the general IP communication. In this case no details about how the communication is secured are given and actually securing the communication (e.g., cryptographically, via hardware mechanism, or appropriate network and switch design) is not part of the model. A [IpIamRemoteSubject](#) is identified by a combination of a local and a remote IP address, local and remote port ranges, and a transport protocol.

[TPS_MANI_03244]{DRAFT} Modeling of a remote peer in case of a general IP communication [In case of a general IP communication the remote peer is modeled as [IpIamRemoteSubject](#) that is identified by the [NetworkEndpoint](#) that is referenced by the [localNetworkEndpoint](#) reference. The defined remote peer is allowed to establish IP connections to the [remoteNetworkEndpoint](#) over the [ip-Protocol](#) and the defined local port range and remote port range.] ([RS_MANI_00060](#))

Class	IplamRemoteSubject			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SCREIAM			
Note	This meta-class defines the proxy information about the remote node in case of general IP communication. Tags: atp.Status=candidate atp.recommendedPackage=IamRemoteSubjects			
Base	ARElement , ARObject , AbstractIamRemoteSubject , CollectableElement , Identifiable , Multilanguage , Referrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
authentic Connection Props	IplamAuthenticConnectionProps	*	aggr	Definition of IP rules assigned to the IplamRemote Subject. Tags: atp.Status=candidate

Table 3.186: IplamRemoteSubject

Class	IplamAuthenticConnectionProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SCREIAM			
Note	This meta-class defines a set of properties for IP connections in the context of IAM configuration. Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	IplamRemoteSubject.authenticConnectionProps			
Attribute	Type	Mult.	Kind	Note
ipProtocol	IPTransportProtocol Enum	0..1	attr	This attribute defines the relevant IP protocol. Tags: atp.Status=candidate
localNetwork Endpoint	EthernetPhysicalChannel	0..1	ref	This reference defines an authentic local Network Endpoint in terms of IAM configuration. Tags: atp.Status=candidate
localPortRange End	PositiveInteger	0..1	attr	This attribute restricts the traffic monitoring and defines an end value for the local port range. Tags: atp.Status=candidate





Class	IplamAuthenticConnectionProps			
localPortRangeStart	PositiveInteger	0..1	attr	This attribute restricts the traffic monitoring and defines a start value for the local port range. Tags: atp.Status=candidate
remoteNetworkEndpoint	EthernetPhysicalChannel	0..1	ref	This reference defines an authentic remote Network Endpoint in terms of IAM configuration. Tags: atp.Status=candidate
remotePortRangeEnd	PositiveInteger	0..1	attr	This attribute restricts the traffic monitoring and defines an end value for the remote port range. Tags: atp.Status=candidate
remotePortRangeStart	PositiveInteger	0..1	attr	This attribute restricts the traffic monitoring and defines a start value for the remote port range. Tags: atp.Status=candidate

Table 3.187: IplamAuthenticConnectionProps

3.22.3.4 Remote subject in case of SecOC communication

The identity information in the case of SecOC depends on the group of [Machines](#) that are sharing the same cryptographic key.

In other words, if a valid SecOC message is received with a given key it is given that only remote [Machines](#) that “know the key” were able to send the message. The key is associated with a DataId and defines the “object” in the access control model. If a message received for a given DataId cannot be validated, then it will be dropped. Therefore, the access control between the remote subject and local object is taking place.

To summarize, the modeling of a Remote subject in case of SecOC cannot provide additional benefit neither by increasing the granularity of the subject identification nor providing new enforcement of rules on the object.

4 Diagnostic Design

4.1 Diagnostic Mapping

4.1.1 Overview

The configuration of diagnostics on the *AUTOSAR adaptive platform* will typically be done by creating a Diagnostic Extract by means of the Diagnostic Extract Template [2] that is also used on the *AUTOSAR classic platform*.

Therefore, concepts within the Diagnostic Extract should be similarly applicable to models on both platforms uniformly.

It can even be safely expected that a given Diagnostic Extract can be divided into parts that apply for ECUs build on top of the *AUTOSAR classic platform* and parts that apply to ECUs built on top of the *AUTOSAR adaptive platform* that all belong to the same vehicle.

In terms of applicability to this document, the part of the Diagnostic Extract that is relevant in this context is the mapping between the definition of information related to diagnostic protocol content and the application software.

In order to exemplify the approach, the diagram depicted in Figure 4.1 describes a very simplistic situation where two different `P`PortPrototypes typed by possibly two different `DiagnosticDataIdentifierInterface` exposed by an `AdaptiveApplicationSwComponentType` is accessed by the AUTOSAR Adaptive Diagnostic Management on the *AUTOSAR adaptive platform* with the purpose of accessing an entire DID.

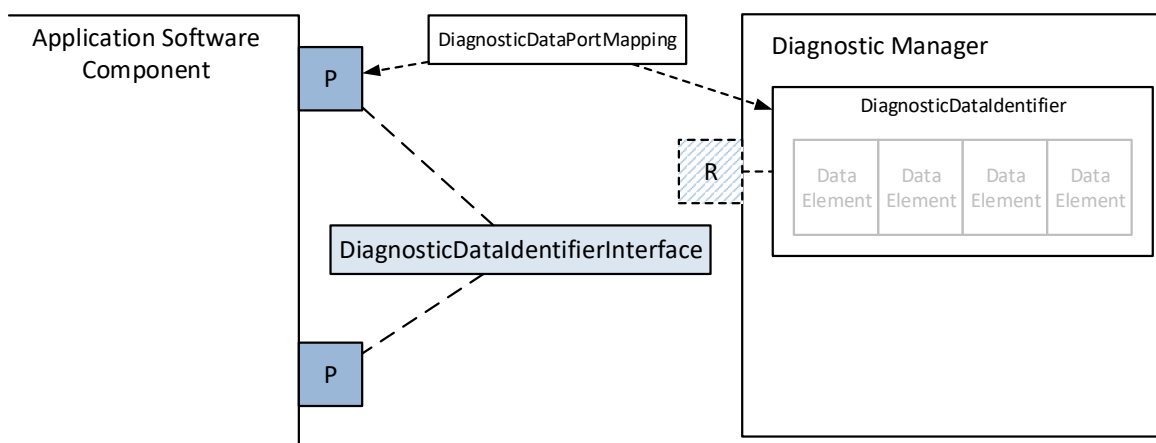


Figure 4.1: Example data exchange for diagnostic purpose

In particular, a subclass of `DiagnosticSwMapping` (in this specific case: `DiagnosticDataPortMapping`) formalizes the “connection” between both ends of the communication.

Class	<i>DiagnosticSwMapping</i> (abstract)			
Package	M2::AUTOSARTemplates::DiagnosticExtract::DiagnosticMapping			
Note	This represents the ability to define a mapping between a diagnostic information (at this point there is no way to become more specific about the semantics) to a software-component.			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	DiagnosticAuthenticationPortMapping , DiagnosticClearConditionPortMapping , DiagnosticDataPortMapping , DiagnosticEnableConditionPortMapping , DiagnosticEventPortMapping , DiagnosticExternalAuthenticationPortMapping , DiagnosticFimFunctionMapping , DiagnosticIndicatorPortMapping , DiagnosticMemoryDestinationPortMapping , DiagnosticMonitorPortMapping , DiagnosticOperationCyclePortMapping , DiagnosticSecurityLevelPortMapping , DiagnosticServiceDataMapping , DiagnosticServiceGenericMapping , DiagnosticServiceSwMapping , DiagnosticServiceValidationMapping , DiagnosticSovdAuthorizationPortMapping , DiagnosticSovdProximityChallengePortMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 4.1: DiagnosticSwMapping

A further kind of mapping that is necessary to enable diagnostics on the *AUTOSAR adaptive platform* comes with slightly more complexity.

In this case use-cases are implemented that may or may not involve several communication ends (in the form of [PortPrototypes](#)).

Class	DiagnosticDataIdentifier			
Package	M2::AUTOSARTemplates::DiagnosticExtract::CommonDiagnostics			
Note	This meta-class represents the ability to model a diagnostic data identifier (DID) that is fully specified regarding the payload at configuration-time. Tags: atp.recommendedPackage=DiagnosticDataIdentifiers			
Base	ARElement , ARObject , CollectableElement , DiagnosticAbstractDataIdentifier , DiagnosticCommonElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataElement	DiagnosticParameter	*	aggr	This is the dataElement associated with the Diagnostic DataIdentifier. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataElement.bitOffset, dataElement.ident.shortName, dataElement.variationPoint.shortLabel vh.latestBindingTime=postBuild
didSize	PositiveInteger	0..1	attr	This attribute indicates the size in bytes of the Diagnostic DataIdentifier.
representsVin	Boolean	0..1	attr	This attributes indicates whether the specific Diagnostic DataIdentifier represents the vehicle identification.
supportInfoByte	DiagnosticSupportInfoByte	0..1	aggr	This attribute represents the supported information associated with the DiagnosticDataIdentifier.

Table 4.2: DiagnosticDataIdentifier

The response to this situation on the *AUTOSAR classic platform* has been the definition of the [SwcServiceDependency](#) that allows for associating several [PortPrototypes](#) in specific roles to a given use-case.

On the other hand, there is a clear difference between the design of `PortInterfaces` for diagnostic usage on the *AUTOSAR classic platform* (where generic `ClientServerInterfaces`, `SenderReceiverInterfaces`, and `ModeSwitchInterfaces` are used) and the *AUTOSAR adaptive platform* (where the `PortInterfaces` are specifically tailored to the respective diagnostic use case).

In other words, if specifically tailored `PortInterfaces` were used, the need for an “umbrella” that defines the scope of the modeling of a given service use case would be drastically reduced.

On top of that, the usage of the `InstanceSpecifier` as the element of identification is strictly bound to the `PortPrototype` rather than the `SwcServiceDependency`. In other words, the diagnostic management uses `<<instanceRef>>`s to identify the “endpoint” in the application software.

The `<<instanceRef>>` and the corresponding `InstanceSpecifier` are strongly related to each other. If one is known the other can be deduced. The consequence of this conclusion is that it would be possible to configure the diagnostic management in the presence of mappings to the application software model that itself does not have to be accessible at the time of creating the configuration of diagnostic management.

This means that an `<<instanceRef>>` originating from a subclass of `DiagnosticSwMapping` needs to have an additional decoration in the form of the stereotype `<<atpUriDef>>`.

Please note that the mapping targets¹ within a set of diagnostic mappings may exist in several instances at run-time.

This kind of multiple instantiation is formalized by the existence of meta-class `Process` (which in turn is represented by meta-class `ProcessDesign` on design level), see chapter 3.21.

It is very typical that different instances of a piece of application software could require a different diagnostic mapping and the modeling needs to accommodate to this requirement, i.e. a relation between a diagnostic mapping and the `ProcessDesign` needs to be established.

[constr_10002]{DRAFT} Only one mapping per `PortPrototype` [If one instance of the following sub-classes of `DiagnosticSwMapping` – that refers to a given `ProcessDesign` – refers to a `PortPrototype`, then no other instance of `DiagnosticSwMapping` that refers to the same `ProcessDesign` shall refer to the same `PortPrototype`:

- `DiagnosticEventPortMapping` that is associated with a `RPortPrototype` typed by a `DiagnosticMonitorInterface` or a `DiagnosticEventInterface`.
- `DiagnosticOperationCyclePortMapping` that is associated with a `RPortPrototype` typed by a `DiagnosticOperationCycleInterface`.

¹on the end of the application software

- `DiagnosticEnableConditionPortMapping` that is associated with a `RPortPrototype` typed by a `DiagnosticConditionInterface`.
- `DiagnosticClearConditionPortMapping` that is associated with a `RPortPrototype` typed by a `DiagnosticConditionInterface`.
- `DiagnosticIndicatorPortMapping` that is associated with a `RPortPrototype` typed by a `DiagnosticIndicatorInterface`.
- `DiagnosticMemoryDestinationPortMapping` that is associated with an `RPortPrototype` typed by a `DiagnosticDTCInformationInterface`.
- `DiagnosticSecurityLevelPortMapping` that is associated with an `PPortPrototype` typed by a `DiagnosticSecurityLevelInterface`.
- `DiagnosticDataPortMapping` that is associated with a `PPortPrototype` typed by a `DiagnosticDataIdentifierInterface`.
- `DiagnosticSecurityLevelPortMapping` that is associated with a `PPortPrototype` typed by a `DiagnosticSecurityLevelInterface`.
- `DiagnosticServiceValidationMapping` that is associated with a `PPortPrototype` typed by a `DiagnosticServiceValidationInterface`.

]()

The rationale for the existence of `[constr_10002]` is that the respective `PortPrototype` has a clearly defined functionality. For example, it can only provide the content of one DID, but it cannot provide the content of an arbitrary number of DIDs.

For such a case, the `DiagnosticServiceGenericMapping` (see section 4.1.12) shall be applied.

Please note the `[constr_10002]` does not apply to the `DiagnosticServiceGenericMapping`, i.e. a `PortPrototype` that is not subject to `[constr_10002]` can be referenced by multiple `DiagnosticServiceGenericMapping`.

In other words, the ability for several `DiagnosticServiceGenericMappings` to refer to the same `PortPrototype` is what makes the `DiagnosticServiceGenericMapping` *generic*.

In addition, `[constr_10002]` is intentionally not applied for `PPortPrototypes` typed by `DiagnosticDataElementInterface` because the operations executed in such context are stateless and can therefore be called from several clients without restrictions.

4.1.2 Diagnostic Monitor to Port Mapping

[TPS_MANI_01351]{DRAFT} Reporting the status of a `DiagnosticEvent` on the *AUTOSAR adaptive platform* [For the purpose of reporting the status of a diagnostic event on the *AUTOSAR adaptive platform*, the relation between a `DiagnosticEvent`

and one `RPortPrototypes` is created by using the `DiagnosticMonitorPortMapping` that refers to

- a `DiagnosticEvent` in the role `diagnosticEvent`,
- a `ProcessDesign` in the role `process`, and
- an `RPortPrototype` typed by a `DiagnosticMonitorInterface` in the role `rPortPrototypeInExecutable`. The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding `InstanceSpecifier` that the `PortPrototype` will use at run-time.

]([RS_MANI_00005](#), [RS_MANI_00061](#))

Class	DiagnosticMonitorPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	Defines to which SWC service port the Diagnostic Monitor is mapped. Tags: atp.recommendedPackage=DiagnosticPortMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
diagnosticEvent	DiagnosticEvent	0..1	ref	Reference to the <code>DiagnosticEvent</code> that is assigned to SWC service ports.
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process
rPortPrototype InExecutable	RPortPrototype	0..1	iref	This aggregation allows for the usage of the <code>DiagnosticMonitorPortMapping</code> on the AUTOSAR adaptive platform. Stereotypes: atpUriDefInstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 4.3: DiagnosticMonitorPortMapping

The use case that supports the reporting of a diagnostic event is depicted in Figure 4.2.

[constr_10047]{DRAFT} Restriction for the applicability of `DiagnosticMonitorPortMapping` [If an `RPortPrototype` is referenced by a `DiagnosticMonitorPortMapping`, then the `RPortPrototype` shall be typed by a `DiagnosticMonitorInterface`.]()

[constr_10048]{DRAFT} Existence of reference from `DiagnosticMonitorPortMapping` to `DiagnosticEvent` [Each `DiagnosticEvent` shall only be referenced by exactly one `DiagnosticMonitorPortMapping`.]()

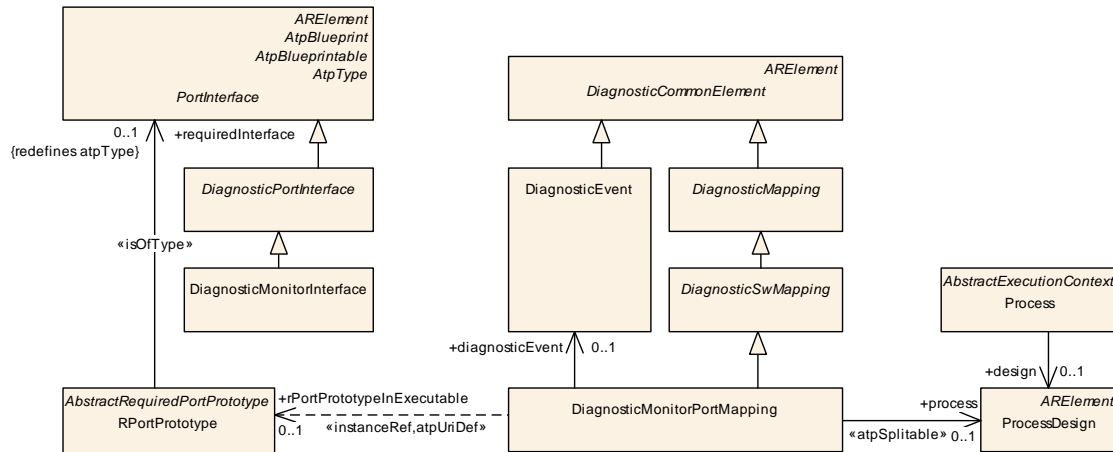


Figure 4.2: Modeling of `DiagnosticMonitorPortMapping` for reporting the status of diagnostic events on the AUTOSAR adaptive platform

Class	DiagnosticEvent			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dem::DiagnosticEvent			
Note	This element is used to configure DiagnosticEvents. Tags: atp.recommendedPackage=DiagnosticEvents			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
associated Event Identification	PositiveInteger	0..1	attr	This attribute represents the identification number that is associated with the enclosing DiagnosticEvent and allows to identify it when placed into a snapshot record or extended data record storage. This value can be reported as internal data element in snapshot records or extended data records.
clearEvent Allowed Behavior	DiagnosticClearEvent AllowedBehaviorEnum	0..1	attr	This attribute defines the resulting UDS status byte for the related event, which shall not be cleared according to the ClearEventAllowed callback
confirmation Threshold	PositiveInteger	0..1	attr	This attribute defines the number of operation cycles with a failed result before a confirmed DTC is set to 1. The semantic of this attribute is a by "1" increased value compared to the confirmation threshold of the "trip counter" mentioned in ISO 14229-1 in figure D.4. A value of "1" defines the immediate confirmation of the DTC along with the first reported failed. This is also sometimes called "zero trip DTC". A value of "2" defines a DTC confirmation in the operation cycle after the first occurred failed. A value of "2" is typically used in the US for OBD DTC confirmation. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime
connected Indicator	DiagnosticConnected Indicator	*	aggr	Event specific description of Indicators. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=connectedIndicator.shortName, connectedIndicator.variationPoint.shortLabel vh.latestBindingTime=postBuild





Class	DiagnosticEvent			
prestorage FreezeFrame	Boolean	0..1	attr	This attribute describes whether the Prestorage of Freeze Frames is supported by the assigned event or not. True: Prestorage of FreezeFrames is supported False: Prestorage of FreezeFrames is not supported
prestored FreezeFrame StoredInNvm	Boolean	0..1	attr	If the Event uses a prestored freeze-frame (using the operations PrestoreFreezeFrame and ClearPrestored FreezeFrame of the service interface DiagnosticMonitor) this attribute indicates if the Event requires the data to be stored in non-volatile memory. TRUE = Dem shall store the prestored data in non-volatile memory, FALSE = Data can be lost at shutdown (not stored in Nvm)
recoverableIn SameOperation Cycle	Boolean	0..1	attr	If the attribute is set to true then reporting PASSED will reset the indication of a failed test in the current operation cycle. If the attribute is set to false then reporting PASSED will be ignored and not lead to a reset of the indication of a failed test.

Table 4.4: DiagnosticEvent

4.1.3 Diagnostic Event to Port Mapping

[TPS_MANI_01048]{DRAFT} **Retrieving the status of a [DiagnosticEvent](#) to [PortPrototype\(s\)](#) on the *AUTOSAR adaptive platform*** [For the purpose of reporting the status of a diagnostic event on the *AUTOSAR adaptive platform*, the relation between a [DiagnosticEvent](#) and one [RPortPrototypes](#) is created by using the [DiagnosticEventPortMapping](#) that refers to

- a [DiagnosticEvent](#) in the role [diagnosticEvent](#),
- a [ProcessDesign](#) in the role [process](#), and
- an [RPortPrototype](#) typed by a [DiagnosticEventInterface](#) in the role [rPortPrototypeInExecutable](#). The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding [InstanceSpecifier](#) that the [PortPrototype](#) will use at run-time.

]([RS_MANI_00005](#), [RS_MANI_00061](#))

[constr_10049]{DRAFT} **Restriction for the applicability of [DiagnosticEvent-PortMapping](#)** [If an [RPortPrototype](#) is referenced by a [DiagnosticEvent-PortMapping](#), then the [RPortPrototype](#) shall be typed by a [DiagnosticEventInterface](#).]()

The use case that supports the retrieval of information about a diagnostic event is depicted in Figure 4.3.

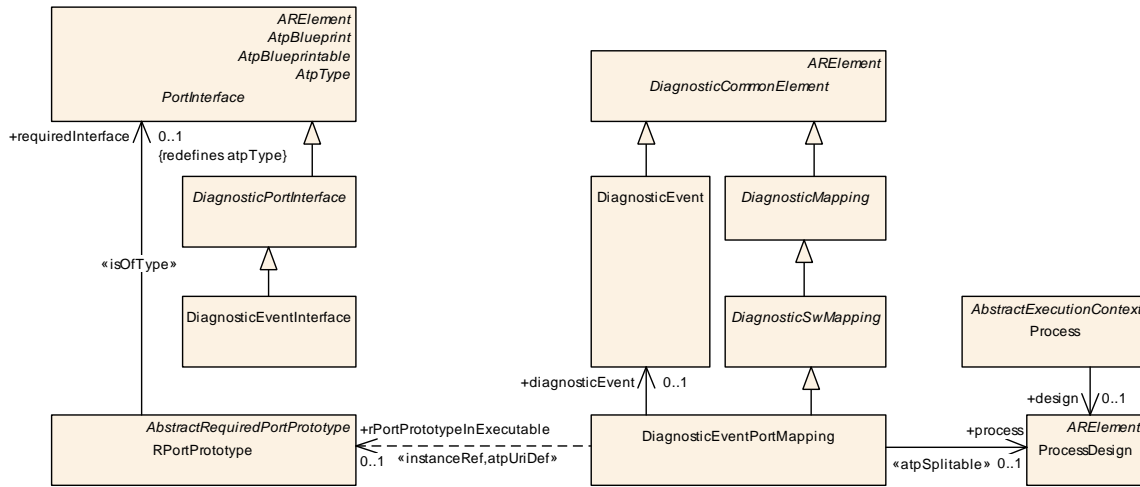


Figure 4.3: Modeling of `DiagnosticEventPortMapping` to retrieve information about a diagnostic event on the *AUTOSAR adaptive platform*

Class	DiagnosticEventPortMapping			
Package	M2::AUTOSARTemplates::DiagnosticExtract::DiagnosticMapping			
Note	Defines to which SWC service ports with DiagnosticEventInfoNeeds the DiagnosticEvent is mapped. Tags: atp.recommendedPackage=DiagnosticMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
diagnosticEvent	DiagnosticEvent	0..1	ref	Reference to the DiagnosticEvent that is assigned to SWC service ports with DiagnosticEventInfoNeeds.
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process atp.Status=draft
rPortPrototypeInExecutable	RPortPrototype	0..1	iref	This aggregation allows for the usage of the DiagnosticEventPortMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDef Tags: atp.Status=draft InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 4.5: DiagnosticEventPortMapping

4.1.4 Diagnostic Operation Cycle to Port Mapping

[TPS_MANI_01049]{DRAFT} Mapping of [DiagnosticOperationCycle](#) to [Port-Prototype\(s\)](#) on the *AUTOSAR adaptive platform* [On the *AUTOSAR adaptive platform*, the relation between a [DiagnosticOperationCycle](#) and one [RPortPrototype](#) is created by using the [DiagnosticOperationCyclePortMapping](#) that refers to

- a `DiagnosticOperationCycle` in the role `operationCycle`,
- a `ProcessDesign` in the role `process`, and
- an `RPortPrototype` typed by a `DiagnosticOperationCycleInterface` in the role `rPortPrototypeInExecutable`. The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding `InstanceSpecifier` that the `PortPrototype` will use at run-time.

](RS_MANI_00005, RS_MANI_00061)

[constr_10050]{DRAFT} Restriction for the applicability of `DiagnosticOperationCyclePortMapping` [If an `RPortPrototype` is referenced by a `DiagnosticOperationCyclePortMapping`, then the `RPortPrototype` shall be typed by a `DiagnosticOperationCycleInterface`.]()

[constr_10051]{DRAFT} Existence of reference from `DiagnosticOperationCyclePortMapping` to `DiagnosticOperationCycle` [Each `DiagnosticOperationCycle` shall only be referenced by exactly one `DiagnosticOperationCyclePortMapping`.]()

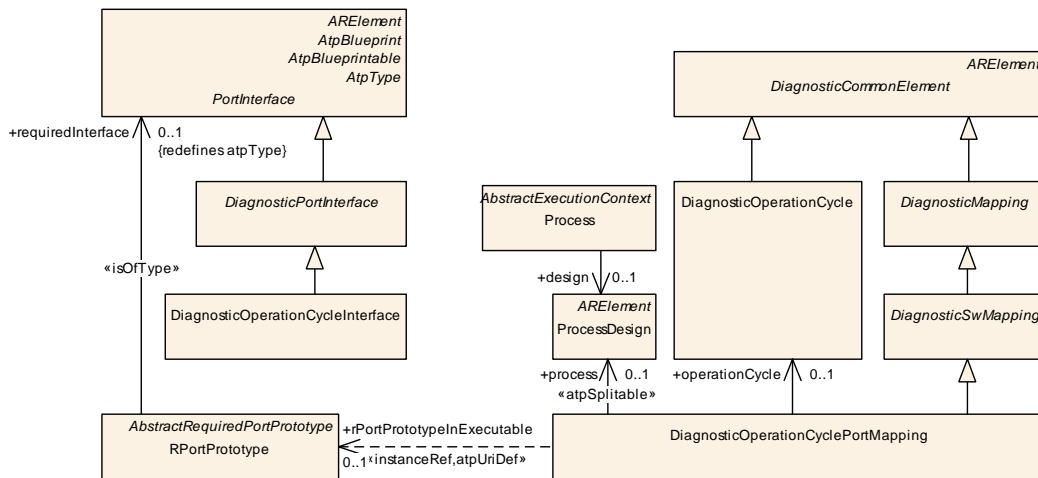


Figure 4.4: Modeling of `DiagnosticOperationCyclePortMapping` for the usage on the AUTOSAR adaptive platform

Class	DiagnosticOperationCycle			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dem::DiagnosticOperationCycle			
Note	Definition of an operation cycle that is the base of the event qualifying and for Dem scheduling. Tags: atp.recommendedPackage=DiagnosticOperationCycles			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
type	DiagnosticOperationCycleTypeEnum	0..1	attr	Operation cycles types for the Dem.

Table 4.6: DiagnosticOperationCycle

Class	DiagnosticOperationCyclePortMapping			
Package	M2::AUTOSARTemplates::DiagnosticExtract::DiagnosticMapping			
Note	Defines to which SWC service ports with DiagnosticOperationCycleNeeds the DiagnosticOperationCycle is mapped. Tags: atp.recommendedPackage=DiagnosticMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
operationCycle	DiagnosticOperationCycle	0..1	ref	Reference to the DiagnosticOperationCycle that is assigned to SWC service ports with DiagnosticOperationCycleNeeds.
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplittable Tags: atp.Splitkey=process atp.Status=draft
rPortPrototypeInExecutable	RPortPrototype	0..1	iref	This aggregation allows for the usage of the DiagnosticOperationCyclePortMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDef Tags: atp.Status=draft InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 4.7: DiagnosticOperationCyclePortMapping

4.1.5 Diagnostic Enable Condition to Port Mapping

[TPS_MANI_01050]{DRAFT} Mapping of [DiagnosticEnableCondition](#) to [PortPrototype\(s\)](#) on the *AUTOSAR adaptive platform* [On the *AUTOSAR adaptive platform*, the relation between a [DiagnosticEnableCondition](#) and one [RPortPrototype](#) is created by using the [DiagnosticEnableCondition-PortMapping](#) that refers to

- a [DiagnosticEnableCondition](#) in the role [enableCondition](#),
- a [ProcessDesign](#) in the role [process](#), and
- an [RPortPrototype](#) typed by a [DiagnosticConditionInterface](#) in the role [rPortPrototypeInExecutable](#). The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding [InstanceSpecifier](#) that the [PortPrototype](#) will use at run-time.

]([RS_MANI_00005](#), [RS_MANI_00061](#))

[constr_10052]{DRAFT} Restriction for the applicability of DiagnosticEnableConditionPortMapping [If an RPortPrototype is referenced by a DiagnosticEnableConditionPortMapping, then the RPortPrototype shall be typed by a DiagnosticConditionInterface.]()

[constr_10053]{DRAFT} Existence of reference from DiagnosticEnableConditionPortMapping to DiagnosticEnableCondition [Each DiagnosticEnableCondition shall only be referenced by at most one DiagnosticEnableConditionPortMapping.]()

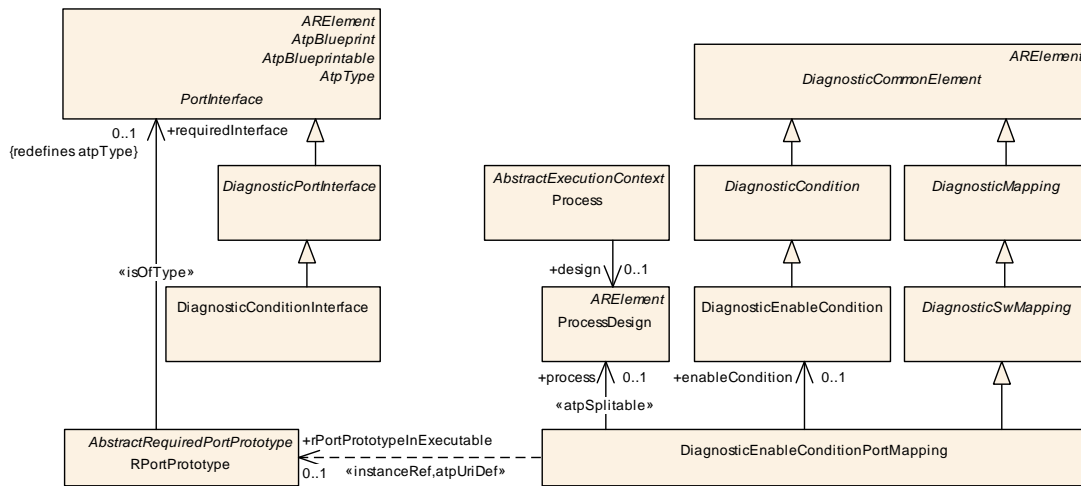


Figure 4.5: Modeling of DiagnosticEnableConditionPortMapping for the usage on the AUTOSAR adaptive platform

Class	DiagnosticEnableCondition			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dem::DiagnosticCondition			
Note	Specification of an enable condition. Tags: atp.recommendedPackage=DiagnosticConditions			
Base	ARElement, ARObjct, CollectableElement, DiagnosticCommonElement, DiagnosticCondition, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 4.8: DiagnosticEnableCondition

Class	DiagnosticEnableConditionPortMapping			
Package	M2::AUTOSARTemplates::DiagnosticExtract::DiagnosticMapping			
Note	Defines to which SWC service ports with DiagnosticEnableConditionNeeds the DiagnosticEnableCondition is mapped. Tags: atp.recommendedPackage=DiagnosticMappings			
Base	ARElement, ARObjct, CollectableElement, DiagnosticCommonElement, DiagnosticMapping, DiagnosticSwMapping, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Aggregated by	ARPackage.element			





Class		DiagnosticEnableConditionPortMapping		
Attribute	Type	Mult.	Kind	Note
enableCondition	DiagnosticEnableCondition	0..1	ref	Reference to the EnableCondition which is mapped to a SWC service port with DiagnosticEnableConditionNeeds.
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process atp.Status=draft
rPortPrototypeInExecutable	RPortPrototype	0..1	iref	This aggregation allows for the usage of the DiagnosticEnableConditionPortMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDef Tags: atp.Status=draft InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 4.9: DiagnosticEnableConditionPortMapping

4.1.6 Diagnostic Clear Condition to Port Mapping

[TPS_MANI_01259]{DRAFT} Mapping of [DiagnosticClearCondition](#) to [Port-Prototype\(s\)](#) on the *AUTOSAR adaptive platform* [On the *AUTOSAR adaptive platform*, the relation between a [DiagnosticClearCondition](#) and one [RPortPrototype](#) is created by using the [DiagnosticClearConditionPortMapping](#) that refers to

- a [DiagnosticClearCondition](#) in the role `clearCondition`,
- a [ProcessDesign](#) in the role `process`, and
- an [RPortPrototype](#) typed by a [DiagnosticConditionInterface](#) in the role `rPortPrototypeInExecutable`. The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding `InstanceSpecifier` that the [PortPrototype](#) will use at run-time.

] ([RS_MANI_00005](#), [RS_MANI_00061](#))

[constr_10054]{DRAFT} **Restriction for the applicability of [DiagnosticClearConditionPortMapping](#)** [If an [RPortPrototype](#) is referenced by a [DiagnosticClearConditionPortMapping](#), then the [RPortPrototype](#) shall be typed by a [DiagnosticConditionInterface](#).]()

[constr_10055]{DRAFT} **Existence of reference from [DiagnosticClearConditionPortMapping](#) to [DiagnosticClearCondition](#)** [Each [DiagnosticClearCondition](#) shall only be referenced by at most one [DiagnosticClearConditionPortMapping](#)]()

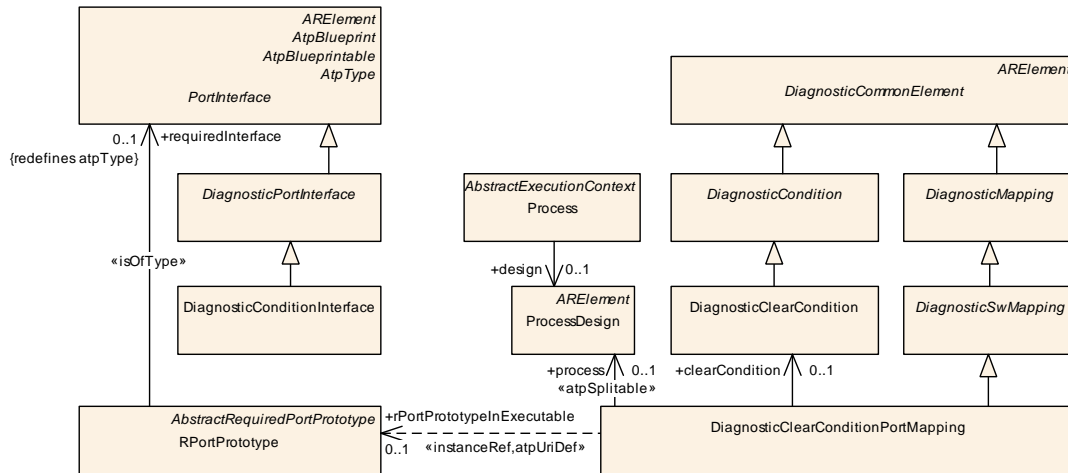


Figure 4.6: Modeling of DiagnosticClearConditionPortMapping for the usage on the AUTOSAR adaptive platform

Class	DiagnosticClearConditionPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	Defines to which SWC service ports with DiagnosticsClearConditionNeeds the DiagnosticClearCondition is mapped. Tags: atp.recommendedPackage=DiagnosticMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
clearCondition	DiagnosticClearCondition	0..1	ref	Reference to the ClearCondition which is mapped to a SWC service port with DiagnosticClearConditionNeeds.
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplittable Tags: atp.Splitkey=process
rPortPrototype InExecutable	RPortPrototype	0..1	iref	This aggregation allows for the usage of the DiagnosticClearConditionMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDefInstanceRef implemented by: RPortPrototypeInExecutable

Table 4.10: DiagnosticClearConditionPortMapping

[constr_10162]{DRAFT} Multiplicity of reference in the role [DiagnosticClearConditionPortMapping.clearCondition](#) [For each [DiagnosticClearConditionPortMapping](#), the reference in the role [clearCondition](#) shall exist **at the time when the diagnostic design is complete.**]()

4.1.7 Diagnostic Indicator to Port Mapping

[TPS_MANI_01260]{DRAFT} Mapping of [DiagnosticIndicator](#) to [PortPrototype\(s\)](#) on the *AUTOSAR adaptive platform* [On the *AUTOSAR adaptive platform*,

the relation between a `DiagnosticIndicator` and one `RPortPrototype` is created by using the `DiagnosticIndicatorPortMapping` that refers to

- a `DiagnosticIndicator` in the role `indicator`,
- a `ProcessDesign` in the role `process`, and
- an `RPortPrototype` typed by a `DiagnosticIndicatorInterface` in the role `rPortPrototypeInExecutable`. The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding `InstanceSpecifier` that the `PortPrototype` will use at run-time.

](RS_MANI_00005, RS_MANI_00061)

[constr_10056]{DRAFT} Restriction for the applicability of `DiagnosticIndicatorPortMapping` [If an `RPortPrototype` is referenced by a `DiagnosticIndicatorPortMapping`, then the `RPortPrototype` shall be typed by a `DiagnosticIndicatorInterface`.]()

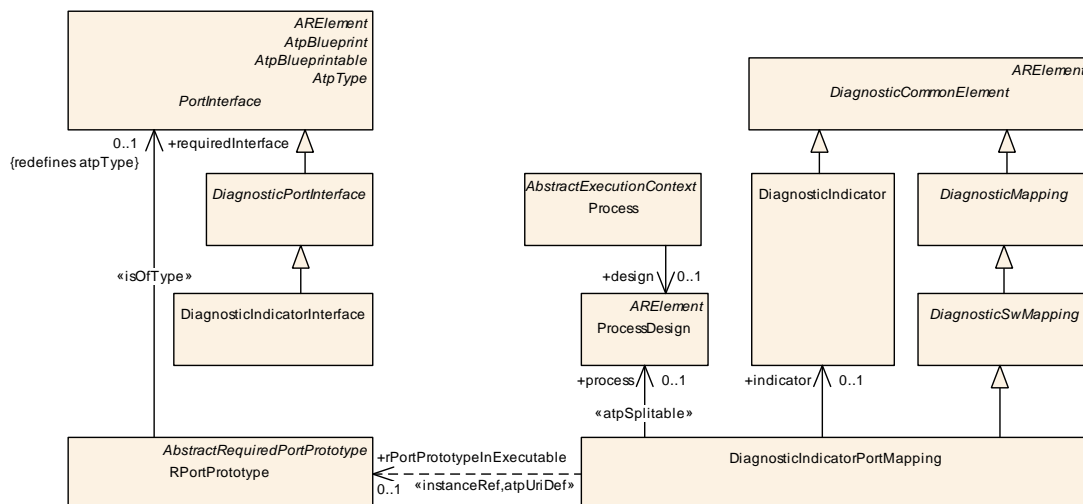


Figure 4.7: Modeling of `DiagnosticIndicatorPortMapping` for the usage on the AUTOSAR adaptive platform

Class	DiagnosticIndicatorPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	Defines to which SWC service ports with <code>DiagnosticIndicatorNeeds</code> the <code>DiagnosticIndicator</code> is mapped. Tags: atp.recommendedPackage=DiagnosticMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
indicator	DiagnosticIndicator	0..1	ref	Reference to the <code>DiagnosticIndicator</code> which is mapped to a SWC service port with <code>DiagnosticIndicatorNeeds</code> .





Class	DiagnosticIndicatorPortMapping			
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplittable Tags: atp.Splitkey=process
rPortPrototype InExecutable	RPortPrototype	0..1	iref	This aggregation allows for the usage of the Diagnostic IndicatorMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDefInstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 4.11: DiagnosticIndicatorPortMapping

[constr_10163]{DRAFT} Multiplicity of reference in the role [DiagnosticIndicatorPortMapping.indicator](#) [For each [DiagnosticIndicatorPortMapping](#), the reference in the role `indicator` shall exist **at the time when the diagnostic design is complete.**.]()

4.1.8 Diagnostic Memory Destination to Port Mapping

[TPS_MANI_01261]{DRAFT} Mapping of [DiagnosticMemoryDestination](#) to [PortPrototype\(s\)](#) on the *AUTOSAR adaptive platform* [On the *AUTOSAR adaptive platform*, the relation between a [DiagnosticMemoryDestination](#) and one [RPortPrototype](#) is created by using the [DiagnosticMemoryDestinationPortMapping](#) that refers to

- a [DiagnosticMemoryDestination](#) in the role `memoryDestination`,
- a [ProcessDesign](#) in the role `process`, and
- an [RPortPrototype](#) typed by a [DiagnosticDTCInformationInterface](#) in the role `rPortPrototypeInExecutable`. The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding `InstanceSpecifier` that the [PortPrototype](#) will use at run-time.

]([RS_MANI_00005](#), [RS_MANI_00061](#))

[constr_10057]{DRAFT} Restriction for the applicability of [DiagnosticMemoryDestinationPortMapping](#) [If an [RPortPrototype](#) is referenced by a [DiagnosticMemoryDestinationPortMapping](#), then the [RPortPrototype](#) shall be typed by a [DiagnosticDTCInformationInterface](#).]()

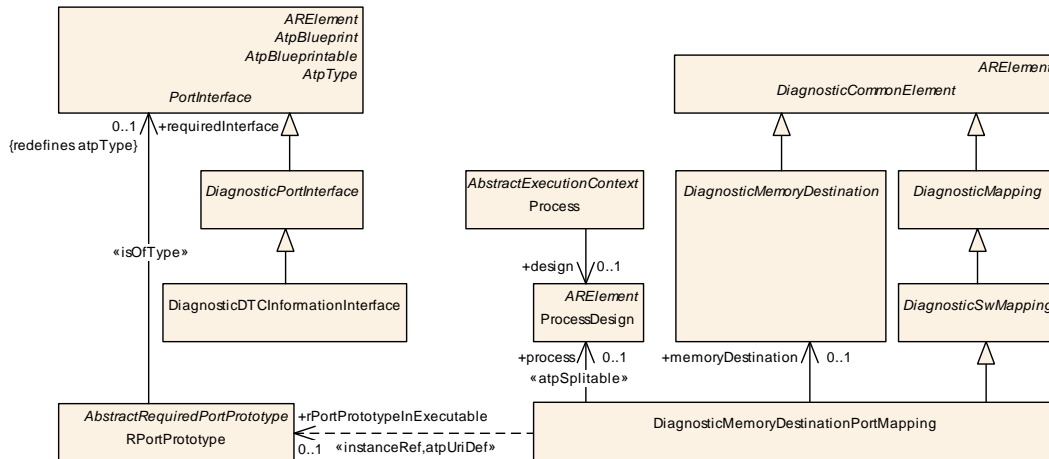


Figure 4.8: Modeling of `DiagnosticMemoryDestinationPortMapping` for the usage on the AUTOSAR adaptive platform

Class	<code>DiagnosticMemoryDestinationPortMapping</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	Defines to which SWC service ports with <code>DiagnosicsEventInfoNeeds</code> the <code>DiagnosticMemoryDestination</code> is mapped. Tags: atp.recommendedPackage=DiagnosticMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
memory Destination	DiagnosticMemory Destination	0..1	ref	Reference to the MemoryDestination which is mapped to a SWC service port with <code>DiagnosticEventInfoNeeds</code> .
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process
rPortPrototype InExecutable	RPortPrototype	0..1	iref	This aggregation allows for the usage of the <code>DiagnosticMemoryDestinationMapping</code> on the AUTOSAR adaptive platform. Stereotypes: atpUriDefInstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 4.12: DiagnosticMemoryDestinationPortMapping

[constr_10164]{DRAFT} Multiplicity of reference in the role `DiagnosticMemoryDestinationPortMapping.memoryDestination` [For each `DiagnosticMemoryDestinationPortMapping`, the reference in the role `memoryDestination` shall exist **at the time when the diagnostic design is complete.**]()

Class	DiagnosticMemoryDestination (abstract)			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dem::DiagnosticMemoryDestination			
Note	This abstract meta-class represents a possible memory destination for a diagnostic event.			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	DiagnosticMemoryDestinationPrimary, DiagnosticMemoryDestinationUserDefined			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
agingRequiresTestedCycle	Boolean	0..1	attr	Defines whether the aging cycle counter is processed every aging cycles or else only tested aging cycle are considered. If the attribute is set to TRUE: only tested aging cycle are considered for aging cycle counter. If the attribute is set to FALSE: aging cycle counter is processed every aging cycle.
clearDtcLimitation	DiagnosticClearDtcLimitationEnum	0..1	attr	Defines the scope of the DEM_ClearDTC Api.
dtcStatusAvailabilityMask	PositiveInteger	0..1	attr	Mask for the supported DTC status bits by the Dem.
eventDisplacementStrategy	DiagnosticEventDisplacementStrategyEnum	0..1	attr	This attribute defines, whether support for event displacement is enabled or not, and which displacement strategy is followed.
maxNumberOfEventEntries	PositiveInteger	0..1	attr	This attribute fixes the maximum number of event entries in the fault memory.
memoryEntryStorageTrigger	DiagnosticMemoryEntryStorageTriggerEnum	0..1	attr	Describes the trigger to allocate an event memory entry.
statusBitHandlingTestFailedSinceLastClear	DiagnosticStatusBitHandlingTestFailedSinceLastClearEnum	0..1	attr	This attribute defines, whether the aging and displacement mechanism shall be applied to the "TestFailedSinceLastClear" status bits.
statusBitStorageTestFailed	Boolean	0..1	attr	This parameter is used to activate/deactivate the permanent storage of the "TestFailed" status bits. true: storage activated false: storage deactivated
typeOfFreezeFrameRecordNumeration	DiagnosticTypeOfFreezeFrameRecordNumerationEnum	0..1	attr	This attribute defines the type of assigning freeze frame record numbers for event-specific freeze frame records.

Table 4.13: DiagnosticMemoryDestination

4.1.9 Diagnostic Security to Port Mapping

[TPS_MANI_01262]{DRAFT} Mapping of **DiagnosticSecurityLevel** to **Port-Prototype(s)** on the **AUTOSAR adaptive platform** [On the **AUTOSAR adaptive platform**, the relation between a **DiagnosticSecurityLevel** and one **Port-Prototype** is created by using the **DiagnosticSecurityLevelPortMapping** that refers to

- a **DiagnosticSecurityLevel** in the role **securityLevel**,
- a **ProcessDesign** in the role **process**, and

- an `PPortPrototype` typed by a `DiagnosticSecurityLevelInterface` in the role `pPortPrototypeInExecutable`. The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding `InstanceSpecifier` that the `PortPrototype` on the application layer will use at run-time.

](RS_MANI_00005, RS_MANI_00061)

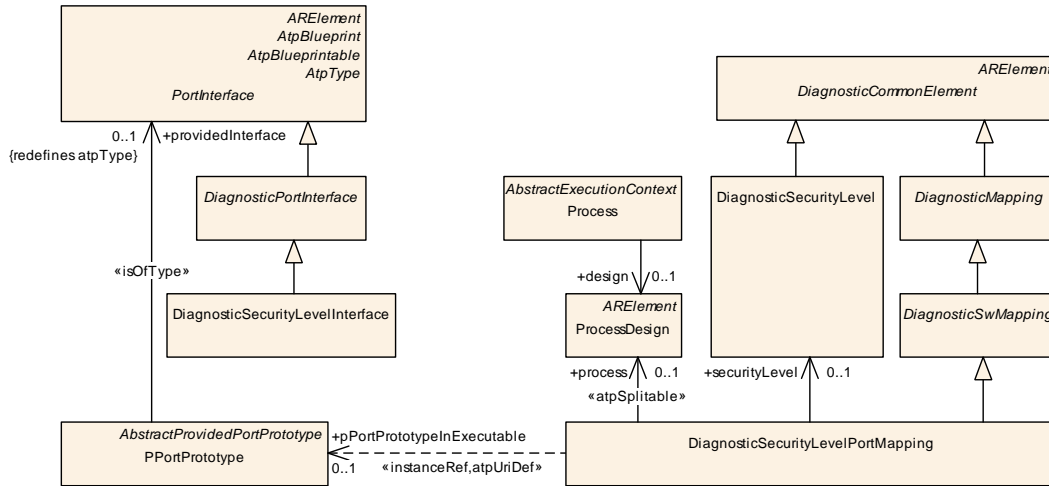


Figure 4.9: Modeling of `DiagnosticSecurityLevelPortMapping` for the usage on the AUTOSAR adaptive platform

[constr_10058]{DRAFT} **Restriction for the applicability of `DiagnosticSecurityLevelPortMapping`** [If a `PPortPrototype` is referenced by a `DiagnosticSecurityLevelPortMapping`, then the `PPortPrototype` shall be typed by a `DiagnosticSecurityLevelInterface`.]()

[constr_10059]{DRAFT} **Existence of reference from `DiagnosticSecurityLevelPortMapping` to `DiagnosticSecurityLevel`** [Each `DiagnosticSecurityLevel` shall only be referenced by exactly one `DiagnosticSecurityLevelPortMapping`.]()

Class	DiagnosticSecurityLevelPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	Defines to which SWC service ports with <code>DiagnosticsCommunicationSecurityNeeds</code> the <code>DiagnosticSecurityLevel</code> is mapped. Tags: atp.recommendedPackage=DiagnosticMappings			
Base	<code>ARElement</code> , <code>ARObject</code> , <code>CollectableElement</code> , <code>DiagnosticCommonElement</code> , <code>DiagnosticMapping</code> , <code>DiagnosticSwMapping</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PackageableElement</code> , <code>Referrable</code>			
Aggregated by	<code>ARPackage.element</code>			
Attribute	Type	Mult.	Kind	Note





Class	DiagnosticSecurityLevelPortMapping			
pPortPrototype InExecutable	PPortPrototype	0..1	iref	This aggregation allows for the usage of the Diagnostic SecurityLevelMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDefInstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process
securityLevel	DiagnosticSecurityLevel	0..1	ref	Reference to the SecurityLevelwhich is mapped to a SWC service port with DiagnosticCommunicationSecurity Needs.

Table 4.14: DiagnosticSecurityLevelPortMapping

Class	DiagnosticSecurityLevel			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm			
Note	This meta-class represents the ability to define a security level considered for diagnostic purposes. Tags: atp.recommendedPackage=DiagnosticSecurityLevels			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , Multilanguage Referrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
accessData RecordSize	PositiveInteger	0..1	attr	This represents the size of the AccessDataRecord used in GetSeed. Unit:byte.
keySize	PositiveInteger	0..1	attr	This represents the size of the security key. Unit: byte.
numFailed SecurityAccess	PositiveInteger	0..1	attr	This represents the number of failed security accesses after which the delay time is activated.
securityDelay Time	TimeValue	0..1	attr	This represents the delay time after a failed security access. Unit: second.
seedSize	PositiveInteger	0..1	attr	This represents the size of the security seed. Unit: byte.

Table 4.15: DiagnosticSecurityLevel

4.1.10 Diagnostic Data Identifier to Port Mapping

The DM on the *AUTOSAR adaptive platform* has the ability to access entire [DiagnosticDataIdentifiers](#) at once. For supporting this ability, a dedicated mapping class named [DiagnosticDataPortMapping](#) is introduced.

[TPS_MANI_01263]{DRAFT} Mapping of [DiagnosticDataIdentifier](#) or [DiagnosticDataElement](#) to [PortPrototype\(s\)](#) on the *AUTOSAR adaptive platform*
 [On the *AUTOSAR adaptive platform*, the relation between a [DiagnosticDataIdentifier](#) resp. [DiagnosticDataElement](#) and one [PPortPrototype](#) is created by using the [DiagnosticDataPortMapping](#) that refers to either

- a [DiagnosticDataIdentifier](#) in the role [diagnosticDataIdentifier](#) or

- a [DiagnosticDataElement](#) in the role [diagnosticDataElement](#).

]([RS_MANI_00005](#), [RS_MANI_00061](#))

Class	DiagnosticDataElement			
Package	M2::AUTOSARTemplates::DiagnosticExtract::CommonDiagnostics			
Note	This meta-class represents the ability to describe a concrete piece of data to be taken into account for diagnostic purposes.			
Base	ARObject , DiagnosticServiceMappingDiagTarget , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	DiagnosticAbstractParameter.dataElement			
Attribute	Type	Mult.	Kind	Note
arraySize Semantics	ArraySizeSemantics Enum	0..1	attr	This attribute controls the meaning of the value of the array size.
maxNumberOf Elements	PositiveInteger	0..1	attr	The existence of this attribute turns the data instance into an array of data. The attribute determines the size of the array in terms of how many elements the array can take.
scalingInfoSize	PositiveInteger	0..1	attr	Size in bytes of scaling information for the DiagnosticDataElement if used with DiagnosticReadScalingDataByIdentifier
swDataDef Props	SwDataDefProps	0..1	aggr	This property allows to specify data definition properties in order to support the definition of e.g. computation formulae and data constraints. Stereotypes: atpSplitable Tags: atp.Splitkey=swDataDefProps

Table 4.16: DiagnosticDataElement

As depicted in Figure 4.10, [DiagnosticDataPortMapping](#) has the ability to handle access to **either** an entire DID **or** to just an element of a DID.

Therefore, the existence of [[constr_10003](#)] is required to enforce that just one of the references is actually used for any given [DiagnosticDataPortMapping](#).

[[constr_10003](#)]{DRAFT} Restriction for the existence of [DiagnosticDataPortMapping.diagnosticDataIdentifier](#) vs. [DiagnosticDataPortMapping.diagnosticDataElement](#) [For each [DiagnosticDataPortMapping](#), **either** the reference in the role [diagnosticDataIdentifier](#) **or** [diagnosticDataElement](#) shall exist.]()

[[constr_10060](#)]{DRAFT} PortInterface of [PPortPrototype](#) referenced by [DiagnosticDataPortMapping](#) [Any particular [PPortPrototype](#) that is referenced in the role [DiagnosticDataPortMapping.pPortPrototypeInExecutable](#) shall be typed by either of

- [DiagnosticDataIdentifierInterface](#)
- [DiagnosticDataElementInterface](#)
- [DiagnosticDataIdentifierGenericInterface](#)

]()

[constr_10061]{DRAFT} Mapping to [DiagnosticDataIdentifierInterface](#), [DiagnosticDataElementInterface](#), or [DiagnosticDataIdentifierGenericInterface](#) [All [PPortPrototype](#)s typed by either

- [DiagnosticDataIdentifierInterface](#)
- [DiagnosticDataElementInterface](#)
- [DiagnosticDataIdentifierGenericInterface](#)

shall **only** be referenced by a [DiagnosticDataPortMapping](#). No other subclass of [DiagnosticSwMapping](#) is eligible for this purpose.](/)

[TPS_MANI_01347]{DRAFT} Definition of a [DiagnosticDataElement](#) used in the context of a DID obtained from a [PPortPrototype](#) typed by a [DiagnosticDataElementInterface](#) [If a [DiagnosticDataElement](#) is aggregated by a [DiagnosticParameter](#) that in turn is aggregated by a [DiagnosticDataIdentifier](#) and the [DiagnosticDataElement](#) is also referenced by a [DiagnosticDataPortMapping](#) then the referenced [DiagnosticDataElement](#) (by way of [SwDataDefProps](#)) shall refer to a [SwBaseType](#) with attribute [baseTypeSize](#) set to either

- 8,
- 16, or
- 32

and attribute [baseTypeEncoding](#) set to either

- NONE (for 8, 16, or 32 bit) or
- 2C (for 8, 16, or 32 bit) or
- IEEE754 (for 32 bit).

In this case it is only possible to define the [DiagnosticDataElement](#) as a scalar or an array (see [TPS_DEXT_01001], [TPS_DEXT_01002]). The ability to define a [Variable-Size Array](#) shall only be used for the last element of the DID.]([RS_MANI_00061](#))

[TPS_MANI_01348]{DRAFT} Definition of a [DiagnosticDataElement](#) used in the context of a DID obtained from a [PPortPrototype](#) typed by a [DiagnosticDataIdentifierInterface](#) [If a [DiagnosticDataIdentifier](#) is referenced by a [DiagnosticDataPortMapping](#) then the aggregated [DiagnosticDataIdentifier.dataElement.dataElement](#) (by way of [SwDataDefProps](#)) shall refer to a [SwBaseType](#) with attribute [baseTypeSize](#) set to either

- 8,
- 16, or
- 32

and attribute `baseTypeEncoding` set to either

- NONE (for 8, 16, or 32 bit) or
- 2C (for 8, 16, or 32 bit) or
- IEEE754 (for 32 bit).

In this case it is only possible to define the `DiagnosticDataElement` as a scalar or an array (see [TPS_DEXT_01001], [TPS_DEXT_01002]). The ability to define a Variable-Size Array shall only be used for the last element of the DID. (RS-MANI_00061)

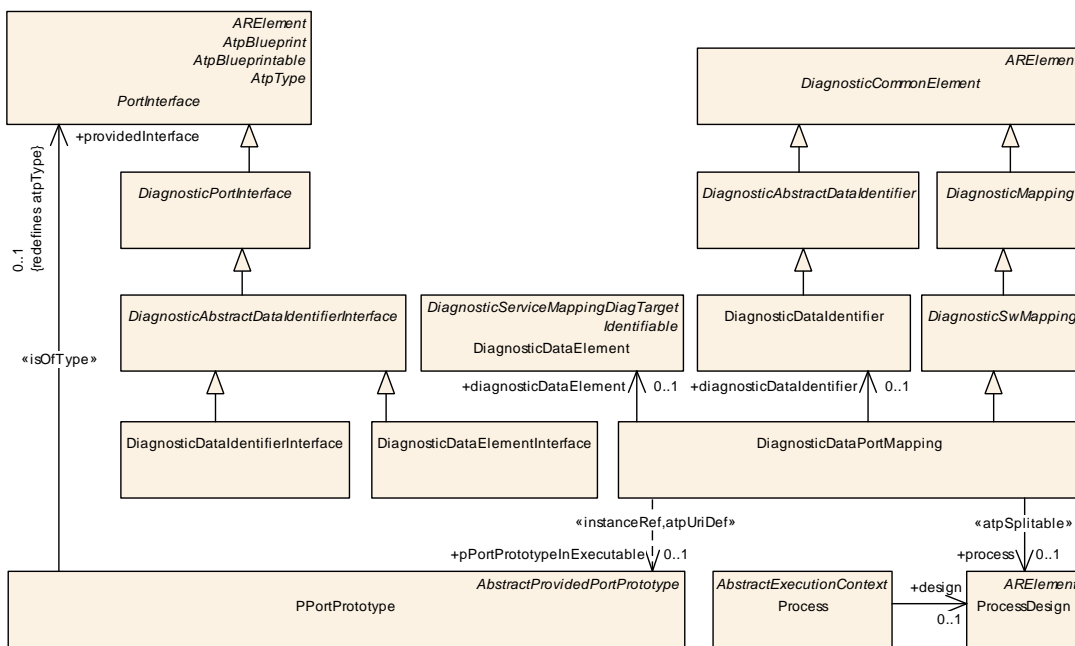


Figure 4.10: Modeling of `DiagnosticDataPortMapping` for the usage on the AUTOSAR adaptive platform

Class	DiagnosticDataPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	This meta-class provides the ability to define a diagnostic access to an entire DID. Tags: atp.recommendedPackage=DiagnosticServiceMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
diagnosticData Element	DiagnosticDataElement	0..1	ref	This reference represents the applicable DiagnosticData Element.
diagnosticData Identifier	DiagnosticDataIdentifier	0..1	ref	This reference represents the applicable DiagnosticData Identifier.





Class	DiagnosticDataPortMapping			
pPortPrototype InExecutable	PPortPrototype	0..1	iref	This reference identifies the applicable PPortPrototype from which that data is obtained. The reference has the ability to point into the component hierarchy (under possible consideration of the rootSoftwareComposition). Stereotypes: atpUriDefInstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process

Table 4.17: DiagnosticDataPortMapping

[constr_10165]{DRAFT} Multiplicity of reference in the role [DiagnosticDataPortMapping.process](#) [For each [DiagnosticDataPortMapping](#), the reference in the role `process` shall exist **at the time when the diagnostic design is complete.**.]()

4.1.11 Diagnostic Generic UDS Service Handler to Port Mapping

It is possible to associate a collection of UDS services to a given [PPortPrototype](#) with the intention that the [PPortPrototype](#) can handle the associated services.

By creating a dedicated association between generic UDS handlers and the services they can take it is possible to use multiple generic UDS handlers and let each take only the associated services.

Technically, a possible alternative to the documented modeling of generic UDS handling would be to avoid the mapping at all and foresee the existence of a catch-all generic UDS handler.

This, to a large extent, contradicts the idea of having modular software installations on the basis of the definition of [SoftwareClusters](#) (see section 15.2).

4.1.12 Diagnostic Generic Mapping

[TPS_MANI_01326]{DRAFT} Generic Mapping to a [DiagnosticServiceInstance](#) on the AUTOSAR Adaptive Platform [On the AUTOSAR adaptive platform, the relation between a [DiagnosticServiceInstance](#) and one [PPortPrototype](#) for select diagnostic services is created by using the meta-class [DiagnosticServiceGenericMapping](#) that refers to

- a [DiagnosticServiceInstance](#) in the role `diagnosticServiceInstance`,
- the [PPortPrototype](#) in the role `pPortPrototypeInExecutable`, and

- a `ProcessDesign` in the role `process`.

|(RS_MANI_00005, RS_MANI_00061)

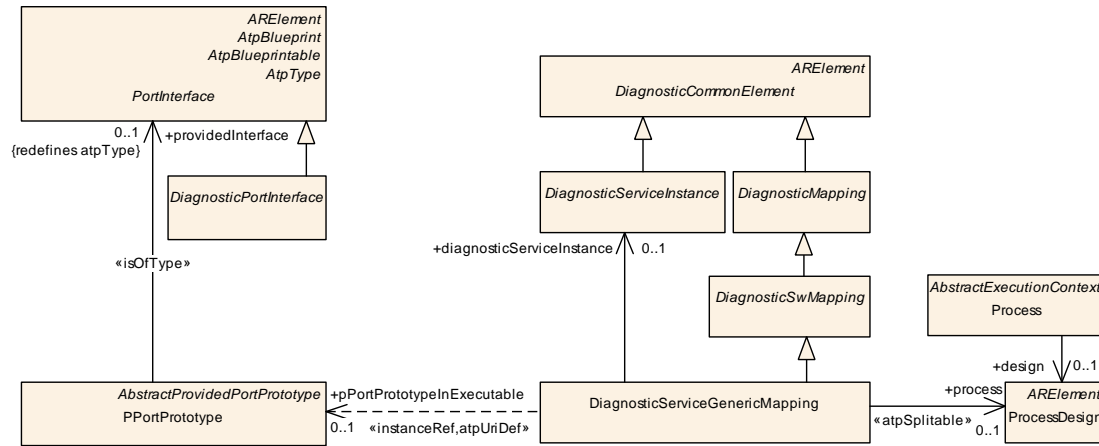


Figure 4.11: Modeling of the diagnostic generic mapping

[constr_10062]{DRAFT} **DiagnosticServiceInstances** that can be mapped by a **DiagnosticServiceGenericMapping** [DiagnosticServiceGenericMapping shall only be used for the following list of DiagnosticServiceInstances:

- DiagnosticEcuReset
- DiagnosticComControl
- DiagnosticRoutineControl
- DiagnosticCustomServiceInstance
- DiagnosticRequestUpload
- DiagnosticRequestDownload
- DiagnosticRequestFileTransfer

]|()

Please note that services `DiagnosticDataTransfer` and `DiagnosticTransfer-Exit` are mapped dynamically according to the UDS request sequence for upload and download.

Class	DiagnosticEcuReset			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::EcuReset			
Note	This represents an instance of the "ECU Reset" diagnostic service. Tags: atp.recommendedPackage=DiagnosticEcuResets			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class		DiagnosticEcuReset		
customSubFunctionNumber	PositiveInteger	0..1	attr	This attribute shall be used to define a custom sub-function number if none of the standardized values of category shall be used.
ecuResetClass	DiagnosticEcuResetClass	0..1	ref	This reference substantiates that abstract reference in the role serviceClass for this specific concrete class. Thereby, the reference represents the ability to access shared attributes among all DiagnosticEcuReset in the given context.

Table 4.18: DiagnosticEcuReset

Class		DiagnosticComControl		
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::CommunicationControl			
Note	This represents an instance of the "Communication Control" diagnostic service. Tags: atp.recommendedPackage=DiagnosticCommunicationControls			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
comControlClass	DiagnosticComControlClass	0..1	ref	This reference substantiates that abstract reference in the role serviceClass for this specific concrete class. Thereby, the reference represents the ability to access shared attributes among all DiagnosticComControl in the given context.
customSubFunctionNumber	PositiveInteger	0..1	attr	This attribute shall be used to define a custom sub-function number if none of the standardized values of category shall be used.

Table 4.19: DiagnosticComControl

Class		DiagnosticRoutineControl		
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::RoutineControl			
Note	This represents an instance of the "Routine Control" diagnostic service. Tags: atp.recommendedPackage=DiagnosticRoutineControls			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
routine	DiagnosticRoutine	0..1	ref	This refers to the applicable DiagnosticRoutine.
routineControlClass	DiagnosticRoutineControlClass	0..1	ref	This reference substantiates that abstract reference in the role serviceClass for this specific concrete class. Thereby, the reference represents the ability to access shared attributes among all DiagnosticRoutineControl in the given context.

Table 4.20: DiagnosticRoutineControl

Class	DiagnosticCustomServiceInstance			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::CustomServiceInstance			
Note	This meta-class has the ability to define an instance of a custom diagnostic service. Tags: atp.recommendedPackage=DiagnosticCustomInstances			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
customServiceClass	DiagnosticCustomServiceClass	0..1	ref	Reference to the corresponding DiagnosticCustomServiceClass.

Table 4.21: DiagnosticCustomServiceInstance

Class	DiagnosticRequestUpload			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::MemoryByAddress			
Note	This represents an instance of the "Request Upload" diagnostic service. Tags: atp.recommendedPackage=DiagnosticMemoryByAdresss			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMemoryAddressableRangeAccess , DiagnosticMemoryByAddress , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
requestUploadClass	DiagnosticRequestUploadClass	0..1	ref	This reference substantiates that abstract reference in the role serviceClass for this specific concrete class. Thereby, the reference represents the ability to access shared attributes among all DiagnosticRequestUpload in the given context.

Table 4.22: DiagnosticRequestUpload

Class	DiagnosticRequestDownload			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::MemoryByAddress			
Note	This represents an instance of the "Request Download" diagnostic service. Tags: atp.recommendedPackage=DiagnosticMemoryByAdresss			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMemoryAddressableRangeAccess , DiagnosticMemoryByAddress , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
requestDownloadClass	DiagnosticRequestDownloadClass	0..1	ref	This reference substantiates that abstract reference in the role serviceClass for this specific concrete class. Thereby, the reference represents the ability to access shared attributes among all DiagnosticRequestDownload in the given context.

Table 4.23: DiagnosticRequestDownload

Class	DiagnosticServiceGenericMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	This meta-class represents the ability to implement a generic generic mapping for select diagnostics services on the adaptive platform. Tags: atp.recommendedPackage=DiagnosticServiceMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
diagnostic ServiceInstance	DiagnosticServiceInstance	0..1	ref	Reference to the ServiceInstance mapped to a SWC service port.
pPortPrototype InExecutable	PPortPrototype	0..1	iref	This aggregation allows for the usage of the Diagnostic ServiceGenericMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDefInstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process

Table 4.24: DiagnosticServiceGenericMapping

Class	DiagnosticRequestFileTransfer			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::RequestFileTransfer			
Note	This diagnostic service instance implements the UDS service 0x38. Tags: atp.recommendedPackage=DiagnosticRequestFileTransfers			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
requestFile TransferClass	DiagnosticRequestFileTransferClass	0..1	ref	This reference substantiates that abstract reference in the role serviceClass for this specific concrete class. Thereby, the reference represents the ability to access shared attributes among all DiagnosticRequestFile Transfer in the given context.

Table 4.25: DiagnosticRequestFileTransfer

4.1.13 Diagnostic Service Validation Mapping

[TPS_MANI_01352]{DRAFT} Definition of [DiagnosticServiceValidationMapping](#) [On the *AUTOSAR adaptive platform*, meta-class [DiagnosticServiceValidationMapping](#) exists to indicate that the referenced [PPortPrototype](#) is used for the execution of a manufacturer-specific or supplier-specific check prior to the execution of a diagnostic service.

The number of [PPortPrototypes](#) that implement such a checking routine is arbitrary and the order in which the individual checks are executed is subject to a decision made on deployment level.

This is the main reason why the `DiagnosticServiceValidationMapping` (beside the reference to the `ProcessDesign`) has no reference into another design object in the context of the DEXT. `] (RS_MANI_00005, RS_MANI_00061)`

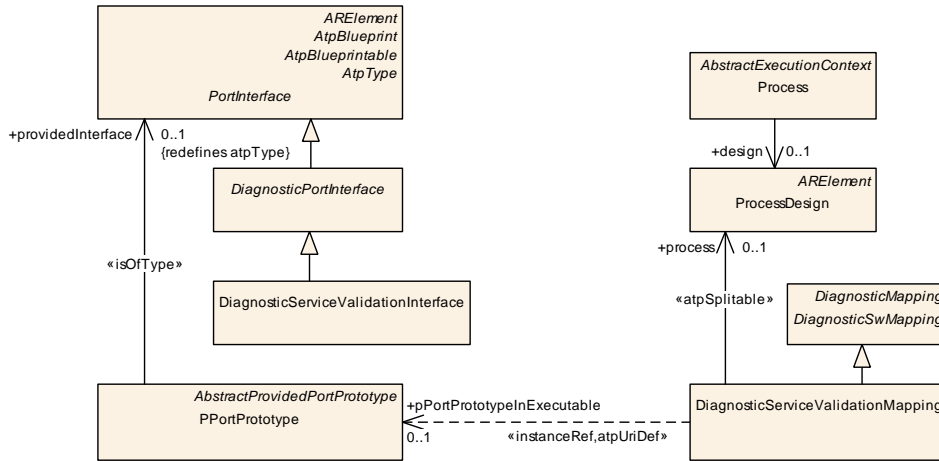


Figure 4.12: Modeling of the diagnostic validation mapping

[constr_10063]{DRAFT} Possible values for `DiagnosticServiceValidationMapping.category` `] (The value of attribute DiagnosticServiceValidationMapping.category is restricted to the following values:`

MANUFACTURER_VALIDATION The enclosing `DiagnosticServiceValidationMapping` represents a validation defined by the manufacturer.

SUPPLIER_VALIDATION The enclosing `DiagnosticServiceValidationMapping` represents a validation defined by the supplier.

`]()`

[constr_10064]{DRAFT} Existence of `DiagnosticServiceValidationMapping.pPortPrototypeInExecutable` `] (A PPortPrototype referenced in the role DiagnosticServiceValidationMapping.pPortPrototypeInExecutable shall be typed by a DiagnosticServiceValidationInterface.]()`

Please note that the final decision about the order in which the validations are executed is decided in the deployment phase, see section 15.2.2.4.

Class	DiagnosticServiceValidationMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	This meta-class provides the ability to specify manufacturer/supplier checks to be executed before diagnostic services can be processed. Tags: atp.recommendedPackage=DiagnosticPortMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	DiagnosticServiceValidationMapping			
pPortPrototype InExecutable	PPortPrototype	0..1	iref	This mapping identifies a PortPrototype typed by a DiagnosticValidationInterface in which a manufacturer/supplier-specific check is executed. Stereotypes: atpUriDefInstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process

Table 4.26: DiagnosticServiceValidationMapping

4.1.14 Diagnostic Authentication Mapping

[TPS_MANI_01360]{DRAFT} Creation of two diagnostic mappings the fulfill different roles in the context of authenticating a diagnostic client [The support for the diagnostic service Authentication (0x29) on the *AUTOSAR adaptive platform* requires the creation of two diagnostic mappings the fulfill different roles in the context of authenticating a diagnostic client:

- The meta-class [DiagnosticAuthenticationPortMapping](#) (described in this section) is used to configure the forwarding of the request for authentication from the DM to some application software that acts as an authentication manager.
- The meta-class [DiagnosticExternalAuthenticationPortMapping](#) is used to convey the authentication state of a diagnostic client to the diagnostic server instance of DM.

]([RS_MANI_00005](#), [RS_MANI_00061](#))

Class	DiagnosticAuthenticationPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	This mapping class identifies the PortPrototype in the application software that handles the client authentication. Tags: atp.recommendedPackage=DiagnosticPortMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
diagnostic Authentication	Diagnostic Authentication	0..1	ref	Reference to the DiagnosticAuthentication that is assigned to a SWC service port.





Class	DiagnosticAuthenticationPortMapping			
pPortPrototype InExecutable	PPortPrototype	0..1	iref	This aggregation allows for the usage of the Diagnostic AuthenticationPortMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDefInstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplittable Tags: atp.Splitkey=process

Table 4.27: DiagnosticAuthenticationPortMapping

Please note that meta-class [DiagnosticExternalAuthenticationPortMapping](#) is described in section 4.1.15.

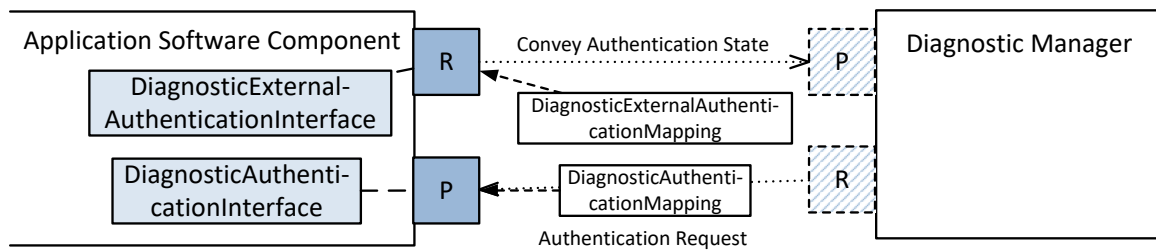


Figure 4.13: Example data exchange for diagnostic authentication

The two different roles mentioned in [TPS_MANI_01360] for the authentication of a diagnostic client are depicted in Figure 4.13.

[TPS_MANI_01361]{DRAFT} **Support the authentication request of a diagnostic client** [For the purpose of supporting the authentication request of a diagnostic client on the *AUTOSAR adaptive platform*, the relation between a [DiagnosticAuthentication](#) and one [PPortPrototype](#) is created by using the [DiagnosticAuthenticationPortMapping](#) that refers to

- a [DiagnosticAuthentication](#) in the role [diagnosticAuthentication](#),
- a [ProcessDesign](#) in the role [process](#), and
- a [PPortPrototype](#) typed by a [DiagnosticAuthenticationInterface](#) in the role [pPortPrototypeInExecutable](#). The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding `InstanceSpecifier` that the [PortPrototype](#) will use at run-time.

]([RS_MANI_00005](#), [RS_MANI_00061](#))

[constr_10093]{DRAFT} Existence of reference from DiagnosticAuthenticationPortMapping to DiagnosticAuthentication [Each DiagnosticAuthentication shall only be referenced by exactly one DiagnosticAuthenticationPortMapping.]()

Class	<i>DiagnosticAuthentication</i> (abstract)			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::Authentication			
Note	This meta-class represents the ability to configure the usage of the UDS service Authentication in the Diagnostic extract.			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>DiagnosticCommonElement</i> , <i>DiagnosticServiceInstance</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>			
Subclasses	DiagnosticAuthenticationConfiguration, DiagnosticDeAuthentication, DiagnosticProofOfOwnership, DiagnosticVerifyCertificateBidirectional, DiagnosticVerifyCertificateUnidirectional			
Aggregated by	<i>ARPackageElement</i>			
Attribute	Type	Mult.	Kind	Note
authentication Class	DiagnosticAuthenticationClass	0..1	ref	This represents the corresponding "class", i.e. this meta-class provides properties that are shared among all instances of applicable sub-classes of DiagnosticService Instance. The subclasses that affected by this pattern implement references to the applicable "class"-role that substantiate this abstract reference.
authentication Timeout	TimeValue	0..1	attr	This attribute defines the time that the authentication state is maintained in default-session if there is no communication from the authenticated client.

Table 4.28: DiagnosticAuthentication

[constr_10111]{DRAFT} Existence of attribute DiagnosticAuthentication.authenticationTimeout [Attribute DiagnosticAuthentication.authenticationTimeout shall exist at the time when the manifest is complete.]()

[constr_10092]{DRAFT} Restriction for the applicability of DiagnosticAuthenticationPortMapping [If a PPortPrototype is referenced by a DiagnosticAuthenticationPortMapping, then the PPortPrototype shall be typed by a DiagnosticAuthenticationInterface]()

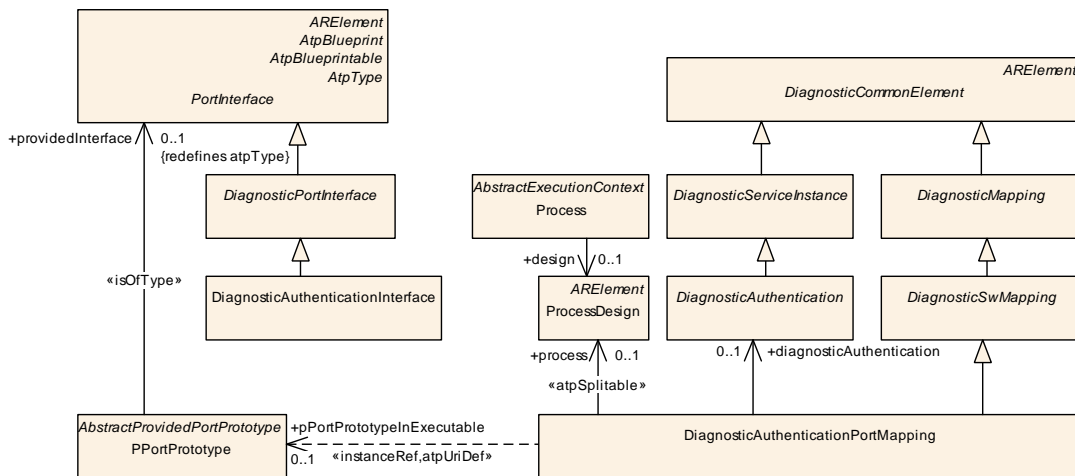


Figure 4.14: Modeling of DiagnosticAuthenticationPortMapping to forward the authentication request of a diagnostic client to an authentication manager

4.1.15 Diagnostic External Authentication Mapping

[TPS_MANI_01362]{DRAFT} **Convey the Authentication state of a diagnostic client to the diagnostic server instance** [For the purpose of conveying the authentication state of a diagnostic client to the diagnostic server instance of DM of a diagnostic client on the *AUTOSAR adaptive platform*, the relation between a *DiagnosticAuthentication* and one *RPortPrototype* is created by using the *DiagnosticExternalAuthenticationPortMapping* that refers to

- a *DiagnosticAuthentication* in the role *diagnosticAuthentication*,
- a *ProcessDesign* in the role *process*, and
- an *RPortPrototype* typed by a *DiagnosticExternalAuthenticationInterface* in the role *rPortPrototypeInExecutable*. The target of this reference does not necessarily have to exist at the time of configuration of the DM. The reference itself, however, is required for constructing the corresponding *InstanceSpecifier* that the *PortPrototype* will use at run-time.

](RS_MANI_00005, RS_MANI_00061)

[constr_10094]{DRAFT} **Restriction for the applicability of *DiagnosticExternalAuthenticationPortMapping*** [If an *RPortPrototype* is referenced by a *DiagnosticExternalAuthenticationPortMapping*, then the *RPortPrototype* shall be typed by a *DiagnosticExternalAuthenticationInterface*]

[constr_10095]{DRAFT} **Existence of reference from *DiagnosticExternalAuthenticationPortMapping* to *DiagnosticAuthentication*** [Each *DiagnosticAuthentication* shall only be referenced by exactly one *DiagnosticExternalAuthenticationPortMapping*.]

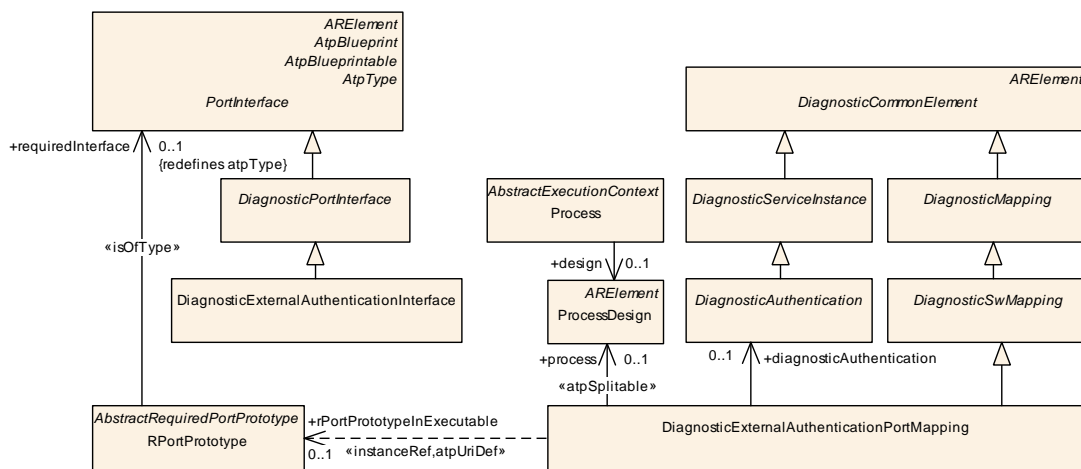


Figure 4.15: Modeling of *DiagnosticExternalAuthenticationPortMapping* to transmit the response to an authentication request back to the DM

Class	DiagnosticExternalAuthenticationPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	This mapping class identifies the PortPrototype in the application software that handles the external authentication. Tags: atp.recommendedPackage=DiagnosticPortMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
diagnostic Authentication	Diagnostic Authentication	0..1	ref	Reference to the DiagnosticAuthentication that is assigned to a SWC service port.
process	ProcessDesign	0..1	ref	Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable. Stereotypes: atpSplitable Tags: atp.Splitkey=process
rPortPrototype InExecutable	RPortPrototype	0..1	iref	This aggregation allows for the usage of the Diagnostic ClientAuthenticationPortMapping on the AUTOSAR adaptive platform. Stereotypes: atpUriDefInstanceRef implemented by: R PortPrototypeInExecutableInstanceRef

Table 4.29: DiagnosticExternalAuthenticationPortMapping

4.2 Diagnostic Clear Condition

On the *AUTOSAR adaptive platform*, a new model element similar [DiagnosticEnableCondition](#) is introduced: [DiagnosticClearCondition](#).

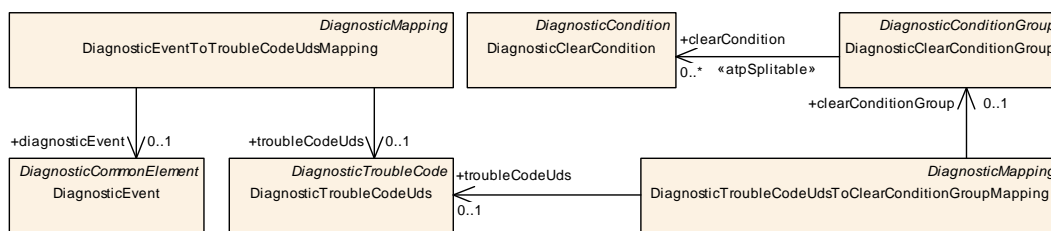


Figure 4.16: Modeling of the diagnostic clear condition

In contrast to [DiagnosticEnableCondition](#), [DiagnosticClearCondition](#) is not mapped to a [DiagnosticEvent](#) but (via the aggregation by [DiagnosticClearConditionGroup](#)) to a [DiagnosticTroubleCodeUds](#).

For this purpose, meta-class [DiagnosticTroubleCodeUdsToClearConditionGroupMapping](#) has been defined.

Class	DiagnosticClearCondition			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticClearCondition			
Note	This meta-class describes a clear condition for diagnostic purposes. Tags: atp.recommendedPackage=DiagnosticConditions			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticCondition , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 4.30: DiagnosticClearCondition

Class	DiagnosticClearConditionGroup			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticClearCondition			
Note	Clear condition group which includes one or several clear conditions. Tags: atp.recommendedPackage=DiagnosticClearConditionGroups			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticConditionGroup , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
clearCondition	DiagnosticClearCondition	*	ref	This aggregation represents the collection of Diagnostic ClearConditions that belong to the DiagnosticClearConditionGroup. Stereotypes: atpSplitable Tags: atp.Splitkey=clearCondition

Table 4.31: DiagnosticClearConditionGroup

Class	DiagnosticTroubleCodeUdsToClearConditionGroupMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticClearCondition			
Note	This meta-class provides the ability to map a DiagnosticClearConditionGroup to a collection of Diagnostic TroubleCodeUds. Tags: atp.recommendedPackage=DiagnosticMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
clearCondition Group	DiagnosticClearConditionGroup	0..1	ref	This reference identifies the applicable DiagnosticClearConditionGroup.
troubleCodeUds	DiagnosticTroubleCodeUds	0..1	ref	This reference identifies the DiagnosticTroubleCodeUds that are relevant for the mapping.

Table 4.32: DiagnosticTroubleCodeUdsToClearConditionGroupMapping

[constr_1658]{DRAFT} Number of [DiagnosticTroubleCodeUdsToClearConditionGroupMapping](#) elements per [DiagnosticTroubleCodeUds](#) [The mapping element [DiagnosticTroubleCodeUdsToClearConditionGroupMapping](#) shall be created no more than once per [DiagnosticTroubleCodeUds](#).

If several `DiagnosticTroubleCodeUdsToClearConditionGroupMapping` elements referring to the same `DiagnosticTroubleCodeUds` are defined, then the Clear Condition Group mapping shall be regarded as defective.] ()

4.3 Security Access

the implementation of the diagnostics manager on the adaptive platform requires a refined modeling of meta-class `DiagnosticSecurityAccessClass`.

A new attribute named `sharedTimer` is introduced that controls whether a single timer is used for all security access levels or whether the individual levels utilize separate timers respectively.

Class	DiagnosticSecurityAccessClass			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::SecurityAccess			
Note	This meta-class contains attributes shared by all instances of the "Security Access" diagnostic service. Tags: atp.recommendedPackage=DiagnosticSecurityAccess			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticServiceClass , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
sharedTimer	Boolean	0..1	attr	Switch between separate or single shared timer instance and timer value. <ul style="list-style-type: none"> • True: use shared timer instance and timer value for all security access levels combined. • False: use separate timer instance and timer values for each security level. Tags: atp.Status=draft

Table 4.33: DiagnosticSecurityAccessClass

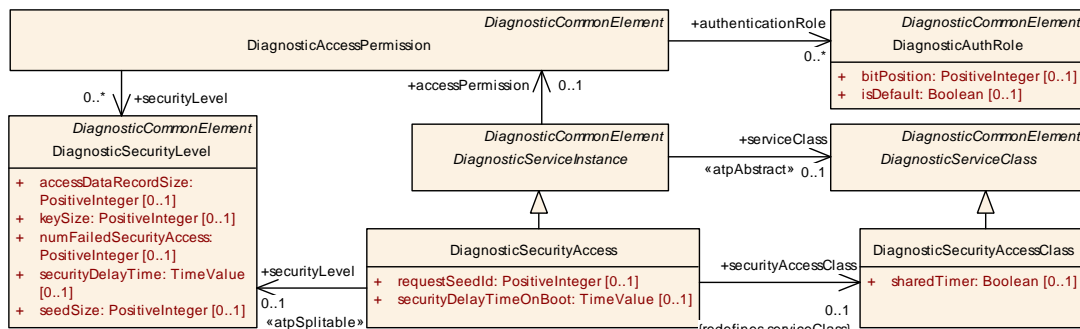


Figure 4.17: Refined modeling of the diagnostic security access

4.4 DiagnosticProvidedDataMapping

[TPS_MANI_01230]{DRAFT} **Semantics of DiagnosticProvidedDataMapping**
[The meta-class `DiagnosticProvidedDataMapping` does not seem to fulfill the condition for representing a mapping class because it only has one reference to a `DiagnosticDataElement` in the role `dataElement`.

However, the specific nature of this mapping is that the second element (the `DiagnosticProvidedDataMapping.dataProvider`) that is supposed to take place in the mapping cannot precisely be modeled as a single meta-class.

Therefore, there is no better way than to model the `DiagnosticProvidedDataMapping.dataProvider` by a `NameToken`.] (*RS_MANI_00005*)

Please note that the list of standardized values of attribute `DiagnosticProvidedDataMapping.dataProvider` is defined in the SWS Diagnostics [20].

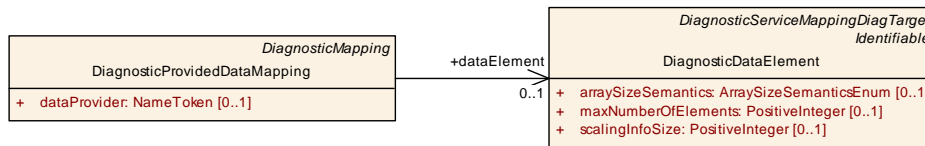


Figure 4.18: Modeling of DiagnosticProvidedDataMapping

Class	DiagnosticProvidedDataMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticProvidedDataMapping			
Note	This represents the ability to define the nature of a data access for a <code>DiagnosticDataElement</code> based on a data provider that cannot be modeled explicitly. Tags: atp.recommendedPackage=DataMappings			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataElement	DiagnosticDataElement	0..1	ref	This represents the <code>DiagnosticDataElement</code> for which the access is further qualified by the <code>DiagnosticProvidedDataMapping.dataProvider</code> .
dataProvider	NameToken	0..1	attr	This represents the ability to further specify the data provider.

Table 4.34: DiagnosticProvidedDataMapping

[constr_10166]{DRAFT} **Multiplicity of attribute DiagnosticProvidedDataMapping.dataProvider** [For each `DiagnosticProvidedDataMapping`, the attribute `dataProvider` shall exist **at the time when the diagnostic design is complete**.]()

4.5 Usage of DiagnosticEnvDataElementCondition on the adaptive Platform

The definition of environmental conditions is explained in the document TPS Diagnostic Extract [2].

Specifically for the *AUTOSAR adaptive platform*, it is possible to obtain data from application software (fetched from a *PPortPrototype* typed by a *DiagnosticDataElementInterface*) as a reference value for the computation of the environmental condition.

[TPS_MANI_01372]{DRAFT} Properties of data obtained from the application software [The properties of the data obtained from the application software can be configured in the context of *DiagnosticEnvDataElementCondition*, namely by means of the aggregation of *SwDataDefProps* in the role *swDataDefProps*.] (*RS_MANI_00005*)

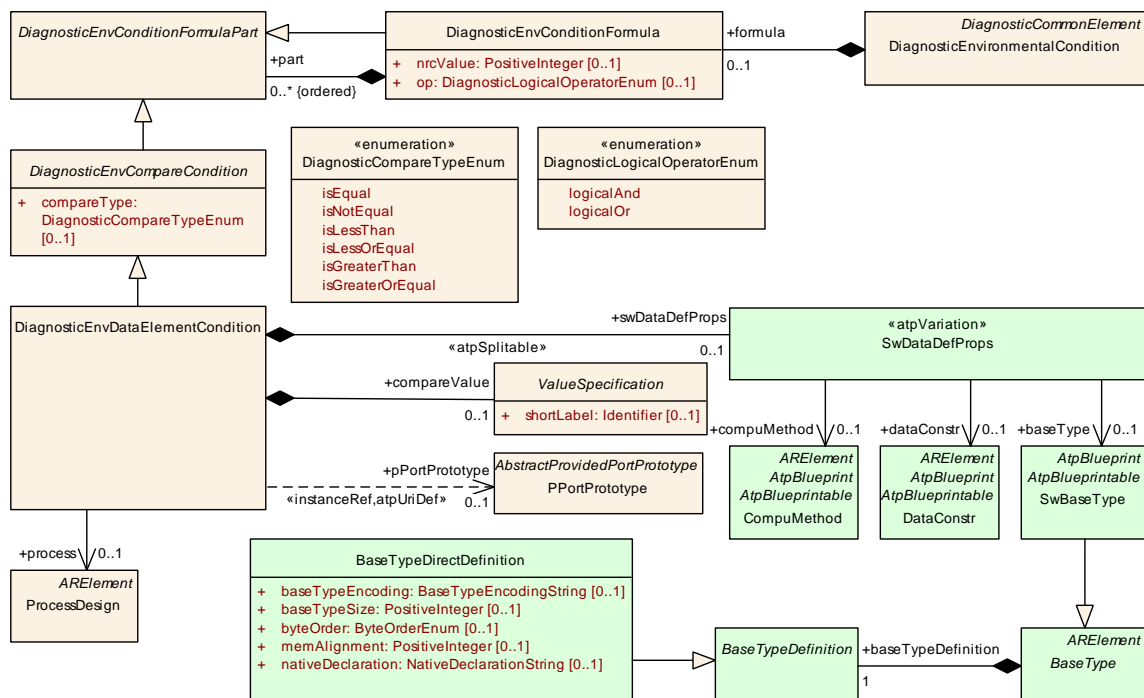


Figure 4.19: Leverage of DiagnosticEnvironmentalCondition on the AUTOSAR adaptive platform

[constr_10114]{DRAFT} Existence of attributes of DiagnosticEnvDataElementCondition if the reference in the role pPortPrototype exists [If the reference in the role *DiagnosticEnvDataElementCondition.pPortPrototype* exists, then the aggregations in the roles *compareValue*, *process*, and *swDataDefProps* shall exist at the time when the diagnostic design is complete.] ()

Please note that the reference *DiagnosticEnvDataElementCondition.pPortPrototype* is decorated with stereotype «atpUriDef» because the model of the

application software does not necessarily have to exist when the diagnostic design is created.

Class	DiagnosticEnvironmentalCondition			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::EnvironmentalCondition			
Note	The meta-class DiagnosticEnvironmentalCondition formalizes the idea of a condition which is evaluated during runtime of the ECU by looking at "environmental" states (e.g. one such condition is that the vehicle is not driving, i.e. vehicle speed == 0). Tags: atp.recommendedPackage=DiagnosticEnvironmentalConditions			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
formula	DiagnosticEnvConditionFormula	0..1	aggr	This attribute represents the formula part of the DiagnosticEnvironmentalCondition.
modeElement	DiagnosticEnvModeElement	*	aggr	This aggregation contains a representation of Mode Declarations in the context of a DiagnosticEnvironmentalCondition.

Table 4.35: DiagnosticEnvironmentalCondition

Class	DiagnosticEnvDataElementCondition			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::EnvironmentalCondition			
Note	This meta-class represents the ability to formulate a diagnostic environment condition based on the value of a data element owned by the application software.			
Base	ARObject , DiagnosticEnvCompareCondition , DiagnosticEnvConditionFormulaPart			
Aggregated by	DiagnosticEnvConditionFormula.part			
Attribute	Type	Mult.	Kind	Note
compareValue	ValueSpecification	0..1	aggr	This aggregation represents the definition of the compare value against which the value taken from the application software shall be compared.
dataPrototype	DataPrototype	0..1	iref	This instanceRef represent the ability to access a data element owned by the application software on the AUTOSAR classic platform. InstanceRef implemented by: DataPrototypeInSystemInstanceRef
pPortPrototype	PPortPrototype	0..1	iref	This instanceRef identifies the PortPrototype from which the relevant information for the environment condition can be obtained. This InstanceRef is only relevant for the adaptive platform. Stereotypes: atpUriDef Tags: atp.Status=draft InstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
process	ProcessDesign	0..1	ref	This reference identifies the applicable ProcessDesign. Tags: atp.Status=draft
swDataDef Props	SwDataDefProps	0..1	aggr	Via this aggregation it is possible to describe the properties of the data that is obtained from the application for the environmental condition. Stereotypes: atpSplitable Tags: atp.Splitkey=swDataDefProps

Table 4.36: DiagnosticEnvDataElementCondition

Class	DiagnosticEnvCompareCondition (abstract)			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::EnvironmentalCondition			
Note	DiagnosticCompareConditions are atomic conditions. They are based on the idea of a comparison at runtime of some variable data with something constant. The type of the comparison (==, !=, <, <=, ...) is specified in DiagnosticCompareCondition.compareType.			
Base	ARObject, DiagnosticEnvConditionFormulaPart			
Subclasses	DiagnosticEnvDataCondition, DiagnosticEnvDataElementCondition , DiagnosticEnvModeCondition			
Aggregated by	DiagnosticEnvConditionFormulaPart			
Attribute	Type	Mult.	Kind	Note
compareType	DiagnosticCompareTypeEnum	0..1	attr	This attributes represents the concrete type of the comparison.

Table 4.37: DiagnosticEnvCompareCondition

Class	DiagnosticEnvConditionFormula			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::EnvironmentalCondition			
Note	<p>A DiagnosticEnvConditionFormula embodies the computation instruction that is to be evaluated at runtime to determine if the DiagnosticEnvironmentalCondition is currently present (i.e. the formula is evaluated to true) or not (otherwise). The formula itself consists of parts which are combined by the logical operations specified by DiagnosticEnvConditionFormula.op.</p> <p>If a diagnostic functionality cannot be executed because an environmental condition fails then the diagnostic stack shall send a negative response code (NRC) back to the client. The value of the NRC is directly related to the specific formula and is therefore formalized in the attribute DiagnosticEnvConditionFormula.nrcValue.</p>			
Base	ARObject, DiagnosticEnvConditionFormulaPart			
Aggregated by	DiagnosticEnvConditionFormulaPart , DiagnosticEnvironmentalCondition.formula			
Attribute	Type	Mult.	Kind	Note
nrcValue	PositiveInteger	0..1	attr	This attribute represents the concrete NRC value that shall be returned if the condition fails.
op	DiagnosticLogicalOperatorEnum	0..1	attr	This attribute represents the concrete operator (supported operators: and, or) of the condition formula.
part (ordered)	DiagnosticEnvConditionFormulaPart	*	aggr	This aggregation represents the collection of formula parts that can be combined by logical operators.

Table 4.38: DiagnosticEnvConditionFormula

Enumeration	DiagnosticCompareTypeEnum
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::EnvironmentalCondition
Note	Enumeration for the type of a comparison of values usually expressed by the following operators: ==, !=, <, <=, >, >=
Aggregated by	DiagnosticEnvCompareCondition.compareType
Literal	Description
isEqual	equal Tags: atp.EnumerationLiteralIndex=0
isGreaterOrEqual	greater than or equal Tags: atp.EnumerationLiteralIndex=5
isGreaterThan	greater than Tags: atp.EnumerationLiteralIndex=4
isLessOrEqual	less than or equal Tags: atp.EnumerationLiteralIndex=3





<i>Enumeration</i>	DiagnosticCompareTypeEnum
isLessThan	less than Tags: atp.EnumerationLiteralIndex=2
isNotEqual	not equal Tags: atp.EnumerationLiteralIndex=1

Table 4.39: DiagnosticCompareTypeEnum

<i>Enumeration</i>	DiagnosticLogicalOperatorEnum
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::EnvironmentalCondition
Note	Logical AND and OR operation (&&,)
Aggregated by	DiagnosticEnvConditionFormula.op
Literal	Description
logicalAnd	Logical AND Tags: atp.EnumerationLiteralIndex=0
logicalOr	Logical OR Tags: atp.EnumerationLiteralIndex=1

Table 4.40: DiagnosticLogicalOperatorEnum

4.6 SOVD Configuration Miscellanea

4.6.1 SOVD Lock

[TPS_MANI_01396]{DRAFT} **Semantics of meta-class [DiagnosticSovdLock](#)**
 [SOVD does not integrate with the existing UDS-based session handling. But nevertheless, it is necessary to provide the ability to lock the access for one SOVD client such that no other SOVD or UDS client can access the software that is subject to the diagnostic activity.

For this purpose, meta-class [DiagnosticSovdLock](#) has been defined. It is referenced by [DiagnosticAccessPermission](#) as an additional criterion for computing the access permission for a diagnostic client.] ([RS_MANI_0005](#), [RS_MANI_0007](#))

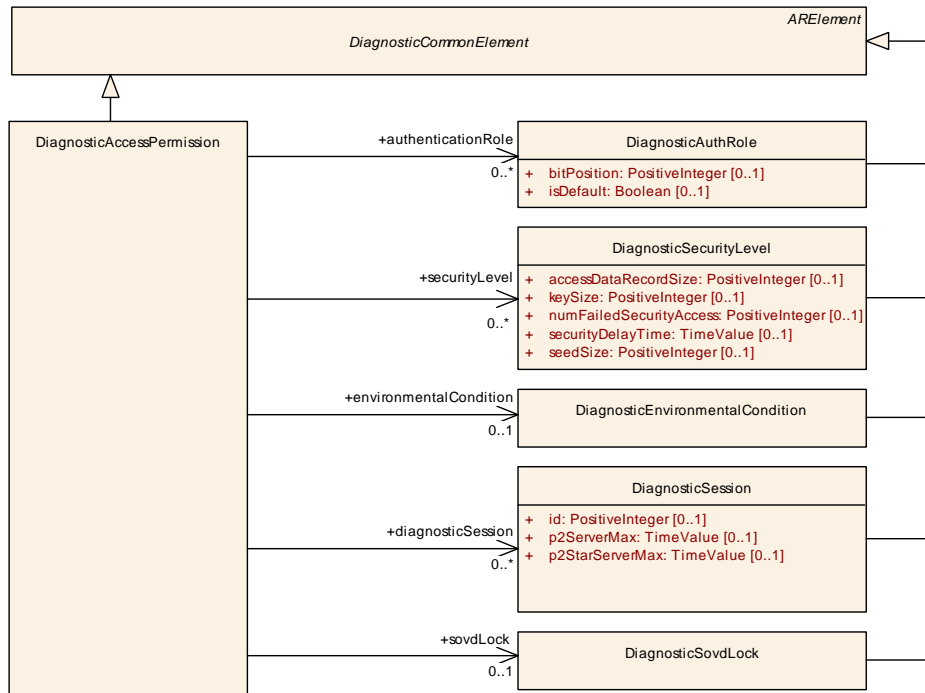


Figure 4.20: Modeling of SovdLock in the context of DiagnosticAccessPermission

Class	DiagnosticSovdLock			
Package	M2::AUTOSARTemplates::DiagnosticExtract::SOVD			
Note	This meta-class represents the ability to define an SOVD lock to be considered for the computation of a diagnostic access permission. Tags: atp.Status=draft atp.recommendedPackage=DiagnosticSovdLocks			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , Multilanguage , Referrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 4.41: DiagnosticSovdLock

4.6.2 SOVD Categorization of Diagnostic Data Identifiers

[TPS_MANI_01397]{DRAFT} Standardized values of [DiagnosticDataIdentifier.category](#) of the usage in SOVD context [The following values of attribute [DiagnosticDataIdentifier.category](#) are standardized by AUTOSAR:

- SOVD_CONFIGURATION
- SOVD_DATA

]([RS_MANI_00005](#), [RS_MANI_00070](#))

4.6.3 SOVD Groups of Diagnostic Data Identifiers

For the support of SOVD, it may be necessary to define a collection of *DiagnosticDataIdentifiers* with the semantics of becoming an *SOVD data group*.

[TPS_MANI_01398]{DRAFT} Definition of an SOVD data group [The definition of an *SOVD data group* shall be done by defining a *Collection* with the following properties:

- Attribute *collectionSemantics* shall be set to the value `SOVD_DATAGROUP`.
- Attribute *category* shall be set to `SET`.
- The references in the role *element* shall refer to the *DiagnosticDataIdentifiers* that shall be members of the collection.
- Attribute *elementRole* shall be set to `PART_OF_SUBSET`.

](*RS_MANI_00005, RS_MANI_00070*)

4.7 Diagnostic Miscellanea

[TPS_MANI_01358]{DRAFT} Restriction for the configuration of diagnostic debouncing [The restriction for the configuration of the diagnostic debouncing, as formulated in [TPS_DEXT_03004], shall **not** apply on *the AUTOSAR adaptive platform*.]
(*RS_MANI_00005*)

5 Machine Design

On the *AUTOSAR classic platform*, the design of communication-related aspects is attached to the existence of meta-class `EcuInstance`. A similar approach to support the definition of communication-related aspects early in the workflow (and definitely before the manifest configuration starts) is also needed on the *AUTOSAR adaptive platform*.

Therefore, `MachineDesign` has been introduced in order to allow the communication system designer to define a placeholder for an adaptive ECU in the scope of the `System` (the `MachineDesign` corresponds to the `EcuInstance` of AUTOSAR classic).

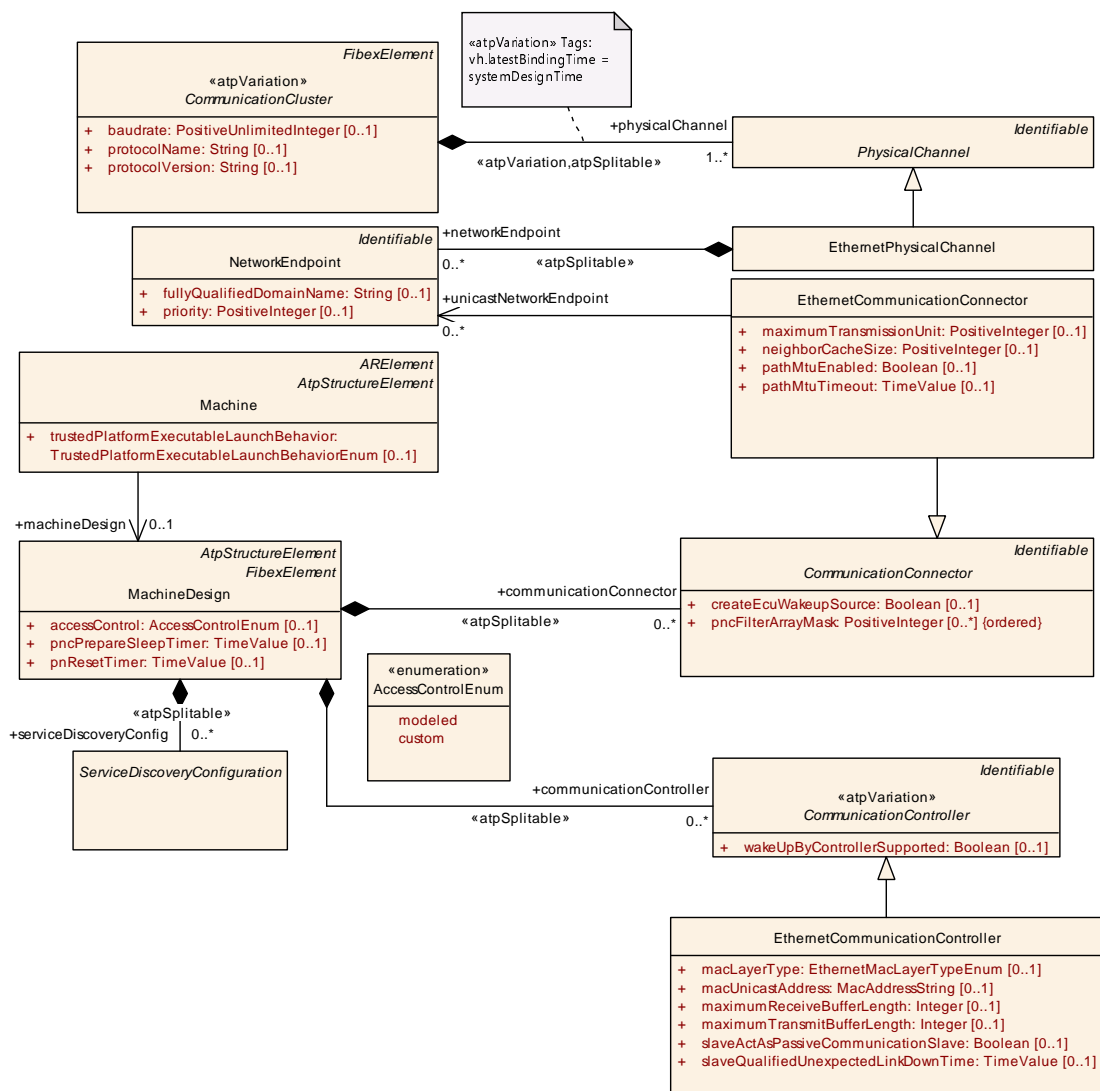


Figure 5.1: MachineDesign

As the *AUTOSAR adaptive platform* focuses on the usage of Ethernet for communication, the task of creating the communication design in the context of the `MachineDesign` boils down to the specification of IP addresses (see section 5.1) and the configuration of service discovery 5.2.

5.1 Network Design aspects of Machine Design

The basic definition of the connectivity of a [MachineDesign](#) is created by aggregating the abstract base-class [CommunicationConnector](#) in the role [communicationConnector](#). The specific subclass of [CommunicationConnector](#) that is used in this context is the [EthernetCommunicationConnector](#).

The [EthernetCommunicationConnector](#) is used to connect the [MachineDesign](#) with a [VLAN](#) that is represented in AUTOSAR by a [EthernetPhysicalChannel](#) that is part of an [EthernetCluster](#). Please find more information about the details of [EthernetCluster](#) in section [6.2.1](#).

Class	MachineDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	This meta-class represents the ability to define requirements on a Machine in the context of designing a system. Tags: atp.recommendedPackage=MachineDesigns			
Base	ARObject , AtpClassifier , AtpFeature , AtpStructureElement , CollectableElement , FibexElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element , AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
accessControl	AccessControlEnum	0..1	attr	This attribute defines how the access restriction to the Service Instance is defined.
communicationConnector	CommunicationConnector	*	aggr	This aggregation defines the network connection of the machine. Stereotypes: atpSplitable Tags: atp.Splitkey=communicationConnector.shortName
communicationController	CommunicationController	*	aggr	CommunicationControllers of the Machine that are used for description of 10-Base-T1S topologies Stereotypes: atpSplitable Tags: atp.Splitkey=communicationController.shortName
ethIpProps	EthIpProps	*	ref	Machine specific IP attributes.
pncPrepareSleepTimer	TimeValue	0..1	attr	Time in seconds the PNC state machine shall wait in PNC_PREPARE_SLEEP.
pnResetTimer	TimeValue	0..1	attr	Specifies the runtime of the reset timer in seconds. This reset time is valid for the reset of PN requests.
serviceDiscoveryConfig	ServiceDiscoveryConfiguration	*	aggr	Set of service discovery configuration settings that are defined on the machine for individual Communication Connectors. Stereotypes: atpSplitable Tags: atp.Splitkey=serviceDiscoveryConfig
tcpIpCmpProps	EthTcpIpCmpProps	*	ref	Machine specific ICMP (Internet Control Message Protocol) attributes
tcpIpProps	EthTcpIpProps	*	ref	Machine specific TcpIp Stack attributes.

Table 5.1: MachineDesign

[constr_3723]{DRAFT} **Upper multiplicity of reference in the role [MachineDesign.tcpIpProps](#)** [In the context of [MachineDesign](#), the reference in the role [tcpIpProps](#) shall exist at most once **at the time when the system design is complete.**]()

[constr_3724]{DRAFT} **Upper multiplicity of reference in the role `MachineDesign.tcpIpIcmpProps`** [In the context of `MachineDesign`, the reference in the role `tcpIpIcmpProps` shall exist at most once **at the time when the system design is complete.**]()

[constr_3725]{DRAFT} **Upper multiplicity of reference in the role `MachineDesign.ethIpProps`** [In the context of `MachineDesign`, the reference in the role `ethIpProps` shall exist at most once **at the time when the system design is complete.**]()

Class	<i>PhysicalChannel</i> (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreTopology			
Note	This element represents a physical connection (in case of CAN, FlexRay, LIN) or a logical connection (VLAN in case of Ethernet) between communicating devices.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Subclasses	<i>AbstractCanPhysicalChannel</i> , <i>EthernetPhysicalChannel</i> , <i>FlexrayPhysicalChannel</i> , <i>UserDefinedPhysicalChannel</i>			
Aggregated by	<i>CommunicationCluster.physicalChannel</i>			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 5.2: PhysicalChannel

Class	<<atpVariation>> EthernetCluster			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Ethernet-specific cluster attributes. Tags: atp.recommendedPackage=CommunicationClusters			
Base	<i>ARObject</i> , <i>CollectableElement</i> , <i>CommunicationCluster</i> , <i>FibexElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
couplingPort Connection	CouplingPort Connection	*	aggr	Specification of connections between CouplingElements and EcuInstances. Note: This atpSplitable property has no atp.Splitkey due to atpVariation (PropertySetPattern). Stereotypes: atpSplitable; atpVariation Tags: vh.latestBindingTime=postBuild
couplingPort StartupActive Time	TimeValue	0..1	attr	The attribute specifies the time in second a coupling port is switched on to enable the host ECU (ECU that maintains an Ethernet switch) to listen to the network for potential network management requests.
couplingPort SwitchoffDelay	TimeValue	0..1	attr	Switch off delay for CouplingPorts in seconds. It denotes the delay of switching off couplingPorts after the request to switch off a couplingPort was issued. (e.g. switch off of Ethernet switch ports).
macMulticast Group	MacMulticastGroup	*	aggr	MacMulticastGroup that is defined for the Subnet (EthernetCluster).

Table 5.3: EthernetCluster

[TPS_MANI_03209]{DRAFT} **The meaning of `MachineDesign.accessControl`** [The `MachineDesign.accessControl` defines whether the access control is defined by AUTOSAR means in the Application Design with `receiverIntent` (see

[TPS_MANI_01106]) and `senderIntent` (see [TPS_MANI_01107]) or by a custom lists that are created by a non-AUTOSAR process.] ([RS_MANI_00034](#))

Enumeration	AccessControlEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment
Note	This enumeration describes the options for the definition of access restriction to resources.
Aggregated by	MachineDesign.accessControl
Literal	Description
custom	The access restriction to the resource is defined by a non-AUTOSAR process. Tags: atp.EnumerationLiteralIndex=1
modeled	The access restriction to the resource is modeled in the AUTOSAR Application Design model or the AUTOSAR Deployment model. Tags: atp.EnumerationLiteralIndex=0

Table 5.4: AccessControlEnum

[constr_3320]{DRAFT} Aggregation of [CommunicationConnector](#) by [MachineDesign](#) [Meta-Class [MachineDesign](#) shall only aggregate [EthernetCommunicationConnectors](#) in the role `communicationConnector`. No other subclass of [CommunicationConnector](#) shall appear in this aggregation.] ()

[constr_5324]{DRAFT} [MachineDesign.communicationController](#) aggregation restriction [[MachineDesign](#) is only allowed to aggregate an [EthernetCommunicationController](#) in the role `communicationController`.] ()

5.2 Service Discovery Configuration

Service Discovery messages are exchanged between network nodes to announce and to discover available service instances. This chapter describes the configuration that is necessary to exchange service discovery messages for supported middleware transport layers.

Class	ServiceDiscoveryConfiguration (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest			
Note	Service Discovery configuration settings for the middleware transport layer.			
Base	ARObject			
Subclasses	SomeipServiceDiscovery			
Aggregated by	MachineDesign.serviceDiscoveryConfig			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 5.5: ServiceDiscoveryConfiguration

5.2.1 SOME/IP Service Discovery Configuration

[TPS_MANI_03064]{DRAFT} SOME/IP Service Discovery message exchange configuration [ProvidedServiceInstances are announced in SOME/IP by the server with multicast addressing on a VLAN to a specifically designated IP multicast address (SomeipServiceDiscovery.multicastSdIpAddress) at a specific UDP port number (SomeipServiceDiscovery.someipServiceDiscoveryPort).] (RS_MANI_00019)

[constr_5045]{DRAFT} Only one SomeipServiceDiscovery configuration per VLAN is allowed [Only a single NetworkEndpoint on an EthernetPhysicalChannel (VLAN) is allowed to be referenced by a SomeipServiceDiscovery element in the role multicastSdIpAddress.] ()

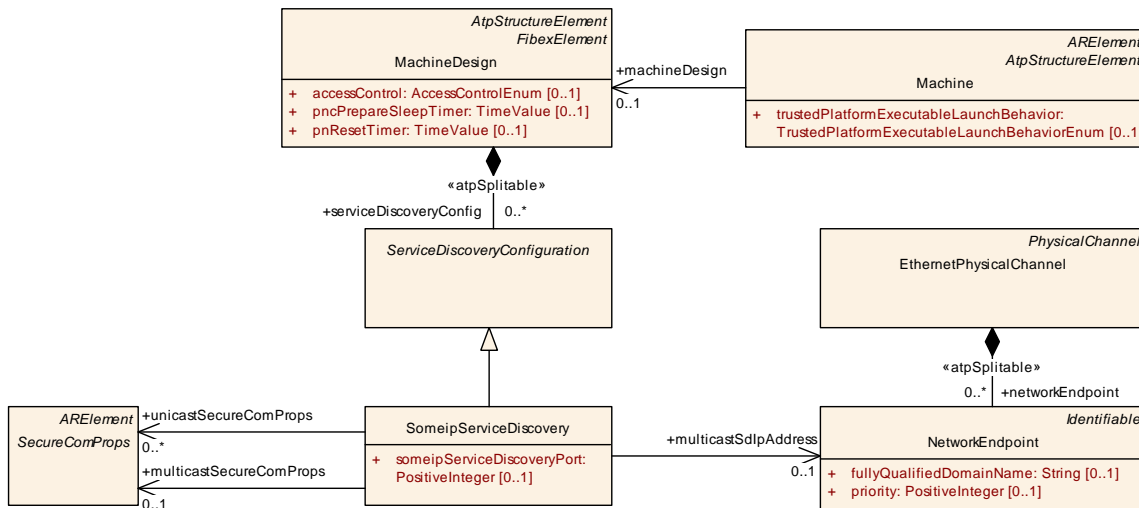


Figure 5.2: SOME/IP Service Discovery Configuration

The `SomeipServiceDiscovery` is able to reference `SecureComProps` to define and to configure a security protocol that will provide communication security for Service Discovery messages.

For Service Discovery messages that will be transmitted to a designated multicast IP address the protection is defined by the `SecureComProps` that is referenced in the role `multicastSecureComProps`. For unicast Service Discovery messages different credentials may be used for the different ECU pairs.

Therefore, a list of `SecureComProps` is aggregated in the role `unicastSecureComProps`.

Class	SomeipServiceDiscovery
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment
Note	This meta-class represents a specialization of the generic service discovery for the SOME/IP case.
Base	<i>ARObject</i> , <i>ServiceDiscoveryConfiguration</i>
Aggregated by	<i>MachineDesign.serviceDiscoveryConfig</i>





Class	SomeipServiceDiscovery			
Attribute	Type	Mult.	Kind	Note
multicastSdIp Address	NetworkEndpoint	0..1	ref	This reference identifies the multicast IP address used for service discovery.
multicastSecure ComProps	SecureComProps	0..1	ref	Reference to a communication security protocol and its configuration settings that will provide communication security for Service Discovery messages that are transmitted using multicast, e.g. FindService message.
someipService DiscoveryPort	PositiveInteger	0..1	attr	This attribute represents the port number reserved for service discovery.
unicastSecure ComProps	SecureComProps	*	ref	Reference to a communication security protocol and its configuration settings that will provide communication security for Service Discovery messages that are transmitted using unicast, e.g. OfferService as answer to a FindService message.

Table 5.6: SomeipServiceDiscovery

[constr_10167]{DRAFT} Multiplicity of attribute [SomeipServiceDiscovery.someipServiceDiscoveryPort](#) [For each [SomeipServiceDiscovery](#), the attribute [someipServiceDiscoveryPort](#) shall exist **at the time when the system design is complete.**]()

5.3 Tcplp stack configuration properties

The [MachineDesign](#) references the following elements and allows to set Machine specific Tcplp stack configuration options in the System Design:

- [EthIpProps](#) - used to configure IPv4 and IPv6
- [EthTcpIpProps](#) - used to configure TCP and UDP
- [EthTcpIpIcmpProps](#) - used to configure ICMP

Please note that the System Template [19] defines constraints for the usage of [EthIpProps](#), [EthTcpIpProps](#), [EthTcpIpIcmpProps](#). These constraints are also valid if the [MachineDesign](#) references these elements.

6 System Design

6.1 Overview

A typical vehicle will most likely be equipped with ECUs developed on the AUTOSAR classic platform and Machines developed on the AUTOSAR adaptive platform. The system design for the entire vehicle has therefore to cover both platform deployment types.

AUTOSAR supports System design descriptions with the possibility to describe Software Components of both AUTOSAR Platforms that will be used in a System and even allows to indicate the service oriented communication between them if possible.

Especially when it comes to the description of the communication behavior of AUTOSAR classic and adaptive ECUs in a harmonized way, the notion of a System Design becomes a special focus point.

All the system design aspects have in common is that they have to cope with both AUTOSAR classic ECUs and adaptive Machines. The basic design aspects of such inter-disciplinary systems have to be already available in the AUTOSAR classic modeling approach otherwise they would not be available to both platforms.

Thus, it is straight forward to take the existing meta-class `System` as the starting point for the modeling of such mixed systems.

Class	System			
Package	M2::AUTOSARTemplates::SystemTemplate			
Note	The top level element of the System Description. Tags: atp.recommendedPackage=Systems			
Base	ARElement , ARObject , AtpClassifier , AtpFeature , AtpStructureElement , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element , AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
fibexElement	FibexElement	*	ref	Reference to ASAM FIBEX elements specifying Communication and Topology. All Fibex Elements used within a System Description shall be referenced from the System Element. atpVariation: In order to describe a product-line, all Fibex Elements can be optional. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=fibexElement.fibexElement, fibexElement.variationPoint.shortLabel vh.latestBindingTime=postBuild
interpolationRoutineMappingSet	InterpolationRoutineMappingSet	*	ref	This reference identifies the InterpolationRoutineMapping Sets that are relevant in the context of the enclosing System.





Class	System			
mapping	SystemMapping	*	aggr	Aggregation of all mapping aspects relevant in the System Description. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=mapping.shortName, mapping.variationPoint.shortLabel vh.latestBindingTime=postBuild
pncVectorLength	PositiveInteger	0..1	attr	Length of the partial networking request release information vector (in bytes).
pncVectorOffset	PositiveInteger	0..1	attr	Absolute offset (with respect to the NM-PDU) of the partial networking request release information vector that is defined in bytes as an index starting with 0.
rootSoftwareComposition	RootSwCompositionPrototype	0..1	aggr	Aggregation of the root software composition, containing all software components in the System in a hierarchical structure. This element is not required when the System description is used for a network-only use-case. atpVariation: The RootSwCompositionPrototype can vary. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=rootSoftwareComposition.shortName, rootSoftwareComposition.variationPoint.shortLabel vh.latestBindingTime=systemDesignTime
systemVersion	RevisionLabelString	1	attr	Version number of the System Description.

Table 6.1: System

There are use cases to exchange parts of such a [SYSTEM_DESIGN_DESCRIPTION](#) in different methodology stages and between different development parties, therefore further system categories are supported by AUTOSAR.

A common approach is for example that the OEM provides a basis for designing an ECU, which is later advanced by the supplier. Therefore Classic AUTOSAR supports [System](#) categories like [ECU_EXTRACT](#) or [ECU_SYSTEM_DESCRIPTION](#) that have only a single ECU in scope. Classic Platform [System.category](#)s are defined in [TPS_-SYST_01003].

The AUTOSAR adaptive platform is using the same approach. If an OEM wants to provide design artifacts that are relevant for the configuration of a single [Machine](#) all unnecessary information is stripped from the [System](#) with [category SYSTEM_-DESIGN_DESCRIPTION](#) and a definition of the subsystem is provided.

[TPS_MANI_01274]{DRAFT} Standardized System Category Definitions for the Adaptive Platform [The standardized System category definitions are defined in Table 6.2] ([RS_MANI_00026](#))

Category	Meaning
SYSTEM_DESIGN_DESCRIPTION	The System description that contains design artifacts that are relevant for the Adaptive Platform and Classic Platform.





MACHINE_DESIGN_EXTRACT	The System description that contains design artifacts that are relevant for a single Adaptive Platform Machine .
------------------------	--

Table 6.2: Standardized System Category definitions

[constr_3421]{DRAFT} Fibex elements applicable for a [System](#) of category [MACHINE_DESIGN_EXTRACT](#) [A [System](#) with the category [MACHINE_DESIGN_EXTRACT](#) is allowed to reference the following [fibexElements](#):

- [CommunicationCluster](#)
- [MachineDesign](#)
- [GlobalTimeDomain](#)
- [NmConfig](#)
- [SystemMapping](#) that is allowed to contain only a [PncMapping](#)

]()

6.2 Specification of Communication System Structure

When the communication interaction is designed for a vehicle system the focus is put on the network and the connected ECUs. Whether a specific ECU connected to the network is implemented using AUTOSAR classic or AUTOSAR adaptive does not influence the major communication design.

But of course, it is essential from a car manufacturer point of view whether a specific ECU will be implemented using AUTOSAR classic or adaptive. Thus, already on system design level there is a need to specify the AUTOSAR Platform kind which shall be used to implement an ECU.

In AUTOSAR classic the element [EcuInstance](#) is used to define one ECU in the system design.

In AUTOSAR adaptive the element [Machine](#) is an entity which already represents a specific ECU Implementation with dedicated configurations for e.g. [Processors](#), [ProcessorCoreS](#).

The [Machine](#) is a model entity which is not in the focus of communication designers and should not be used during system design.

Therefore, the [MachineDesign](#) has been introduced, see section [5](#).

6.2.1 Network connection

The canonical way to specify an IP address is the modeling of a `NetworkEndpoint`, referenced from an `EthernetCommunicationConnector` that is aggregated by `MachineDesign` in the role `communicationConnector`.

In addition to the IP address, the `NetworkEndpoint` may have a *Fully Qualified Domain Name* and a priority.

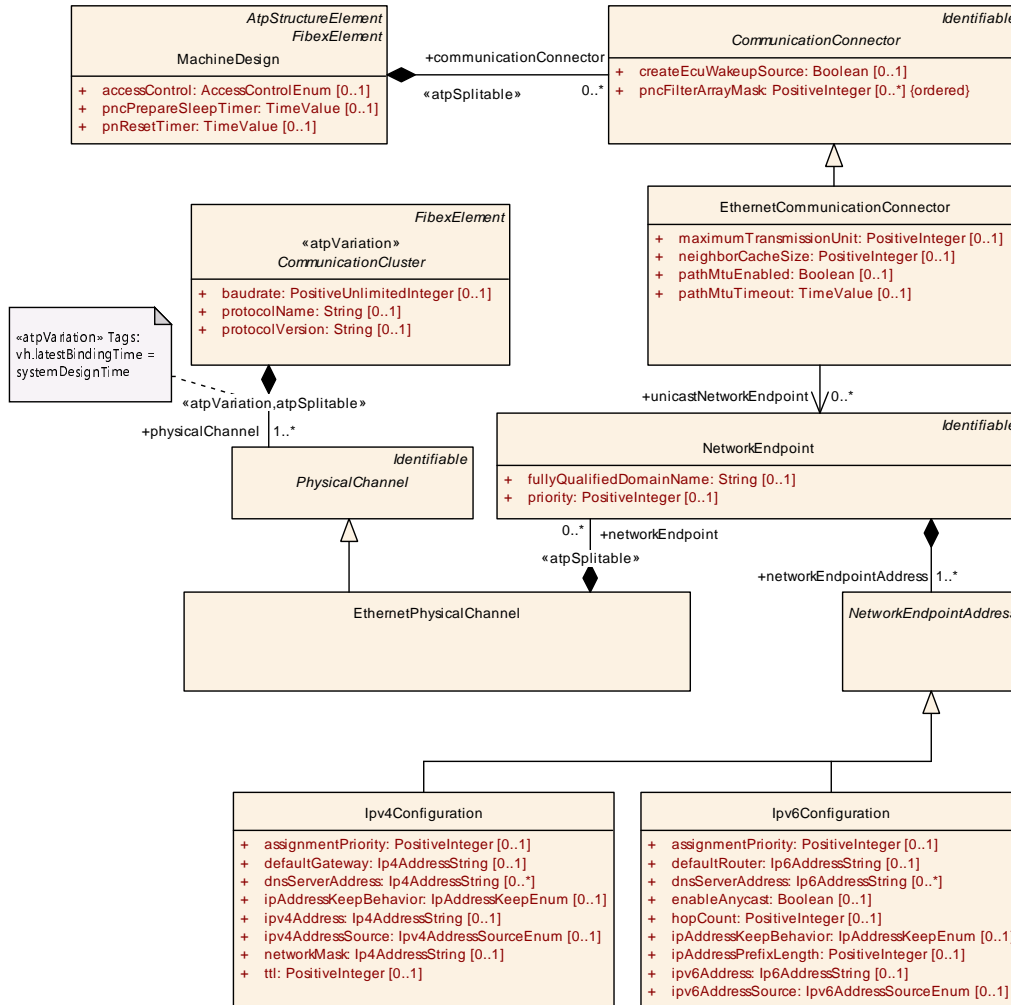


Figure 6.1: Network connection of a MachineDesign

Class	NetworkEndpoint			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	The network endpoint defines the network addressing (e.g. IP-Address or MAC multicast address).			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	EthernetPhysicalChannel.networkEndpoint			
Attribute	Type	Mult.	Kind	Note



Class	NetworkEndpoint			
fullyQualifiedDomainName	String	0..1	attr	Defines the fully qualified domain name (FQDN) e.g. some.example.host.
ipSecConfig	IPSecConfig	0..1	aggr	Optional IPSec configuration that provides security services for IP packets.
networkEndpointAddress	NetworkEndpointAddress	1..*	aggr	Definition of a Network Address. Tags: xml.name Plural=NETWORK-ENDPOINT-ADDRESSES
priority	PositiveInteger	0..1	attr	Defines the frame priority where values from 0 (best effort) to 7 (highest) are allowed.

Table 6.3: NetworkEndpoint

More precisely, the particular IP address is configured by means of the aggregation of [Ipv4Configuration](#) or [Ipv6Configuration](#) in the role [networkEndpointAddress](#).

The [NetworkEndpoint](#) is aggregated by the [EthernetPhysicalChannel](#) that in turn is aggregated by the [EthernetCluster](#).

[TPS_MANI_03052]{DRAFT} Static IPv4 configuration [If the value of attribute [ipv4AddressSource](#) of meta-class [Ipv4Configuration](#) is set to [Ipv4AddressSourceEnum.fixed](#) then the [ipv4Address](#) defines the static IPv4 Address.] ([RS_MANI_00018](#))

Class	Ipv4Configuration			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Internet Protocol version 4 (IPv4) configuration.			
Base	ARObject , NetworkEndpointAddress			
Aggregated by	NetworkEndpoint.networkEndpointAddress			
Attribute	Type	Mult.	Kind	Note
assignmentPriority	PositiveInteger	0..1	attr	Priority of assignment (1 is highest). If a new address from an assignment method with a higher priority is available, it overwrites the IP address previously assigned by an assignment method with a lower priority.
defaultGateway	Ip4AddressString	0..1	attr	IP address of the default gateway.
dnsServerAddress	Ip4AddressString	*	attr	IP addresses of preconfigured DNS servers. Tags: xml.namePlural=DNS-SERVER-ADDRESSES
ipAddressKeepBehavior	IpAddressKeepEnum	0..1	attr	Defines the lifetime of a dynamically fetched IP address.
ipv4Address	Ip4AddressString	0..1	attr	IPv4 Address. Notation: 255.255.255.255. The IP Address shall be declared in case the ipv4AddressSource is FIXED and thus no auto-configuration mechanism is used.
ipv4AddressSource	Ipv4AddressSourceEnum	0..1	attr	Defines how the node obtains its IP address.
networkMask	Ip4AddressString	0..1	attr	Network mask. Notation 255.255.255.255
ttl	PositiveInteger	0..1	attr	Lifespan of data (0..255). The purpose of the TimeToLive field is to avoid a situation in which an undeliverable datagram keeps circulating on a system.

Table 6.4: Ipv4Configuration

Enumeration	Ipv4AddressSourceEnum
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology
Note	Defines how the node obtains its IPv4-Address.
Aggregated by	Ipv4Configuration.ipv4AddressSource
Literal	Description
autolp	AutolP is used to dynamically assign IP addresses at device startup. Tags: atp.EnumerationLiteralIndex=0
autolp_doip	Linklocal IPv4 Address Assignment using DoIP Parameters Tags: atp.EnumerationLiteralIndex=2
dhcpv4	DHCP is a service for the automatic IP configuration of a client. Tags: atp.EnumerationLiteralIndex=3
fixed	The IP Address shall be declared manually. Tags: atp.EnumerationLiteralIndex=4

Table 6.5: Ipv4AddressSourceEnum

[TPS_MANI_03053]{DRAFT} Static IPv6 configuration [If the value of attribute [ipv6AddressSource](#) of meta-class [Ipv6Configuration](#) is set to [Ipv6AddressSourceEnum.fixed](#) then the [ipv6Address](#) defines the static IPv6 Address.] ([RS_MANI_00018](#))

Class	Ipv6Configuration			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Internet Protocol version 6 (IPv6) configuration.			
Base	ARObject , NetworkEndpointAddress			
Aggregated by	NetworkEndpoint.networkEndpointAddress			
Attribute	Type	Mult.	Kind	Note
assignment Priority	PositiveInteger	0..1	attr	Priority of assignment (1 is highest). If a new address from an assignment method with a higher priority is available, it overwrites the IP address previously assigned by an assignment method with a lower priority.
defaultRouter	Ip6AddressString	0..1	attr	IP address of the default router.
dnsServer Address	Ip6AddressString	*	attr	IP addresses of pre configured DNS servers. Tags: xml.namePlural=DNS-SERVER-ADDRESSES
enableAnycast	Boolean	0..1	attr	This attribute is used to enable anycast addressing (i.e. to one of multiple receivers).
hopCount	PositiveInteger	0..1	attr	The distance between two hosts. The hop count n means that n gateways separate the source host from the destination host (Range 0..255)
ipAddressKeep Behavior	IpAddressKeepEnum	0..1	attr	Defines the lifetime of a dynamically fetched IP address.
ipAddressPrefix Length	PositiveInteger	0..1	attr	IPv6 prefix length defines the part of the IPv6 address that is the network prefix.
ipv6Address	Ip6AddressString	0..1	attr	IPv6 Address. Notation: FFFF:...:FFFF. The IP Address shall be declared in case the ipv6AddressSource is FIXED and thus no auto-configuration mechanism is used.
ipv6Address Source	Ipv6AddressSourceEnum	0..1	attr	Defines how the node obtains its IP address.

Table 6.6: Ipv6Configuration

Enumeration	Ipv6AddressSourceEnum
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology
Note	Defines how the node obtains its IPv6-Address.
Aggregated by	Ipv6Configuration.ipv6AddressSource
Literal	Description
dhcpv6	DHCP is a service for the automatic IP configuration of a client. Tags: atp.EnumerationLiteralIndex=0
fixed	The IP Address shall be declared manually. Tags: atp.EnumerationLiteralIndex=1
linkLocal	LinkLocal is intended only for communications within the segment of a local network (a link) or a point-to-point connection that a host is connected to. Tags: atp.EnumerationLiteralIndex=2
linkLocal_doip	Linklocal IPv6 Address Assignment using DoIP Parameters Tags: atp.EnumerationLiteralIndex=3
router Advertisement	IPv6 Stateless Autoconfiguration. Tags: atp.EnumerationLiteralIndex=4

Table 6.7: Ipv6AddressSourceEnum

Enumeration	IpAddressKeepEnum
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology
Note	Defines the behavior after a dynamic IP address has been assigned.
Aggregated by	Ipv4Configuration.ipAddressKeepBehavior , Ipv6Configuration.ipAddressKeepBehavior
Literal	Description
forget	After a dynamic IP address has been assigned just use it for this session. Tags: atp.EnumerationLiteralIndex=0
storePersistently	After a dynamic IP address has been assigned store the address persistently. Tags: atp.EnumerationLiteralIndex=1

Table 6.8: IpAddressKeepEnum

Please note that there is also the possibility to describe a [MacMulticastConfiguration](#) as [NetworkEndpointAddress](#) in addition to [Ipv4Configuration](#) and [Ipv6Configuration](#) in a system topology description. This may be useful for description of endpoints that are not based on IP, e.g. for streaming protocols like AVB (Audio Video Bridging). But please note that there is no foundation software or ara::com support for such [MacMulticastConfiguration NetworkEndpoints](#) in Adaptive Autosar. For SOME/IP communication such [NetworkEndpoints](#) are excluded by [[constr_3288](#)].

6.2.1.1 Support of 10BASE-T1S Network Topologies

Please note that 10BASE-T1S network topology description is supported in the System Design with a [CouplingPortConnection](#) that points with the [nodePort](#) reference to [CouplingPorts](#) that represent the 10Base-T1S PHYs connected to the network.

More details about the modeling of 10BASE-T1S networks can be found in the System Template [19]. Since the same modeling approach is used in the Classic Platform and the Adaptive Platform the detailed description of the meta-model available in the System Template is not repeated in this specification.

6.2.1.2 Support of Ethernet tunneling through CAN XL

On AUTOSAR AP, CAN XL supports only the “mapped tunneling” of Ethernet frames through the physical CAN XL network (i.e. SDU Type 0x05h as specified by the CiA standardization of CAN XL). Configuration of this tunneling is done in a similar way as in CP by using the category CAN_XL for `EthernetCommunicationConnector`.

[TPS_MANI_03668]{DRAFT} Supported type of Ethernet tunneling through CAN XL on Adaptive Platform [On the Adaptive Platform, CAN XL only supports SDU Type 0x05h (Ethernet mapped tunneling). If an AP machine receives a CAN XL frame containing an SDU Type other than 0x05h, it shall discard this frame without processing its content.]()

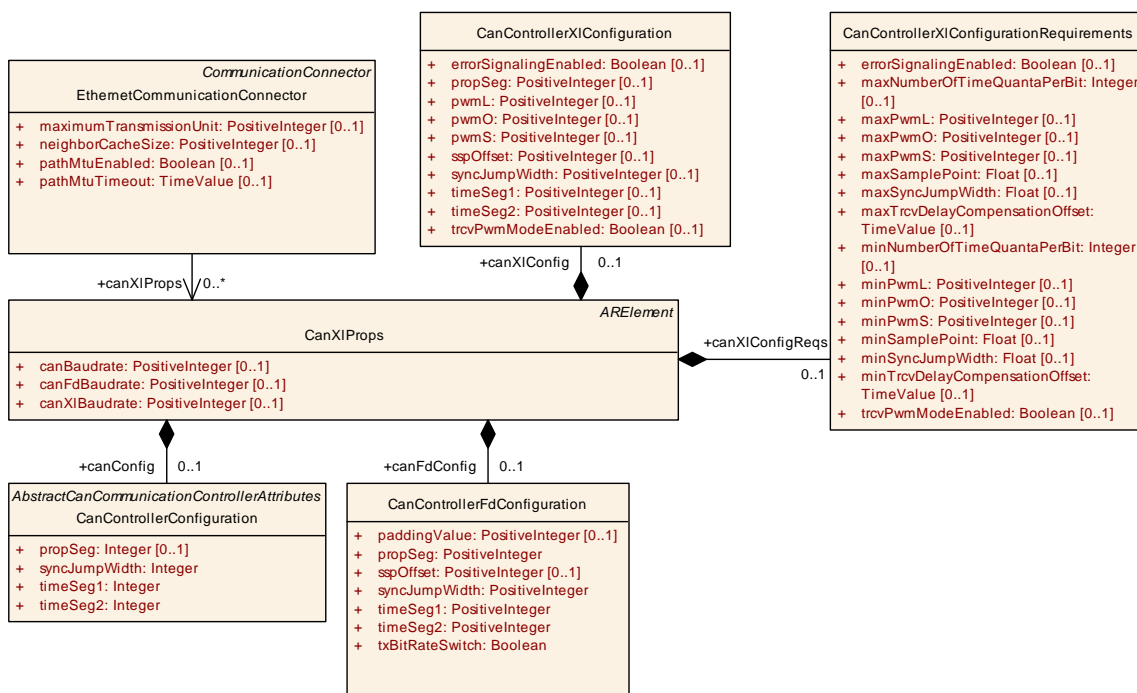


Figure 6.2: Modeling of CanXlProps

In other words, CAN XL frames containing (native or tunneled) Classical CAN, CAN FD or CAN XL payload cannot be meaningfully processed by an AP machine as it does not contain a CAN communication stack.

[TPS_MANI_03669]{DRAFT} Ethernet tunneling through CAN XL [If an Ethernet connection of a `MachineDesign` shall be realized by Ethernet frames tunneled through a CAN XL network, the `EthernetCommunicationConnector` aggregated by the `MachineDesign` shall set the value of attribute `category` to CAN_XL

and additionally have a reference in the role `canXlProps` to meta-class `CanXlProps` which contains the required CAN XL specific configuration parameters, i.e. `CanControllerXlConfiguration` and `CanControllerXlConfigurationRequirements`.¹()

Class	CanXlProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	This meta-class is used to configure Machine specific CAN XL attributes. Tags: atp.recommendedPackage=CanXlProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
canBaudrate	PositiveInteger	0..1	attr	Specifies the data segment CAN 2.0 baud rate of the CAN XL controller in bits/s.
canConfig	CanControllerConfiguration	0..1	aggr	CAN 2.0 configuration parameters for the CAN XL controller.
canFdBaudrate	PositiveInteger	0..1	attr	Specifies the data segment CAN FD baud rate of the CAN XL controller in bits/s.
canFdConfig	CanControllerFdConfiguration	0..1	aggr	CAN FD configuration parameters for the CAN XL controller.
canXlBaudrate	PositiveInteger	0..1	attr	Specifies the data segment CAN XL baud rate of the CAN XL controller in bits/s.
canXlConfig	CanControllerXlConfiguration	0..1	aggr	CAN XL configuration parameters for the CAN XL controller.
canXlConfigReqs	CanControllerXlConfigurationRequirements	0..1	aggr	CAN XL configuration parameter requirements for the CAN XL controller.

Table 6.9: CanXlProps

[constr_3693]{DRAFT} `EthernetCommunicationConnector.category` is set to `CAN_XL` [If a `EthernetCommunicationConnector` is aggregated by the `MachineDesign` where attribute `category` is set to `CAN_XL`, then a reference from the `EthernetCommunicationConnector` to a `CanXlProps` in the role `canXlProps` shall exist **at the time when the system design is complete**.]¹()

[constr_3694]{DRAFT} Existence of `canXlConfig` vs. `canXlConfigReqs` [For each `CanXlProps`, one of

- `canXlConfig` or
- `canXlConfigReqs`

shall exist **at the time when the system design is complete**.]¹()

6.2.1.3 IP configuration properties

This chapter introduces meta-classes and attributes that can be used to configure the TCP/IP Stack in the Adaptive Platform.

The Internet Protocol (IP) is the main protocol of the TCP/IP stack and is responsible for delivering datagrams from a source host identified by the source address to one or multiple destination hosts identified by the destination address.

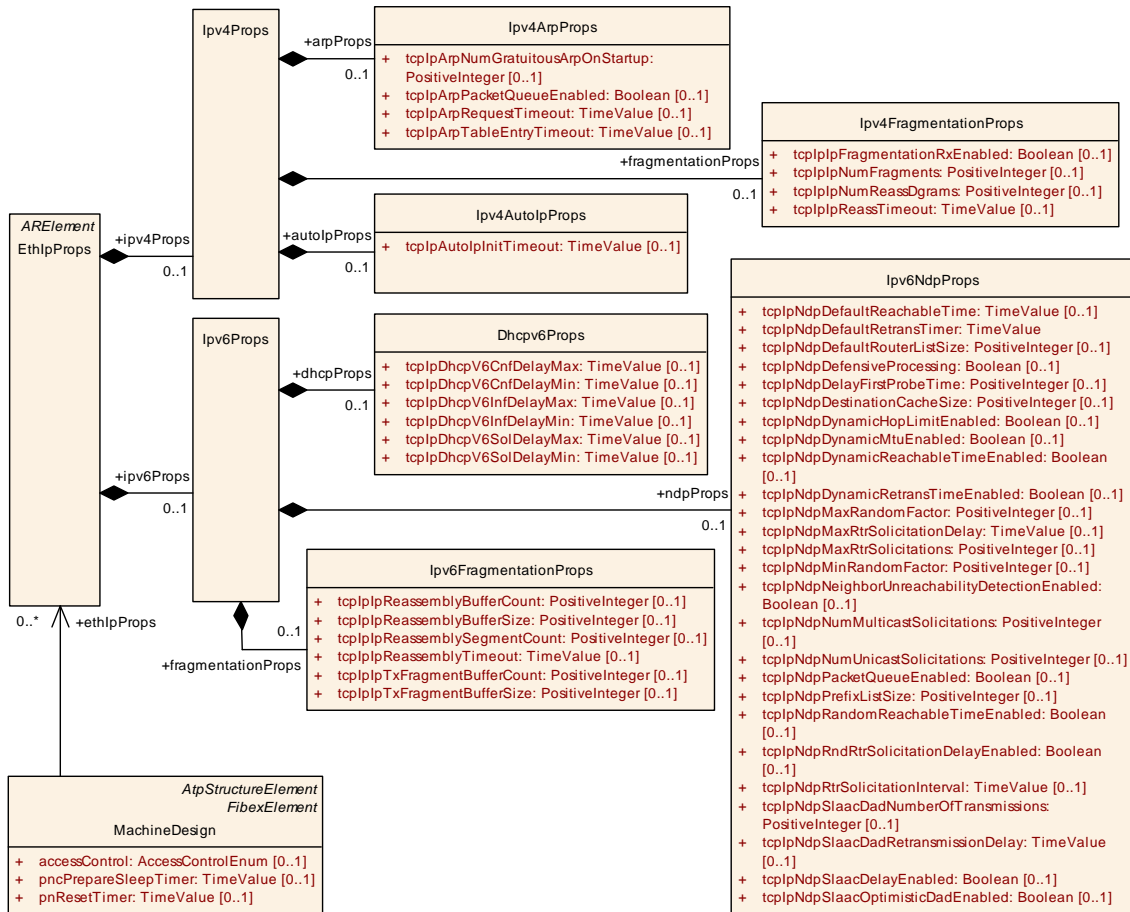


Figure 6.3: Machine specific IP configuration options

AUTOSAR supports the configuration of

- Internet Protocol of version 4 with [Ipv4Props](#). This includes the configuration of
 - ARP (Address Resolution Protocol) with [Ipv4ArpProps](#)
 - Auto IP with [Ipv4AutoIpProps](#)
 - Packet fragmentation and reassembly with [Ipv4FragmentationProps](#)
- Internet Protocol of version 6 with [Ipv6Props](#). This includes the configuration of
 - NDP (Neighbor Discovery Protocol) with [Ipv6NdpProps](#)
 - Dhcp (Dynamic Host Configuration Protocol) with [Dhcipv6Props](#)
 - Packet fragmentation and reassembly with [Ipv6FragmentationProps](#)

Please note that for the configuration of the Internet Protocol the same modeling approach is used as in the Classic Platform (System Template [19]). Therefore, the following constraints defined in the System Template [19] are valid for this specification as well:

- [constr_5126]
- [constr_5127]
- [constr_5128]
- [constr_5129]
- [constr_5130]
- [constr_5131]
- [constr_5132]
- [constr_5133]
- [constr_5134]
- [constr_5135]
- [constr_5136]
- [constr_5137]
- [constr_5138]
- [constr_5139]
- [constr_5140]
- [constr_5141]
- [constr_5142]
- [constr_5143]
- [constr_5144]
- [constr_5145]
- [constr_5146]
- [constr_5147]
- [constr_5148]
- [constr_5149]
- [constr_5151]
- [constr_5152]
- [constr_5153]

Class	EthIpProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class is used to configure the Machine specific IP attributes. Tags: atp.recommendedPackage=EthIpProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
ipv4Props	Ipv4Props	0..1	aggr	Configuration options for IPv4.
ipv6Props	Ipv6Props	0..1	aggr	Configuration options for IPv6.

Table 6.10: EthIpProps

Class	Ipv4Props			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for IPv4.			
Base	ARObject			
Aggregated by	EthIpProps.ipv4Props			
Attribute	Type	Mult.	Kind	Note
arpProps	Ipv4ArpProps	0..1	aggr	Configuration properties for the ARP (Address Resolution Protocol).
autolpProps	Ipv4AutolpProps	0..1	aggr	Configuration options for Auto-IP (automatic private IP addressing).
fragmentation Props	Ipv4Fragmentation Props	0..1	aggr	Configuration options for IPv4 packet fragmentation/reassembly.

Table 6.11: Ipv4Props

Class	Ipv4ArpProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Specifies the configuration options for the ARP (Address Resolution Protocol).			
Base	ARObject			
Aggregated by	Ipv4Props.arpProps			
Attribute	Type	Mult.	Kind	Note
tcplpArpNum GratuitousArp OnStartup	PositiveInteger	0..1	attr	This attribute specifies the number of gratuitous ARP replies which shall be sent on assignment of a new IP address.
tcplpArpPacket QueueEnabled	Boolean	0..1	attr	This attribute enables (TRUE) or disables (FALSE) support of the ARP Packet Queue according to IETF RFC 1122, section 2.3.2.2.
tcplpArp Request Timeout	TimeValue	0..1	attr	This attribute specifies a timeout in seconds for the validity of ARP requests. After the transmission of an ARP request the Tcplp shall skip the transmission of any further ARP requests to the same destination within a duration of tcplpArpRequestTimeout seconds. (IETF RFC 1122, section 2.3.2.1).
tcplpArpTable EntryTimeout	TimeValue	0..1	attr	This attribute specifies the timeout in seconds after which an unused ARP entry is removed.

Table 6.12: Ipv4ArpProps

Class	Ipv4AutolpProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Specifies the configuration options for Auto-IP (automatic private IP addressing).			
Base	ARObject			
Aggregated by	Ipv4Props.autolpProps			
Attribute	Type	Mult.	Kind	Note
tcpIpAutolpInit Timeout	TimeValue	0..1	attr	This attribute specifies the time in seconds Auto-IP waits at startup, before beginning with ARP probing. This delay is used to give DHCP time to acquire a lease in case a DHCP server is present.

Table 6.13: Ipv4AutolpProps

Class	Ipv4FragmentationProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Specifies the configuration options for IPv4 packet fragmentation/reassembly.			
Base	ARObject			
Aggregated by	Ipv4Props.fragmentationProps			
Attribute	Type	Mult.	Kind	Note
tcpIpIp Fragmentation RxEnabled	Boolean	0..1	attr	Enables (TRUE) or disables (FALSE) support for reassembling of incoming datagrams that are fragmented according to IETF RFC 815 (IP Datagram Reassembly Algorithms).
tcpIpIpNum Fragments	PositiveInteger	0..1	attr	Specifies the maximum number of IP fragments per datagram.
tcpIpIpNum ReassDgrams	PositiveInteger	0..1	attr	Specifies the maximum number of fragmented IP datagrams that can be reassembled in parallel.
tcpIpIpReass Timeout	TimeValue	0..1	attr	Specifies the timeout in [s] after which an incomplete datagram gets discarded.

Table 6.14: Ipv4FragmentationProps

Class	Ipv6Props			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for IPv6.			
Base	ARObject			
Aggregated by	EthIpProps.ipv6Props			
Attribute	Type	Mult.	Kind	Note
dhcpProps	Dhcpv6Props	0..1	aggr	Configuration properties for DHCPv6.
fragmentation Props	Ipv6Fragmentation Props	0..1	aggr	Configuration properties for IPv6 packet fragmentation/reassembly.
ndpProps	Ipv6NdpProps	0..1	aggr	Configuration properties for the Neighbor Discovery Protocol for IPv6.

Table 6.15: Ipv6Props

Class	Ipv6FragmentationProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for IPv6 packet fragmentation/reassembly.			
Base	ARObject			
Aggregated by	Ipv6Props.fragmentationProps			
Attribute	Type	Mult.	Kind	Note
tcpIplp Reassembly BufferCount	PositiveInteger	0..1	attr	Number of buffers that can be used for fragment reassembly. In case of a reassembly error or if not all fragments are received in time this buffer will be blocked until the specified "Fragment Reassembly Timeout" has been exceeded. A value of 0 disables fragment reassembly.
tcpIplp Reassembly BufferSize	PositiveInteger	0..1	attr	Size of each fragment tx buffer in bytes.
tcpIplp Reassembly SegmentCount	PositiveInteger	0..1	attr	Specifies the maximum number of consecutive data segments that can be managed in each reassembly buffer. If all fragments are received in order, only one segment will be needed. To deal with fragments received out of order this value should be configured bigger than 1.
tcpIplp Reassembly Timeout	TimeValue	0..1	attr	Specifies the timeout in seconds after which an incomplete datagram gets discarded.
tcpIplpTx FragmentBuffer Count	PositiveInteger	0..1	attr	These buffers will be used if the IPv6 receives packets from the upper layer that do not fit into the MTU and thus must be fragmented. A value of 0 disables tx fragmentation.
tcpIplpTx FragmentBuffer Size	PositiveInteger	0..1	attr	Size of each fragment tx buffer in bytes.

Table 6.16: Ipv6FragmentationProps

Class	Dhcpv6Props			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for DHCPv6.			
Base	ARObject			
Aggregated by	Ipv6Props.dhcpProps			
Attribute	Type	Mult.	Kind	Note
tcpIplpDhcp V6CnfDelayMax	TimeValue	0..1	attr	Maximum delay in seconds before sending the first Confirm message. If this value is bigger than the previous minimum delay value a random delay will be chosen from the interval.
tcpIplpDhcp V6CnfDelayMin	TimeValue	0..1	attr	Minimum delay in seconds before the first Confirm message will be sent.
tcpIplpDhcpV6Inf DelayMax	TimeValue	0..1	attr	Maximum delay in seconds before sending the first Information Request message. If this value is bigger than the previous minimum delay value a random delay will be chosen from the interval.
tcpIplpDhcpV6Inf DelayMin	TimeValue	0..1	attr	Minimum delay (s) before the first Information Request message will be sent.





Class	Dhcpv6Props			
tcpIpDhcpV6SolDelayMax	TimeValue	0..1	attr	Maximum delay in seconds before sending the first Solicit message. If this value is bigger than the previous minimum delay value a random delay will be chosen from the interval.
tcpIpDhcpV6SolDelayMin	TimeValue	0..1	attr	Minimum delay (s) before the first Solicit message will be sent.

Table 6.17: Dhcpv6Props

Class	Ipv6NdpProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for the Neighbor Discovery Protocol for IPv6.			
Base	ARObject			
Aggregated by	Ipv6Props.ndpProps			
Attribute	Type	Mult.	Kind	Note
tcpIpNdpDefaultReachableTime	TimeValue	0..1	attr	Configuration of the ReachableTime (s) specified in [RFC4861 6.3.2. Host Variables].
tcpIpNdpDefaultRetransTimer	TimeValue	1	attr	Configures the default value (s) for the RetransTimer variable specified in [RFC4861 6.3.2. Host Variables].
tcpIpNdpDefaultRouterListSize	PositiveInteger	0..1	attr	Maximum number of default router entries.
tcpIpNdpDefensiveProcessing	Boolean	0..1	attr	If enabled the NDP shall only process Neighbor Advertisements which are received in reaction to a previously transmitted Neighbor Solicitation as well as skipping updates to the Neighbor Cache based on received Neighbor Solicitations. If disabled all Neighbor Advertisements and Solicitations shall be processed as specified in RFC4861.
tcpIpNdpDelayFirstProbeTime	PositiveInteger	0..1	attr	Delay before sending the first NUD probe in (s).
tcpIpNdpDestinationCacheSize	PositiveInteger	0..1	attr	Maximum number of entries in the destination cache.
tcpIpNdpDynamicHopLimitEnabled	Boolean	0..1	attr	If enabled the default hop limit may be reconfigured based on received Router Advertisements.
tcpIpNdpDynamicMtuEnabled	Boolean	0..1	attr	Allow dynamic reconfiguration of link MTU via Router Advertisements.
tcpIpNdpDynamicReachableTimeEnabled	Boolean	0..1	attr	If enabled the default Reachable Time value may be reconfigured based on received Router Advertisements.
tcpIpNdpDynamicRetransTimeEnabled	Boolean	0..1	attr	If enabled the default Retransmit Timer value may be reconfigured based on received Router Advertisements.
tcpIpNdpMaxRandomFactor	PositiveInteger	0..1	attr	Maximum random factor used for randomization
tcpIpNdpMaxRtrSolicitationDelay	TimeValue	0..1	attr	Maximum delay before the first Router Solicitation will be sent after interface initialization in (s).
tcpIpNdpMaxRtrSolicitations	PositiveInteger	0..1	attr	Maximum number of Router Solicitations that will be sent before the first Router Advertisement has been received.





Class	Ipv6NdpProps			
tcpIpNdpMinRandomFactor	PositiveInteger	0..1	attr	Minimum random factor used for randomization
tcpIpNdpNeighborUnreachabilityDetectionEnabled	Boolean	0..1	attr	Neighbor Unreachability Detection is used to remove unused entries from the neighbor cache. This feature is a basic feature of NDP and should be turned on.
tcpIpNdpNumMulticastSolicitations	PositiveInteger	0..1	attr	Maximum number of multicast solicitations that will be sent when performing address resolution.
tcpIpNdpNumUnicastSolicitations	PositiveInteger	0..1	attr	Maximum number of unicast solicitations that will be sent when performig Neighbor Unreachability Detection.
tcpIpNdpPacketQueueEnabled	Boolean	0..1	attr	Enables (TRUE) or disables (FALSE) support of a NDP Packet Queue according to IETF RFC 4861, section 7.2.2.
tcpIpNdpPrefixListSize	PositiveInteger	0..1	attr	Maximum number of entries in the on-link prefix list.
tcpIpNdpRandomReachableTimeEnabled	Boolean	0..1	attr	If enabled the value of ReachableTime will be multiplied with a random value between MIN_RANDOM_FACTOR and MAX_RANDOM_FACTOR in order to prevent multiple nodes from transmitting at exactly the same time.
tcpIpNdpRndRtrSolicitationDelayEnabled	Boolean	0..1	attr	If enabled the first router solicitation will be delayed randomly from [0...MAX_RTR_SOLICITATION_DELAY]. Otherwise the first router solicitation will be sent after exactly MAX_RTR_SOLICITATION_DELAY milliseconds.
tcpIpNdpRtrSolicitationInterval	TimeValue	0..1	attr	Interval between consecutive Router Solicitations in (s).
tcpIpNdpSlaacDadNumberOfTransmissions	PositiveInteger	0..1	attr	Number of Neighbor Solicitations that have to be unanswered in order to set an autoconfigured address to PREFERRED (usable) state.
tcpIpNdpSlaacDadRetransmissionDelay	TimeValue	0..1	attr	Sets the maximum value for the address configuration delay (s).
tcpIpNdpSlaacDelayEnabled	Boolean	0..1	attr	If enabled transmission of the first DAD Neighbor Solicitation will be delayed by a random value from [0...MAX_DAD_DELAY].
tcpIpNdpSlaacOptimisticDadEnabled	Boolean	0..1	attr	Enable Optimistic Duplicate Address Detection (DAD) according to RFC4429.

Table 6.18: Ipv6NdpProps

6.2.1.4 TCP and UDP configuration properties

The Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) are transport protocols that are based on the Internet Protocol (IP) that is located on the network layer in the OSI model.

The Transport Protocol configuration is supported with the [EthTcpIpProps](#) meta-class and the two aggregated classes:

- [UdpProps](#) - used for configuration of Udp

- **TcpProps** - used for configuration of Tcp

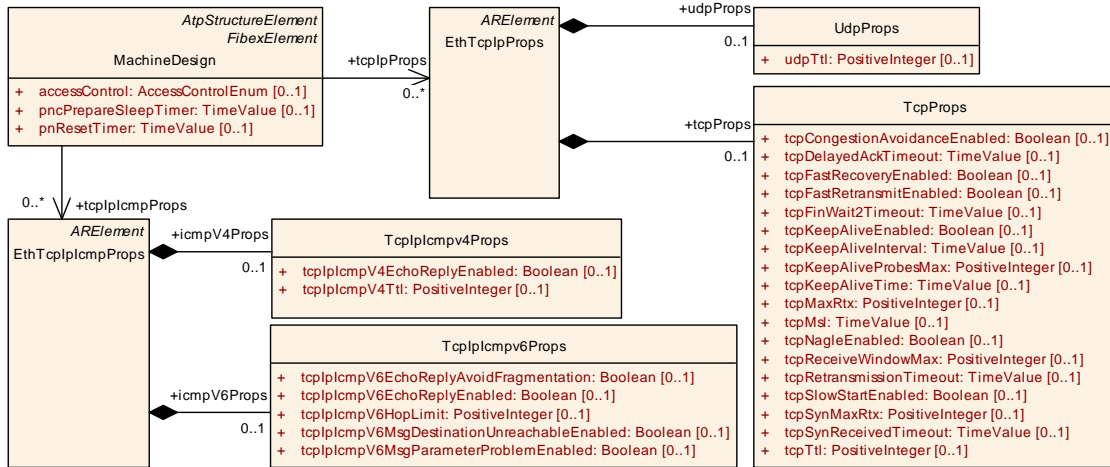


Figure 6.4: Machine specific TCP/UDP and ICMP configuration options

Please note that for the configuration of TCP and UDP the same modeling approach is used as in the Classic Platform (System Template [19]). Therefore, the following constraints defined in the System Template [19] are valid for this specification as well:

- [constr_5118]
- [constr_5119]
- [constr_5120]
- [constr_5121]
- [constr_5122]
- [constr_5123]
- [constr_5124]

Class	EthTcplpProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class is used to configure the Machine specific Tcplp Stack attributes. Tags: atp.recommendedPackage=EthTcplpProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
tcpProps	TcpProps	0..1	aggr	TCP configuration properties
udpProps	UdpProps	0..1	aggr	UDP configuration properties

Table 6.19: EthTcplpProps

Class	UdpProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for UDP (User Datagram Protocol).			
Base	ARObject			
Aggregated by	EthTcpIpProps.udpProps			
Attribute	Type	Mult.	Kind	Note
udpTtl	PositiveInteger	0..1	attr	Default Time-to-live value of outgoing UDP packets.

Table 6.20: UdpProps

Class	TcpProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for TCP (Transmission Control Protocol).			
Base	ARObject			
Aggregated by	EthTcpIpProps.tcpProps			
Attribute	Type	Mult.	Kind	Note
tcpCongestionAvoidanceEnabled	Boolean	0..1	attr	Enables (TRUE) or disables (FALSE) support of TCP congestion avoidance algorithm according to IETF RFC 5681.
tcpDelayedAckTimeout	TimeValue	0..1	attr	The maximal time an acknowledgement is delayed for transmission in seconds.
tcpFastRecoveryEnabled	Boolean	0..1	attr	Enables (TRUE) or disables (FALSE) support of TCP Fast Recovery according to IETF RFC 5681.
tcpFastRetransmitEnabled	Boolean	0..1	attr	Enables (TRUE) or disables (FALSE) support of TCP Fast Retransmission according to IETF RFC 5681.
tcpFinWait2Timeout	TimeValue	0..1	attr	Timeout in [s] to receive a FIN from the remote node (after this node has initiated connection termination), i.e. maximum time waiting in FINWAIT-2 for a connection termination request from the remote TCP.
tcpKeepAliveEnabled	Boolean	0..1	attr	Enables (TRUE) or disables (FALSE) TCP Keep Alive Probes according to IETF RFC 1122 chapter 4.2.3.6.
tcpKeepAliveInterval	TimeValue	0..1	attr	Specifies the interval in seconds between subsequent keepalive probes.
tcpKeepAliveProbesMax	PositiveInteger	0..1	attr	Maximum number of times that a TCP Keep Alive is retransmitted before the connection is closed.
tcpKeepAliveTime	TimeValue	0..1	attr	Specifies the time in [s] between the last data packet sent (simple ACKs are not considered data) and the first keepalive probe.
tcpMaxRtx	PositiveInteger	0..1	attr	Maximum number of times that a TCP segment is retransmitted before the TCP connection is closed. This parameter is only valid if tcpRetransmissionTimeout is configured. Note: This parameter also applies for FIN retransmissions.
tcpMsl	TimeValue	0..1	attr	Maximum segment lifetime in [s].
tcpNagleEnabled	Boolean	0..1	attr	Enables (TRUE) or disables (FALSE) support of Nagle's algorithm according to IETF RFC 1122 (chapter 4.2.3.4 When to Send Data). If enabled the Nagle's algorithm is activated per default for all TCP sockets, but can be deactivated per Socket (with the attribute TcpTp.nagleAlgorithm).
tcpReceiveWindowMax	PositiveInteger	0..1	attr	Default value of maximum receive window in bytes.





Class	TcpProps			
tcpRetransmissionTimeout	TimeValue	0..1	attr	Timeout in [s] before an unacknowledged TCP segment is sent again. If the timeout is disabled, no TCP segments shall be retransmitted.
tcpSlowStartEnabled	Boolean	0..1	attr	Enables (TRUE) or disables (FALSE) support of TCP slow start algorithm according to IETF RFC 5681.
tcpSynMaxRtx	PositiveInteger	0..1	attr	Maximum number of times that a TCP SYN is retransmitted.
tcpSynReceivedTimeout	TimeValue	0..1	attr	Timeout in [s] to complete a remotely initiated TCP connection establishment, i.e. maximum time waiting in SYN-RECEIVED for a confirming connection request acknowledgement after having both received and sent a connection request.
tcpTtl	PositiveInteger	0..1	attr	Default Time-to-live value of outgoing TCP packets.

Table 6.21: TcpProps

6.2.1.5 ICMP configuration properties

Internet Control Message Protocol (ICMP) is located in the network layer in the OSI model and is used by network devices to diagnose network communication issues, e.g. it is used to determine whether the data is reaching its intended destination in a timely manner.

AUTOSAR supports the configuration of

- the Internet Control Message Protocol Version 4 for the Internet Protocol Version 4 (IPv4) with [TcpIpIcmpv4Props](#)
- the Internet Control Message Protocol Version 6 for the Internet Protocol Version 6 (IPv6) with [TcpIpIcmpv6Props](#)

Please note that for the configuration of ICMP the same modeling approach is used as in the Classic Platform (System Template [19]). Therefore the following constraints defined in the System Template [19] are valid for this specification as well:

- [constr_5125]
- [constr_5154]

Class	EthTcplcmpProps
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology
Note	This meta-class is used to configure the Machine specific ICMP (Internet Control Message Protocol) attributes Tags: atp.recommendedPackage=EthTcplcmpProps
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable
Aggregated by	ARPackage.element





Class		EthTcplplcmpProps		
Attribute	Type	Mult.	Kind	Note
icmpV4Props	Tcplplcmpv4Props	0..1	aggr	ICMPv4 configuration properties
icmpV6Props	Tcplplcmpv6Props	0..1	aggr	ICMPv6 configuration properties

Table 6.22: EthTcplplcmpProps

Class		Tcplplcmpv4Props		
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for ICMPv4 (Internet Control Message Protocol).			
Base	<i>ARObject</i>			
Aggregated by	EthTcplplcmpProps.icmpV4Props			
Attribute	Type	Mult.	Kind	Note
tcplplcmpV4EchoReplyEnabled	Boolean	0..1	attr	This attribute enables or disables transmission of ICMP echo reply message in case of a ICMP echo reception.
tcplplcmpV4Ttl	PositiveInteger	0..1	attr	This attribute is only relevant in case that ICMP (Internet Control Message Protocol) is used. It specifies the default Time-to-live value of outgoing ICMP packets.

Table 6.23: Tcplplcmpv4Props

Class		Tcplplcmpv6Props		
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	This meta-class specifies the configuration options for ICMPv6 (Internet Control Message Protocol).			
Base	<i>ARObject</i>			
Aggregated by	EthTcplplcmpProps.icmpV6Props			
Attribute	Type	Mult.	Kind	Note
tcplplcmpV6EchoReplyAvoidFragmentation	Boolean	0..1	attr	This attribute defines whether the echo reply is only transmitted in case that the incoming ICMPv6 Echo Request (Pings) fits the MTU of the respective interface, i.e. can be transmitted without IPv6 fragmentation.
tcplplcmpV6EchoReplyEnabled	Boolean	0..1	attr	This attribute enables or disables transmission of ICMP echo reply message in case of a ICMP echo reception.
tcplplcmpV6HopLimit	PositiveInteger	0..1	attr	Default Hop-Limit value of outgoing ICMPv6 packets.
tcplplcmpV6MsgDestinationUnreachableEnabled	Boolean	0..1	attr	This attribute Enables/Disables the transmission of Destination Unreachable Messages.
tcplplcmpV6MsgParameterProblemEnabled	Boolean	0..1	attr	If enabled an ICMPv6 parameter problem message will be sent if a received packet has been dropped due to unknown options or headers that are found in the packet.

Table 6.24: Tcplplcmpv6Props

6.2.2 Securing Communication with IPsec

IPsec is a protocol suite that provides cryptographic protection for IP datagrams in IPv4 and IPv6 network packets.

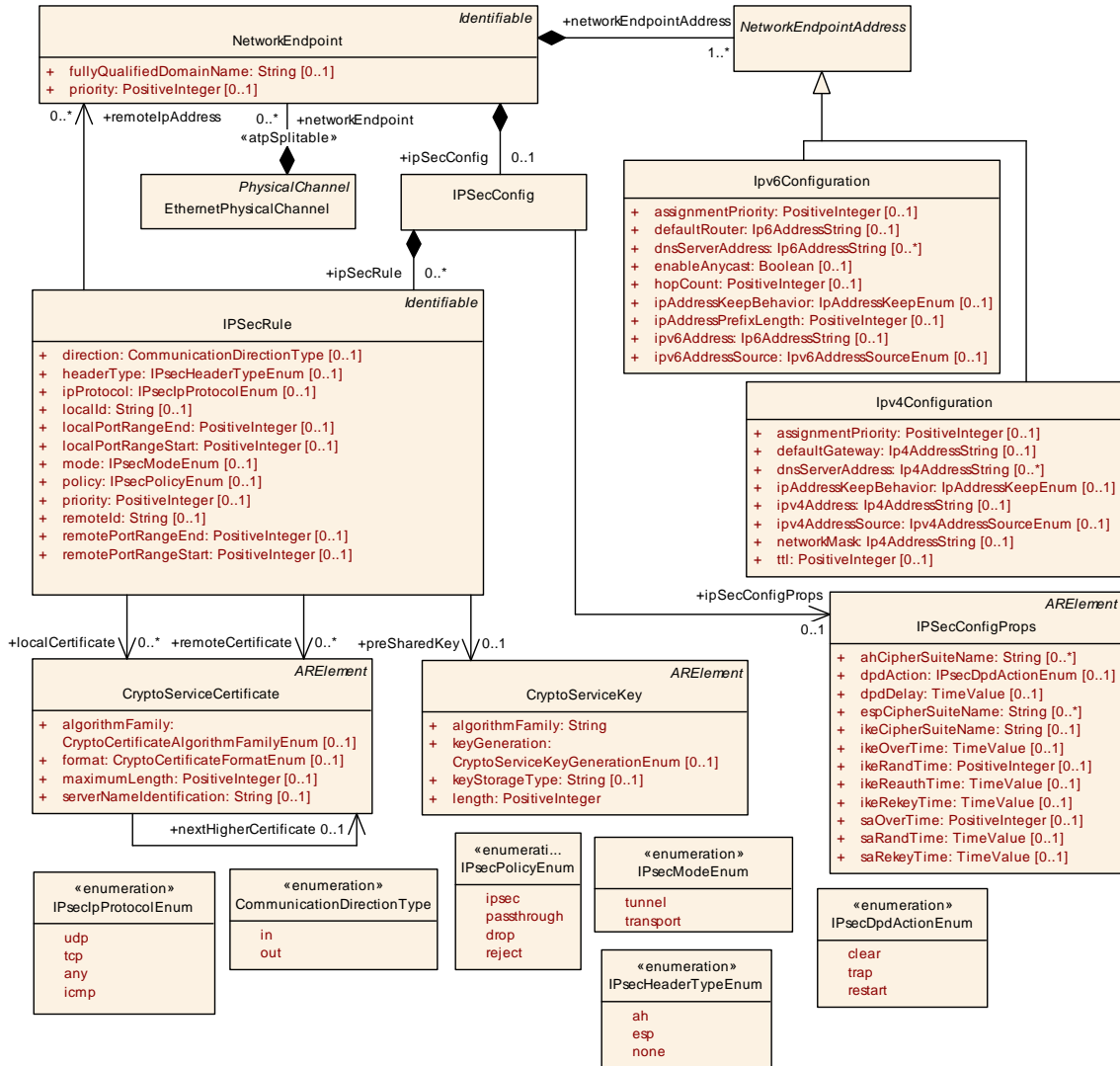


Figure 6.5: IPsec configuration model

IPsec uses a security association to specify security properties that are shared between the communicating parties. The security association defines a relationship between two or more parties and determines which security services will be used to communicate securely. In other words the security association serves as a “contract” between the different devices.

A single security association protects data in one communication direction. Two security associations shall be present to secure traffic in both directions. Each security association can provide encryption, data integrity and data authentication.

In addition, the senders and receivers of IP datagrams can determine the required protection for an IP packet according to IPsec security policies. These are rules that

define how datagrams are processed that are received by a device. For example, security policies are used to decide if a particular packet needs to be dropped or needs to be processed by IPsec.

[TPS_MANI_03203]{DRAFT} Configuration of IPsec [The [IPSecConfig](#) meta-class that is aggregated by a [NetworkEndpoint](#) in the role [ipSecConfig](#) provides the ability to define IPsec settings that are necessary to configure IPsec security associations and IPsec security policies.] ([RS_MANI_00036](#))

[TPS_MANI_03204]{DRAFT} Definition of IPSecRules [The [IPSecConfig](#) meta-class may contain one or several [IPSecRules](#). Each [IPSecRule](#) defines the network connection that is monitored by IPsec by defining the local endpoint and the remote endpoint. Each endpoint is defined by the IP Address and the Tcp/Udp Port. The communication direction for which the [IPSecRule](#) is valid is defined by the [direction](#) attribute.] ([RS_MANI_00036](#))

Class	IPSecConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	IPsec is a protocol that is designed to provide "end-to-end" cryptographically-based security for IP network connections.			
Base	ARObject			
Aggregated by	NetworkEndpoint.ipSecConfig			
Attribute	Type	Mult.	Kind	Note
ipSecConfig Props	IPSecConfigProps	0..1	ref	Global IPsec configuration settings that are valid for all IPSecRules that are defined on the NetworkEndpoint.
ipSecRule	IPSecRule	*	aggr	IPSec rules and filters that are defined in the IPSecConfig for a specific NetworkEndpoint.

Table 6.25: IPSecConfig

Class	IPSecRule			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This element defines an IPsec rule that describes communication traffic that is monitored, protected and filtered.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	IPSecConfig.ipSecRule			
Attribute	Type	Mult.	Kind	Note
direction	CommunicationDirectionType	0..1	attr	This attribute defines the direction in which the traffic is monitored. If this attribute is not set a bidirectional traffic monitoring is assumed.
headerType	IPsecHeaderTypeEnum	0..1	attr	Header type specifying the IPsec security mechanism.
ipProtocol	IPsecIpProtocolEnum	0..1	attr	This attribute defines the relevant IP protocol used in the Security Policy Database (SPD) entry.
localCertificate	CryptoServiceCertificate	*	ref	This reference identifies the applicable certificate used for a local authentication.
localId	String	0..1	attr	This attribute defines how the local participant should be identified for authentication.





Class	IPSecRule			
localPortRangeEnd	PositiveInteger	0..1	attr	<p>This attribute restricts the traffic monitoring and defines an end value for the local port range.</p> <p>If this attribute is not set then this rule shall be effective for all local ports.</p> <p>Please note that port ranges are currently not supported in the AUTOSAR AP's operating system backend. If AP systems are involved, each IPsec rule may only contain a single port.</p>
localPortRangeStart	PositiveInteger	0..1	attr	<p>This attribute restricts the traffic monitoring and defines a start value for the local port range.</p> <p>If this attribute is not set then this rule shall be effective for all local ports.</p> <p>Please note that port ranges are currently not supported in the AUTOSAR AP's operating system backend. If AP systems are involved, each IPsec rule may only contain a single port.</p>
mode	IPsecModeEnum	0..1	attr	This attribute defines the type of the connection.
policy	IPsecPolicyEnum	0..1	attr	An IPsec policy defines the rules that determine which type of IP traffic needs to be secured using IPsec and how that traffic is secured.
preSharedKey	CryptoServiceKey	0..1	ref	This reference identifies the applicable cryptographic key used for authentication.
priority	PositiveInteger	0..1	attr	This attribute defines the priority of the IPSecRule (SPD entry). The processing of entries is based on priority, starting with the highest priority "0".
remoteCertificate	CryptoServiceCertificate	*	ref	This reference identifies the applicable certificate used for a remote authentication.
remoteld	String	0..1	attr	This attribute defines how the remote participant should be identified for authentication.
remoteIpAddress	NetworkEndpoint	*	ref	Definition of the remote NetworkEndpoint. With this reference the connection between the local NetworkEndpoint and the remote NetworkEndpoint is described on which the traffic is monitored.
remotePortRangeEnd	PositiveInteger	0..1	attr	<p>This attribute restricts the traffic monitoring and defines an end value for the remote port range.</p> <p>If this attribute is not set then this rule shall be effective for all local ports.</p> <p>Please note that port ranges are currently not supported in the AUTOSAR AP's operating system backend. If AP systems are involved, each IPsec rule may only contain a single port.</p>
remotePortRangeStart	PositiveInteger	0..1	attr	<p>This attribute restricts the traffic monitoring and defines a start value for the remote port range.</p> <p>If this attribute is not set then this rule shall be effective for all local ports.</p> <p>Please note that port ranges are currently not supported in the AUTOSAR AP's operating system backend. If AP systems are involved, each IPsec rule may only contain a single port.</p>

Table 6.26: IPSecRule

Class	IPSecConfigProps			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This element holds all the attributes for configuration of IPsec that are independent of specific IPsec rules. Tags: atp.recommendedPackage=IPSecConfigProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
ahCipherSuite Name	String	*	attr	AH (Authentication Header) algorithm to be used for the connection, e.g. HMAC/SHA2-256
dpdAction	IPsecDpdActionEnum	0..1	attr	This attribute defines what to do if the peer is considered dead. If not configured "restart" shall be assumed.
dpdDelay	TimeValue	0..1	attr	This attribute describes the interval to check the liveness of a peer actively using IKEv2 INFORMATIONAL exchanges. Active DPD checking is only enforced if no IKE or ESP/AH packet has been received for the configured DPD delay. In not configured the value "5 minutes" shall be assumed.
espCipherSuite Name	String	*	attr	ESP (Encapsulating Security Payload) algorithm that provides encryption and optional authentication for the connection, e.g. AES-128+SHA2-256.
ikeCipherSuite Name	String	0..1	attr	IKE encryption/authentication algorithms to be used for the connection.
ikeOverTime	TimeValue	0..1	attr	This attribute describes the hard deadline when an SA becomes invalid in percentage. Example: ikeOverTime of max(ikeReauthTime, ikeRekeyTime). Default: 10 %
ikeRandTime	PositiveInteger	0..1	attr	This attribute defines in percentage by how long before the expiration of ikeReauthTime and ikeRekeyTime will be rekeyed/reauthenticated. Default: 10%
ikeReauthTime	TimeValue	0..1	attr	This attribute defines the absolute time after which an IKE SA will be reauthenticated. 0 means reauthentication is disabled.
ikeRekeyTime	TimeValue	0..1	attr	This attribute defines the absolute time after which an IKE SA will be rekeyed. 0 means rekey is disabled.
saOverTime	PositiveInteger	0..1	attr	This attribute describes the hard deadline when an IPsec SA becomes invalid in percentage. Example: saOverTime * saRekeyTime. Default: 110%
saRandTime	TimeValue	0..1	attr	This attribute defines by how long before the expiration of saRekeyTime will be rekeyed.
saRekeyTime	TimeValue	0..1	attr	This attribute defines the absolute time after which an IPsec SA will be rekeyed. 0 means rekey is disabled.

Table 6.27: IPSecConfigProps

Enumeration	IPsecIpProtocolEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	Definition of supported TcpIp protocols that are supported in Security Policy Database (SPD) entries in IPsec configurations.
Aggregated by	IPSecRule.ipProtocol
Literal	Description
any	ANY protocol Tags: atp.EnumerationLiteralIndex=3
icmp	Internet Control Message Protocol (ICMP) Tags: atp.EnumerationLiteralIndex=2
tcp	TCP Protocol Tags: atp.EnumerationLiteralIndex=1
udp	UDP Protocol Tags: atp.EnumerationLiteralIndex=0

Table 6.28: IPsecIpProtocolEnum

[constr_5102]{DRAFT} Usage of remote port ranges in [IPSecRule](#) is not allowed [[IPSecRule.remotePortRangeStart](#) and [IPSecRule.remotePortRangeEnd](#) shall always be set to the same value.]()

[constr_5103]{DRAFT} Usage of local port ranges in [IPSecRule](#) is not allowed [[IPSecRule.localPortRangeStart](#) and [IPSecRule.localPortRangeEnd](#) shall always be set to the same value.]()

The reason for [\[constr_5102\]](#) and [\[constr_5103\]](#) is that port ranges are currently not supported by the AUTOSAR Adaptive Platform operating system backend and each [IPSecRule](#) is allowed to define only a single local Port and a single remote Port.

[TPS_MANI_03232]{DRAFT} Definition of general IPsec configuration settings [General configuration properties that are independent of particular [IPSecRules](#) are collected in the [IPSecConfigProps](#) element that is referenced from the [IPSecConfig](#) in the role [ipSecConfigProps](#).] ([RS_MANI_00036](#))

[TPS_MANI_03205]{DRAFT} IPsec policy [The [IPSecRule.policy](#) attribute defines how IP packets are handled that are going over the network connection defined by the [IPSecRule](#). In detail, it defines whether the IP packet is processed by IPsec or not.] ([RS_MANI_00036](#))

Enumeration	IPsecPolicyEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	Defines the filter actions that are supported by IPsec.
Aggregated by	IPSecRule.policy
Literal	Description
drop	Signifying that packets should be discarded Tags: atp.EnumerationLiteralIndex=3





Enumeration	IPsecPolicyEnum
ipsec	Signifying that packets should be protected. Tags: atp.EnumerationLiteralIndex=1
passthrough	Signifying that no IPsec processing should be done at all. Tags: atp.EnumerationLiteralIndex=2
reject	Signifying that packets should be discarded and a diagnostic ICMP returned. Tags: atp.EnumerationLiteralIndex=4

Table 6.29: IPsecPolicyEnum

IPsec can be configured to operate in two different modes, Tunnel and Transport mode. With tunnel mode, the entire IP packet is protected by IPsec. IPsec wraps the original packet, encrypts it and adds a new IP header to it.

The tunnel mode is most commonly used between VPN gateways and the IP addresses of the newly added outer IP header are that of the VPN Gateways. In other words the traffic between the two VPN Gateways is protected and each gateway acts as a proxy for the hosts behind it.

The transport mode provides the protection of the Data Payload of the IP datagram with an AH or ESP header. The IP Header remains the same and IPsec inserts its header between the IP header and the upper level headers.

The IPsec transport mode can be used when securing traffic between two hosts or between a host and a VPN gateway.

[TPS_MANI_03233]{DRAFT} IPsec mode [The `IPSecRule.mode` attribute defines whether the IP packet is processed in the `transport` or `tunnel` mode.] ([RS_MANI_00036](#))

Please note that AUTOSAR currently supports only the `transport mode` as configuration option.

Enumeration	IPsecModeEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	This enumeration describes the supported IPsec modes.
Aggregated by	IPSecRule.mode
Literal	Description
transport	Signifying that the IPsec transport mode is used. With the transport mode the original IP header is retained and only the IP payload and ESP trailer is encrypted. Tags: atp.EnumerationLiteralIndex=1
tunnel	Signifying that the IPsec tunnel mode is used. With tunnel mode, the entire original IP packet is protected by IPsec. This means IPsec wraps the original packet, encrypts it, adds a new IP header and sends it to the other side. Tags: atp.EnumerationLiteralIndex=0

Table 6.30: IPsecModeEnum

IPsec uses two protocols:

- AH - Authentication Header
- ESP - Encapsulating Security Payload

The AH protocol provides a mechanism for authentication only and authenticates the entire IP packet, including the outer IP header.

The ESP protocol provides data confidentiality (encryption) and/or authentication (data integrity, data origin authentication, and replay protection).

When ESP is used in transport mode, the IP payload is encrypted and the original IP header is moved to the front of the message. The ESP header is inserted after the IP header and is signed together with the IP payload. The original IP header remains unprotected.

When ESP is used in tunnel mode a new IP Header is created and the ESP header is added in front of the original IP Packet. The entire original IP packet is encrypted and signed in this mode.

[TPS_MANI_03206]{DRAFT} IPsec AH and ESP protocol configuration [In the [IPSecRule](#) it is possible to define the IPsec protocol that shall be used to protect IP packets that are going over the defined network connection. The attribute [headerType](#) defines whether AH, ESP or neither one is used.] ([RS_MANI_00036](#))

<i>Enumeration</i>	IPsecHeaderTypeEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	IPsec Header Type options
Aggregated by	IPSecRule.headerType
Literal	Description
ah	Authentication Header (AH) Tags: atp.EnumerationLiteralIndex=0
esp	Encapsulating Security Payloads (ESP) Tags: atp.EnumerationLiteralIndex=1
none	No header Tags: atp.EnumerationLiteralIndex=2

Table 6.31: IPsecHeaderTypeEnum

[TPS_MANI_03234]{DRAFT} IPsec AH and ESP CipherSuites [The attributes [ahCipherSuiteName](#) and [espCipherSuiteName](#) define the supported AH and ESP algorithms.] ([RS_MANI_00036](#))

The naming convention for [ahCipherSuiteName](#), [espCipherSuiteName](#) and [IPSecConfigProps.ikeCipherSuiteName](#) shall follow the naming convention for cryptographic primitives that is defined in [15].

[TPS_MANI_03207]{DRAFT} IPsec Internet Key Exchange protocol configuration [In the [IPSecRule](#) it is possible to define how IKE protocol authenticates the remote party and how the local party authenticates itself to the remote party. In other words

both sides use the same method. The usage of the `IPSecRule.preSharedKey` reference defines that the pre-shared key is used. The usage of the `IPSecRule.localCertificate` and `IPSecRule.remoteCertificate` defines that Digital Signature Authentication is used.]([RS_MANI_00036](#))

Please note that the supported IKE CipherSuites are configured with the `IPSecConfigProps.ikeCipherSuiteName`. The `IPSecConfigProps` contains additional IKE specific configuration settings.

Enumeration	IPsecDpdActionEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	Potential Dead Peer Detection (Dpd) Actions
Aggregated by	IPSecConfigProps.dpdAction
Literal	Description
clear	Deletes the SA. Tags: atp.EnumerationLiteralIndex=0
restart	Immediately tries to establish the connection. Tags: atp.EnumerationLiteralIndex=2
trap	tries to establish the connection after traffic is sent to the peer. Tags: atp.EnumerationLiteralIndex=1

Table 6.32: IPsecDpdActionEnum

[[TPS_MANI_03208](#)]{DRAFT} **Protection of [AdaptivePlatformServiceInstance](#) by IPsec** [To describe the protection of an [AdaptivePlatformServiceInstance](#) by IPsec the [AdaptivePlatformServiceInstance](#) needs to be mapped by a [ServiceInstanceToMachineMapping](#) to an [EthernetCommunicationConnector](#) that points with the [unicastNetworkEndpoint](#) to a [NetworkEndpoint](#) that aggregates the [IPSecConfig](#) that in turn describes IPsec Security Associations.]([RS_MANI_00036](#))

Please note that IP Multicast protection by IPsec is not supported. It is by intention not possible to model the IPsec protection of IP Multicast communication since the IP Multicast address is defined in the [SomeipProvidedEventGroup](#) by the two attributes [ipv4MulticastIpAddress](#) and [ipv6MulticastIpAddress](#). The [NetworkEndpoint](#) element is used for description of IP Unicast Endpoints only. This means that only the IP Unicast communication of an [AdaptivePlatformServiceInstance](#) that is described according to [[TPS_MANI_03208](#)] will be protected by IPsec.

6.2.3 MACsec

MACsec (Media Access Control security) is defined by IEEE standard 802.1AE and operates at the medium access control layer and defines connectionless data confidentiality and integrity for media access independent protocols. The MACsec standard specifies a set of protocols to meet the security requirements for protecting data

traversing Ethernet LANs. MACsec allows unauthorized LAN connections to be identified and excluded from communication within the network. In common with IPsec and TLS, MACsec defines a security infrastructure to provide data confidentiality, data integrity and data origin authentication. With security on the MAC layer, protocols not based on IP as well as protocols using multicast can be protected by MACsec.

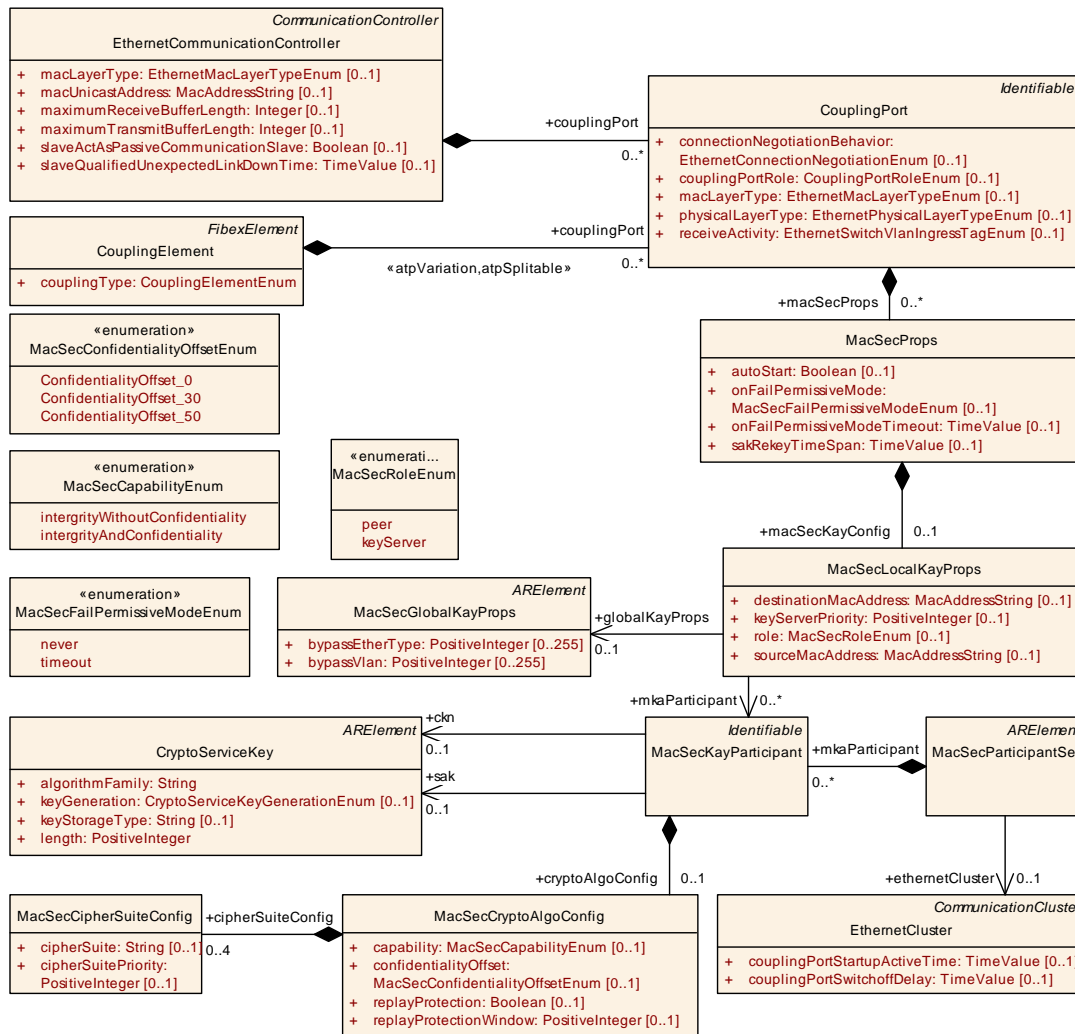


Figure 6.6: MACsec configuration

The MACsec standard relies on the usage of authentic partners, which are called MAC Security Entities (SecYs). The standard organizes this by MACsec Protocol Data Units (MPDU), which resides in the MAC layer (ISO/OSI layer 2). The MAC Security Key Agreement Entity (KaY) will take care of properly configuring and managing of the MAC Security Entities to enable the secure communication channel.

In the System Design model the configuration of MACsec is supported on [CouplingPorts](#) that in turn are aggregated either by a [CouplingElement](#) or by an [EthernetCommunicationController](#). This allows the configuration of MACsec on a switch port or on an [EthernetCommunicationController](#) of a [MachineDesign](#). Please note that the same modeling approach is used in the Classic Platform System Template as well.

[TPS_MANI_03317]{DRAFT} MACsec configuration [A [CouplingPort](#) that aggregates the [MacSecProps](#) in the role [macSecProps](#) defines a MAC Security Entity.] ([RS_MANI_00036](#))

Please note that constraint [constr_5361] from the System Template is also valid in the System Design model of the Adaptive Platform.

Please note that constraint [constr_3726] from the System Template is also valid in the System Design model of the Adaptive Platform.

[TPS_MANI_03318]{DRAFT} MAC Security Key Agreement Entity configuration [The [MacSecLocalKayProps](#) element that is referenced by the [MacSecProps](#) in the role [macSecKayConfig](#) in combination with [MacSecGlobalKayProps](#) that is referenced by [MacSecLocalKayProps](#) in the role [globalKayProps](#) defines the configuration settings for the MACsec Key Agreement that is responsible for the peer discovery and key negotiation to secure the Ethernet link.] ([RS_MANI_00036](#))

Class	MacSecProps			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class allows to configure MACsec (Media access control security) and the MKA (MACsec Key Agreement) for the CouplingPort (PHY). Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	CouplingPort.macSecProps			
Attribute	Type	Mult.	Kind	Note
autoStart	Boolean	0..1	attr	This attribute defines how the Port Access Entity (PAE) is started: True := Autostart False := Manual Start Tags: atp.Status=candidate
macSecKay Config	MacSecLocalKayProps	0..1	aggr	Properties to configure the MKA instance (KaY) for a controlled CouplingPort (PaE). Tags: atp.Status=candidate
onFail Permissive Mode	MacSecFailPermissive ModeEnum	0..1	attr	This attribute sets the behavior of the Port Access Entity in case MACsec does not succeed. Tags: atp.Status=candidate
onFail Permissive ModeTimeout	TimeValue	0..1	attr	Timeout in seconds to enable the controlled port in case onFailPermissiveMode is set to Timeout. Tags: atp.Status=candidate
sakRekeyTime Span	TimeValue	0..1	attr	Time in seconds to trigger the rekey of an in use SAK (Static Secure Association key). If set to 0, the rekey will not be triggered after a time span. Tags: atp.Status=candidate

Table 6.33: MacSecProps

Class	MacSecLocalKayProps			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	Configuration of the MAC Security Key Agreement Entity (KaY). Tags: atp.Status=candidate			
Base	<i>ARObject</i>			
Aggregated by	MacSecProps.macSecKayConfig			
Attribute	Type	Mult.	Kind	Note
destinationMac Address	MacAddressString	0..1	attr	This attribute defines the destination MAC Address that is used to calculate the ICV (Integrity Check Value). Tags: atp.Status=candidate
globalKayProps	MacSecGlobalKay Props	0..1	ref	Reference to properties that are shared between MAC Security Key Agreement Entities. Tags: atp.Status=candidate
keyServer Priority	PositiveInteger	0..1	attr	This attribute defines the key-server priority. Tags: atp.Status=candidate
mkaParticipant	MacSecKayParticipant	*	ref	Reference to MKA participant settings supported on the CouplingPort. Tags: atp.Status=candidate
role	MacSecRoleEnum	0..1	attr	Role of the MAC Security Key Agreement Entity Tags: atp.Status=candidate
sourceMac Address	MacAddressString	0..1	attr	This attribute defines the source MAC Address that is used to calculate the ICV (Integrity Check Value). Tags: atp.Status=candidate

Table 6.34: MacSecLocalKayProps

Class	MacSecGlobalKayProps			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	Configuration of the MAC Security Key Agreement Entity properties that are shared by different KaY configurations. Tags: atp.Status=candidate atp.recommendedPackage=MacSecGlobalKayProps			
Base	ARElement , <i>ARObject</i> , <i>CollectableElement</i> , Identifiable , <i>MultilanguageReferrable</i> , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
bypassEther Type	PositiveInteger	0..255	attr	This attribute is used to define EtherTypes that are bypassed by MACsec. The providedEtherType will not be MACsec protected. Tags: atp.Status=candidate
bypassVlan	PositiveInteger	0..255	attr	This attribute is used to define VLAN-IDs that are bypassed by MACsec. The provided VLAN-IDs will not be MACsec protected. (VLAN-ID 0 is interpreted as no-VLAN → Bypass untagged traffic) Tags: atp.Status=candidate

Table 6.35: MacSecGlobalKayProps

Class	MacSecParticipantSet			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	Collection of MACsec Kay Participants on an Ethernet Link. Tags: atp.Status=candidate atp.recommendedPackage=MacSecKayParticipantSets			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
ethernetCluster	EthernetCluster	0..1	ref	Reference to the EthernetCluster (Link) on which the KaY participants are located Tags: atp.Status=candidate
mkaParticipant	MacSecKayParticipant	*	aggr	Configuration of a MKA Participant. Tags: atp.Status=candidate

Table 6.36: MacSecParticipantSet

Class	MacSecKayParticipant			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class configures a MKA participant. Tags: atp.Status=candidate atp.recommendedPackage=MacSecKayParticipants			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	MacSecParticipantSet.mkaParticipant			
Attribute	Type	Mult.	Kind	Note
ckn	CryptoServiceKey	0..1	ref	Reference to the key where the ckn (Connectivity Association key) is stored. Tags: atp.Status=candidate
cryptoAlgo Config	MacSecCryptoAlgo Config	0..1	aggr	Cryptography that is used by the MKA Participant. Tags: atp.Status=candidate
sak	CryptoServiceKey	0..1	ref	Reference to the key where SAK shall be stored. Tags: atp.Status=candidate

Table 6.37: MacSecKayParticipant

Class	MacSecCryptoAlgoConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class defines the cryptography configuration for MACsec. Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	MacSecKayParticipant.cryptoAlgoConfig			
Attribute	Type	Mult.	Kind	Note
capability	MacSecCapabilityEnum	0..1	attr	This attribute defines the MACsec capability. Tags: atp.Status=candidate
cipherSuite Config	MacSecCipherSuite Config	0..4	aggr	Cipher suite configuration to use with MACsec. Tags: atp.Status=candidate





Class	MacSecCryptoAlgoConfig			
confidentialityOffset	MacSecConfidentialityOffsetEnum	0..1	attr	The MACsec confidentiality offset specifies the number of bytes starting from the frame header. MACsec encrypts only the bytes after the offset in a frame. Tags: atp.Status=candidate
replayProtection	Boolean	0..1	attr	This attribute is used to configure the MACsec replay protection. Tags: atp.Status=candidate
replayProtectionWindow	PositiveInteger	0..1	attr	In case replay protection is active, this attribute defines the replay protection window. Tags: atp.Status=candidate

Table 6.38: MacSecCryptoAlgoConfig

Class	MacSecCipherSuiteConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class defines the cipher suite configuration to use with MACsec. cipherSuitePriority is present in case the MKA instance acts as a Key Server to select the cipher suite to use for MACsec. Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	MacSecCryptoAlgoConfig.cipherSuiteConfig			
Attribute	Type	Mult.	Kind	Note
cipherSuite	String	0..1	attr	Cipher Suite to use for MACsec. Tags: atp.Status=candidate
cipherSuitePriority	PositiveInteger	0..1	attr	In case the MKA instance acts as a Key Server, the priority is used to select the Cipher Suite to use with MACsec from the supported Ciphers. Tags: atp.Status=candidate

Table 6.39: MacSecCipherSuiteConfig

[TPS_MANI_03319]{DRAFT} **Standardized values for the attribute [cipherSuite](#) of meta-class [MacSecCipherSuiteConfig](#)** [The following values for [MacSecCipherSuiteConfig.cipherSuite](#) are reserved by the AUTOSAR standard:

- GCM-AES-128
- GCM-AES-256
- GCM-AES-XPB-128
- GCM-AES-XPB-256

]([RS_MANI_00036](#))

[TPS_MANI_03320]{DRAFT} **Semantics of [MacSecCipherSuiteConfig.cipherSuitePriority](#)** [The [MacSecCryptoAlgoConfig](#) can define up to four [MacSecCipherSuiteConfigs](#). If more than one [MacSecCipherSuiteConfig](#) is defined then the [cipherSuitePriority](#) decides about the chosen cipher. The [cipherSuitePriority](#) of value 1 means the highest priority and 4 means the lowest priority.]([RS_MANI_00036](#))

Enumeration	MacSecConfidentialityOffsetEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	This enum defines the MACsec capability options. Tags: atp.Status=candidate
Aggregated by	MacSecCryptoAlgoConfig.confidentialityOffset
Literal	Description
Confidentiality Offset_0	confidentiality offset of 0. Tags: atp.EnumerationLiteralIndex=0
Confidentiality Offset_30	confidentiality offset of 30. Tags: atp.EnumerationLiteralIndex=1
Confidentiality Offset_50	confidentiality offset of 50. Tags: atp.EnumerationLiteralIndex=2

Table 6.40: MacSecConfidentialityOffsetEnum

Enumeration	MacSecCapabilityEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	This enum defines the MACsec capability options. Tags: atp.Status=candidate
Aggregated by	MacSecCryptoAlgoConfig.capability
Literal	Description
integrityAnd Confidentiality	Option that ensures confidentiality and integrity Tags: atp.EnumerationLiteralIndex=1
integrityWithout Confidentiality	Option that ensures integrity without confidentiality Tags: atp.EnumerationLiteralIndex=0

Table 6.41: MacSecCapabilityEnum

Enumeration	MacSecRoleEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	This enum defines the MACsec Role options. Tags: atp.Status=candidate
Aggregated by	MacSecLocalKayProps.role
Literal	Description
keyServer	Port acts in the KeyServer role Tags: atp.EnumerationLiteralIndex=1
peer	Port acts in the peer role Tags: atp.EnumerationLiteralIndex=0

Table 6.42: MacSecRoleEnum

Enumeration	MacSecFailPermissiveModeEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	Behavior options of the Port Access Entity in case MACsec does not succeed. Tags: atp.Status=candidate
Aggregated by	MacSecProps.onFailPermissiveMode





<i>Enumeration</i>	MacSecFailPermissiveModeEnum
<i>Literal</i>	<i>Description</i>
never	The controlled port will never be set to enabled if the participants cannot establish and successfully use a MACsec Secure Channel. Tags: atp.EnumerationLiteralIndex=0
timeout	The controlled port will be set to enabled and MACsec will not be used in the port if the timeout value (onFailPermissiveModeTimeout) is reached and the following conditions apply: <ul style="list-style-type: none"> - A participant belonging to the same CA was recognized and authenticated. - A secure channel could be established. - Both participants can transmit and receive MACsec protected traffic through the SC. Tags: atp.EnumerationLiteralIndex=1

Table 6.43: MacSecFailPermissiveModeEnum

For MACsec to start up, a key distribution based on MAC Security Key Agreement runs first. The pre-shared key is identified by the `ckn`. While one might choose only to communicate encrypted, the key distribution itself needs to be unencrypted but integrity protected. In addition, user may choose to allow additional Ethernet frames unprotected, e.g., for installing keys into ECUs. These frames can be selected via so-called bypass rules based on e.g., EtherType or VLAN-ID defined in `MacSecGlobalKayProps`.

Each `MacSecKayParticipant` that is referenced by `MacSecLocalKayProps` in the role `mkaParticipant` defines the Connectivity Association Key and the `MacSecCryptoAlgoConfig`. The `MacSecKayParticipant` settings in the connectivity association need to match on both `CouplingPorts` of the link to enable MACsec.

For better control and predictability, the MAC Security Key Agreement participant that will get the `KeyServer` role (the node generating the MACsec Key for this link) can be configured by `role`.

6.2.4 Partial Network

AUTOSAR supports power saving during vehicle operation time with the partial networking mechanism. This mechanism allows shutting down and starting up the bus communication interfaces of groups of ECUs (Partial Network Cluster) during normal bus communication.

On the VFB Level Partial Networks are represented by Virtual Function Clusters and are described with `PortGroups`. The Virtual Function Cluster groups the communication necessary to realize one or more vehicle functions that can become activated/deactivated during normal vehicle operation. The Virtual Function Clusters are mapped onto Partial Network Clusters.

[TPS_MANI_03224]{DRAFT} **Modeling of a Partial Network Cluster** [A Partial Network Cluster is modeled with the `PncMapping` element and is identified by the `pncIdentifier`. The `PncMapping` defines the collection of `AdaptivePlatformServiceInstances` that are participating in the partial network with the `PncMapping.serviceInstance` reference.](RS_MANI_00062)

[TPS_MANI_03225]{DRAFT} **References to VLANs in `PncMapping`** [There are two ways for a `PncMapping` to relate to a VLAN or an untagged channel:

- via the reference from `PncMapping` to `PhysicalChannel` in the role `physicalChannel`,
- via a `ServiceInstanceToMachineMapping` that maps the `AdaptivePlatformServiceInstance` and that also refers an `EthernetCommunicationConnector` that in turn is connected to an `EthernetPhysicalChannel` via the `unicastNetworkEndpoint`.

The two options are not mutually exclusive, they can exist at the same time.](RS_MANI_00062)

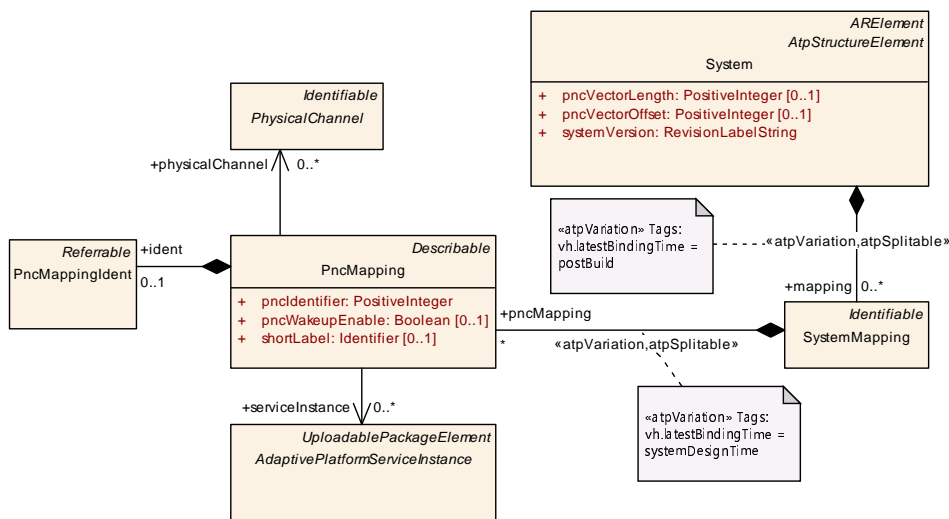


Figure 6.7: PncMapping with collection of ServiceInstances that are participating in the Partial Network Cluster

Class	SystemMapping			
Package	M2::AUTOSARTemplates::SystemTemplate			
Note	The system mapping aggregates all mapping aspects that are relevant in the System Description.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	System.mapping			
Attribute	Type	Mult.	Kind	Note





Class	SystemMapping			
pncMapping	PncMapping	*	aggr	Mappings between Virtual Function Clusters and Partial Network Clusters. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=pncMapping, pncMapping.variation Point.shortLabel vh.latestBindingTime=systemDesignTime

Table 6.44: SystemMapping

Class	PncMapping			
Package	M2::AUTOSARTemplates::SystemTemplate::PncMapping			
Note	Describes a mapping between one or several Virtual Function Clusters onto Partial Network Clusters. A Virtual Function Cluster is realized by a PortGroup. A Partial Network Cluster is realized by one or more ServiceInstances.			
Base	ARObject, Describable			
Aggregated by	SystemMapping.pncMapping			
Attribute	Type	Mult.	Kind	Note
ident	PncMappingIdent	0..1	aggr	This adds the ability to become referable to PncMapping.
physical Channel	PhysicalChannel	*	ref	This reference maps the partial network to a communication channel.
pncConsumed Provided ServiceInstance Group	ConsumedProvided ServiceInstanceGroup	*	ref	ConsumedProvidedServiceInstanceGroup used in a Partial Network Cluster. This reference is optional, since this could be used for starting and stopping Consumed ProvidedServiceInstanceGroup according the requested partial network, but is not necessarily needed. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=pncConsumedProvidedServiceInstance Group.consumedProvidedServiceInstanceGroup, pnc ConsumedProvidedServiceInstanceGroup.variation Point.shortLabel vh.latestBindingTime=postBuild
pncIdentifier	PositiveInteger	1	attr	Identifier of the Partial Network Cluster. This number represents the absolute bit position of this Partial Network Cluster in the NM Pdu.
pncWakeup Enable	Boolean	0..1	attr	If this parameter is available and set to true then this PNC will be woken up as soon as a channel wakeup occurs on a channel where this PNC is assigned to. This is ensured by adding this PNC to the corresponding channel wakeup sources during upstream mapping.
serviceInstance	AdaptivePlatform ServiceInstance	*	ref	Reference to ServiceInstances that are participating in a Partial Network Cluster. Tags: atp.Status=draft
shortLabel	Identifier	0..1	attr	This attribute specifies an identifying shortName for the PncMapping. It shall be unique in the System scope.
vfc	PortGroup	*	iref	Virtual Function Cluster to be mapped onto a Partial Network Cluster. This reference is optional in case that the System Description doesn't use a complete Software Component Description (VFB View). This supports the inclusion of legacy systems. InstanceRef implemented by: PortGroupInSystem InstanceRef

Table 6.45: PncMapping

6.3 Specification of Application Software System Structure

The root element of a System Design model is the `System` element that is already known from the AUTOSAR classic platform. The `System` aggregates the `RootSwCompositionPrototype` that represents the top-level-composition of all software components that are available in a given system.

[TPS_MANI_03110]{DRAFT} Allowed components in system description with category `SYSTEM_DESIGN_DESCRIPTION`. [`SwComponentPrototypes` nested inside the `CompositionSwComponentType` that is referenced by the `RootSwCompositionPrototype` of a `System` with category `SYSTEM_DESIGN_DESCRIPTION` are allowed to be of any `SwComponentType` that is supported by Classic or by Adaptive AUTOSAR.] ([RS_MANI_00026](#))

Class	RootSwCompositionPrototype			
Package	M2::AUTOSARTemplates::SystemTemplate			
Note	<p>The <code>RootSwCompositionPrototype</code> represents the top-level-composition of software components within a given <code>System</code>.</p> <p>According to the use case of the <code>System</code>, this may for example be a more or less complete VFB description, the software of a <code>System Extract</code> or the software of a flat <code>ECU Extract</code> with only atomic SWCs.</p> <p>Therefore the <code>RootSwComposition</code> will only occasionally contain all atomic software components that are used in a complete VFB <code>System</code>. The OEM is primarily interested in the required functionality and the interfaces defining the integration of the <code>Software Component</code> into the <code>System</code>. The internal structure of such a component contains often substantial intellectual property of a supplier. Therefore a top-level software composition will often contain empty compositions which represent subsystems.</p> <p>The contained <code>SwComponentPrototypes</code> are fully specified by their <code>SwComponentTypes</code> (including <code>Port Prototypes</code>, <code>PortInterfaces</code>, <code>VariableDataPrototypes</code>, <code>SwcInternalBehavior</code> etc.), and their ports are interconnected using <code>SwConnectorPrototypes</code>.</p>			
Base	<code>ARObject</code> , <code>AtpFeature</code> , <code>AtpPrototype</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>			
Aggregated by	<code>AtpClassifier.atpFeature</code> , <code>System.rootSoftwareComposition</code>			
Attribute	Type	Mult.	Kind	Note
software Composition	<code>CompositionSwComponentType</code>	1	tref	<p>We assume that there is exactly one top-level composition that includes all <code>Component</code> instances of the system.</p> <p>Stereotypes: <code>isOfType</code></p>

Table 6.46: RootSwCompositionPrototype

If a `Software Component` communicates over the service oriented communication and provides or requires a `ServiceInterface` the opposite communication end is not always known upfront. In the `System` with category `SYSTEM_DESIGN_DESCRIPTION` a `System Designer` may want to indicate the service oriented communication between endpoints if it is already known at the `System Design` time.

[TPS_MANI_03114]{DRAFT} Usage of `AssemblySwConnectors` in the `System Design` model [In the `System` with category `SYSTEM_DESIGN_DESCRIPTION` it is allowed to indicate the service oriented communication between two communication endpoints by `AssemblySwConnectors` if the required `RPortPrototype` is searching for a specific service instance, i.e. if the `RPortPrototypeProps.searchIntention` is set to `searchForSpecificInstance`.

If the `searchIntention` is set to `searchForAllInstances`, the `AssemblySwConnector` shall not be used to connect this `RPortPrototype`. (RS_MANI_00026)

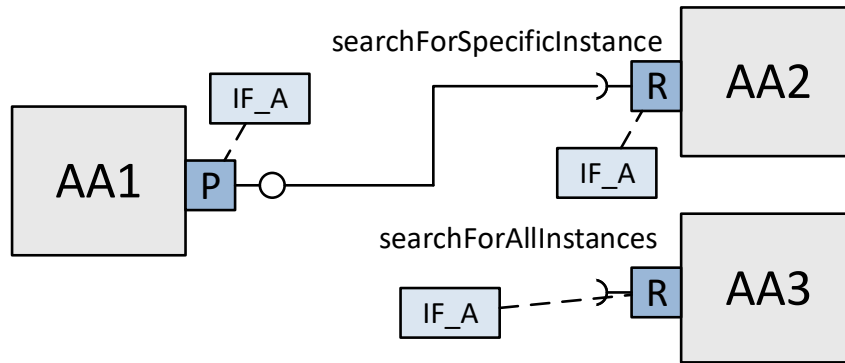


Figure 6.8: Example for Assembly connectors in System Design model

6.4 Modeling of service oriented communication between Classic and Adaptive platform

AUTOSAR classic platform does not support `ServiceInterfaces` yet but provides the possibility to communicate in a service oriented way over SOME/IP. To mimic a `ServiceInterface` in the classic platform any combination of `ClientServerInterfaces`, `SenderReceiverInterfaces` or `TriggerInterfaces` may be used to describe a service to which later a SOME/IP Service ID is assigned.

To simplify the description of the service oriented communication between Classic and Adaptive Software components in a System design model the `InterfaceMapping` was introduced that allows to map elements of `PortInterfaces` of the Classic Platform to a single `ServiceInterface` of the Adaptive Platform.

Class	InterfaceMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	This meta-class collects the mappings of elements of a single <code>ServiceInterface</code> to <code>PortInterface</code> elements of the AUTOSAR Classic Platform. Tags: atp.recommendedPackage=InterfaceMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
eventMapping	EventMapping	*	aggr	Mapping of a <code>VariableDataPrototype</code> in a <code>SenderReceiverInterface</code> to an <code>Event</code> in a <code>ServiceInterface</code> .





Class	InterfaceMapping			
fieldMapping	FieldMapping	*	aggr	Mapping of a Field in a ServiceInterface to ClientServer Operations that represent the getter and setter methods and to a VariableDataPrototype that represents the notifier in the Field.
fireAndForget MethodMapping	FireAndForgetMethod Mapping	*	aggr	Mapping of a Fire&Forget Method that is located in a ServiceInterface to a VariableDataPrototype in a Sender ReceiverInterface or to a Trigger in a TriggerInterface.
methodMapping	MethodMapping	*	aggr	Mapping of a ClientServerOperation in a ClientServer Interface to a Method in a ServiceInterface.

Table 6.47: InterfaceMapping

[constr_3370]{DRAFT} **InterfaceMapping** shall map all elements of a single **ServiceInterface** [The mappings that are included in an **InterfaceMapping** shall map all elements of a single **ServiceInterface** (i.e. fields, events, methods) to **PortInterface** elements of the classic platform.]()

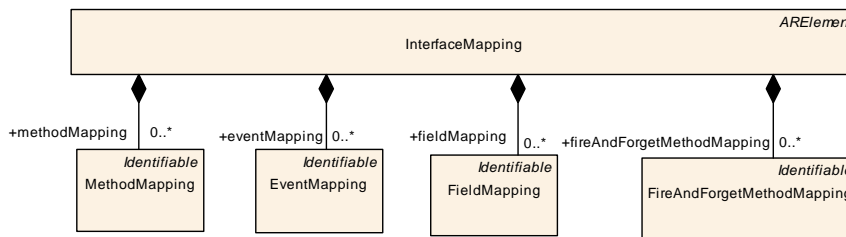


Figure 6.9: InterfaceMapping Overview

Figure 6.10 shows a possible System Design modeling approach where an a piece of application software is communicating in a service oriented way over SOME/IP with classic Software Components. SWC_1 requires a **ClientServerInterface** IF_Y with a **ClientServerOperation** and a **SenderReceiverInterface** IF_X with a **VariableDataPrototype**. SWC_2 requires a **SenderReceiverInterface** IF_X with a **VariableDataPrototype**.

The two **PortInterfaces** IF_X and IF_Y are mapped to a single **ServiceInterface** IF_A using an **InterfaceMapping**.

On the other side the application software AA1 provides the **ServiceInterface** IF_A.

Note that this is a mapping on **PortInterface** level. If each **PortInterface** is only used once in a network the actual communication can be directly derived out of the **InterfaceMapping**. If **PortInterfaces** are used several times on a network there is the need to take the network configuration into account in order to be able to emulate how the service discovery will behave on the network. From this information the actual communication relations on software level can be deduced.

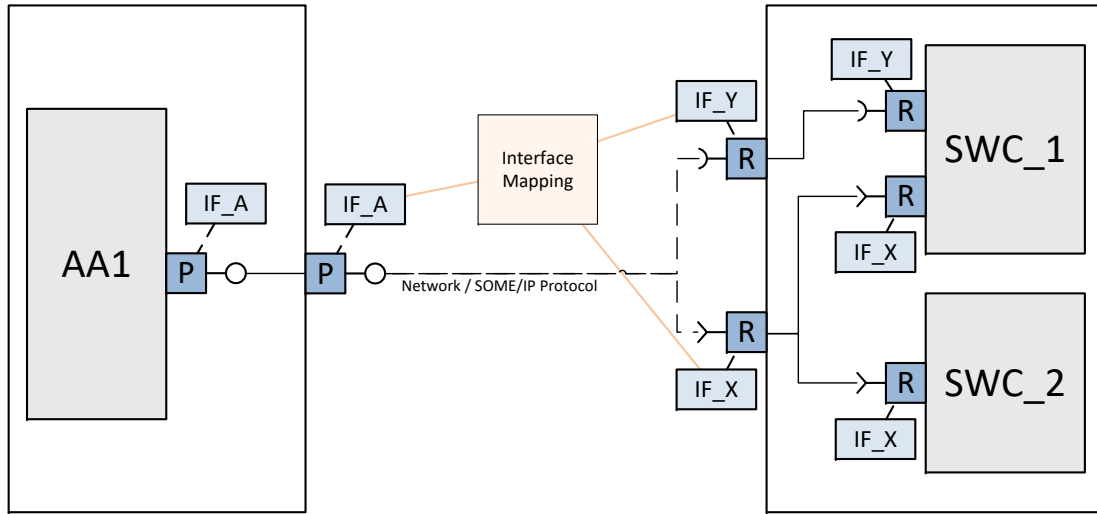


Figure 6.10: Example for a modeling of Service Oriented communication between application software on the *AUTOSAR adaptive platform* and Software Components of the Classic Platform

6.4.1 MethodMapping

[TPS_MANI_03111]{DRAFT} Mapping between **method** and **operation** located in a **ClientServerInterface** [The mapping between a **method** located in a **ServiceInterface** and a **operation** located in a **ClientServerInterface** is provided by the class **MethodMapping**.] (*RS_MANI_00026*)

Class	MethodMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	Mapping of a ClientServerOperation that is located in a ClientServerInterface to a Method that is located in a ServiceInterface.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	InterfaceMapping.methodMapping			
Attribute	Type	Mult.	Kind	Note
clientServerOperation	ClientServerOperation	0..1	ref	Reference to a ClientSeverOperation that is located in a ClientSeverInterface.
method	ClientServerOperation	0..1	ref	Reference to a Method that is located in a Service Interface.

Table 6.48: MethodMapping

[advisory_01000]{DRAFT} Existence of the reference **MethodMapping.clientServerOperation** [For each **MethodMapping**, the reference in the role **MethodMapping.clientServerOperation** should exist at the time when the System Design is finished.] ()

[**advisory_01001**]{DRAFT} **Existence of reference `MethodMapping.method`** [For each `MethodMapping`, the reference in the role `MethodMapping.method` should exist at the time when the System Design is finished.]()

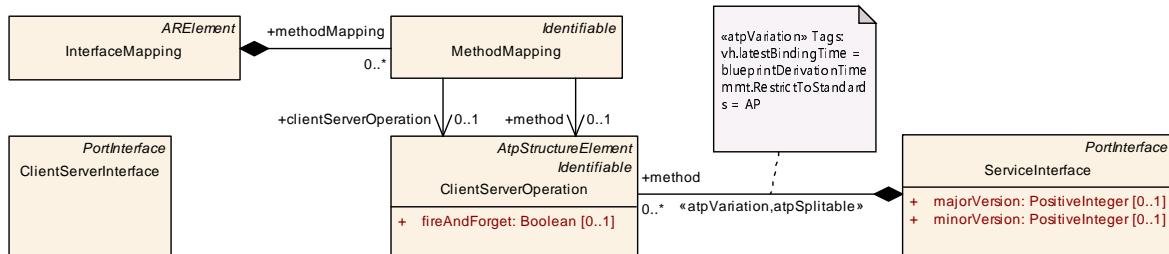


Figure 6.11: Mapping of a Method to a ClientServerOperation

6.4.2 EventMapping

[**TPS_MANI_03112**]{DRAFT} **Mapping between an event and a dataElement** [The mapping between an event located in a `ServiceInterface` and a `dataElement` located in a `SenderReceiverInterface` is provided by the class `EventMapping`.] (*RS_MANI_00026*)

Class	EventMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	Mapping of a VariableDataPrototype that is located in a SenderReceiverInterface to an Event that is located in a ServiceInterface.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	InterfaceMapping.eventMapping			
Attribute	Type	Mult.	Kind	Note
dataElement	VariableDataPrototype	0..1	ref	Reference to a VariableDataPrototype that is located in a SenderReceiverInterface.
event	VariableDataPrototype	0..1	ref	Reference to an Event that is located in a Service Interface.

Table 6.49: EventMapping

[**advisory_01002**]{DRAFT} **Existence of reference `EventMapping.dataElement`** [For each `EventMapping`, the reference in the role `EventMapping.dataElement` should exist at the time when the System Design is finished.]()

[**advisory_01003**]{DRAFT} **Existence of reference `EventMapping.event`** [For each `EventMapping`, the reference in the role `EventMapping.event` should exist at the time when the System Design is finished.]()

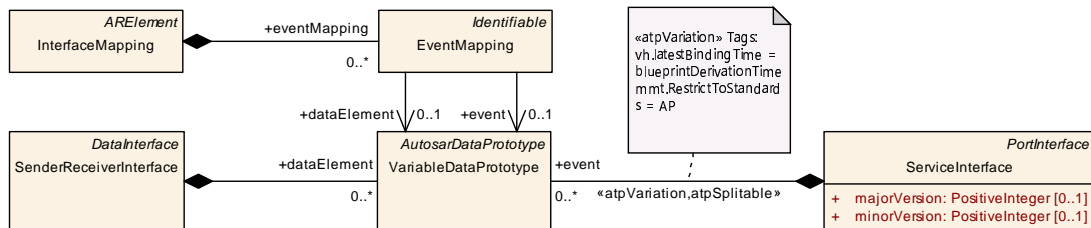


Figure 6.12: Mapping between an **event** and a **dataElement**

6.4.3 FieldMapping

[TPS_MANI_03113]{DRAFT} **Mapping between a field and elements of Classic Platform PortInterfaces** [The mapping between a **field** located in a **ServiceInterface** and elements of Classic Platform **PortInterfaces** is provided by the class **FieldMapping**. The field notifier in the classic platform is represented by a **dataElement** that is located in a **SenderReceiverInterface**. The getter and setter methods in the classic platform are represented by operations that are located in a **ClientServerInterface**.] (*RS_MANI_00026*)

[constr_3367]{DRAFT} **FieldMapping.notifierDataElement** reference [The **FieldMapping** shall only contain the **notifierDataElement** reference if the **hasNotifier** attribute in the referenced **field** is set to true.] ()

[constr_3368]{DRAFT} **FieldMapping.getterOperation** reference [The **FieldMapping** shall only contain the **getterOperation** reference if the **hasGetter** attribute in the referenced **field** is set to true.] ()

[constr_3369]{DRAFT} **FieldMapping.setterOperation** reference [The **FieldMapping** shall only contain the **setterOperation** reference if the **hasSetter** attribute in the referenced **field** is set to true.] ()

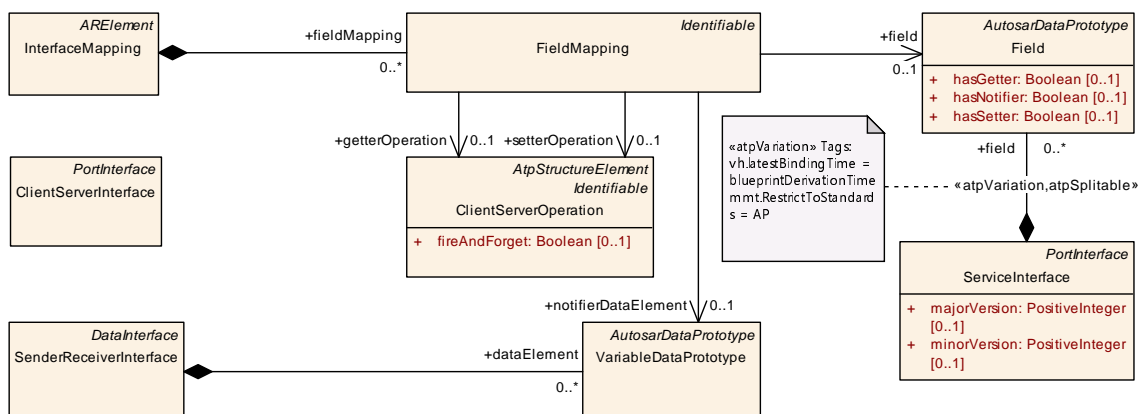


Figure 6.13: Mapping between a **field** and elements of Classic Platform **PortInterfaces**

Class	FieldMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	Mapping of a Field that is located in a ServiceInterface to ClientServerOperations that represent the getter and setter methods and to a VariableDataPrototype that represents the notifier in the Field.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	InterfaceMapping.fieldMapping			
Attribute	Type	Mult.	Kind	Note
field	Field	0..1	ref	Reference to a field that is located in a ServiceInterface.
getterOperation	ClientServerOperation	0..1	ref	Reference to a ClientServerOperation that represents the getter Method in the Field.
notifierDataElement	VariableDataPrototype	0..1	ref	Reference to a VariableDataPrototype that represents the notifier in the Field.
setterOperation	ClientServerOperation	0..1	ref	Reference to a ClientServerOperation that represents the setter Method in the Field.

Table 6.50: FieldMapping

[advisory_01004]{DRAFT} Existence of reference [FieldMapping.field](#) [For each [FieldMapping](#), the reference in the role [FieldMapping.field](#) should exist at the time when the System Design is finished.]()

[advisory_01005]{DRAFT} Existence of references [FieldMapping.getterOperation](#), [setterOperation](#), and [notifierDataElement](#) [For each [FieldMapping](#), at least one of the references in the role

- [FieldMapping.getterOperation](#)
- [FieldMapping.setterOperation](#)
- [FieldMapping.notifierDataElement](#)

should exist at the time when the System Design is finished.]()

6.4.4 FireAndForgetMethodMapping

In a fire and forget Message Exchange Pattern the consumer sends a message to a provider with no expectation of a response as described in chapter 3.4.5.1.

In Adaptive AUTOSAR the fire and forget method is described with a [method](#) where the value of attribute [method.fireAndForget](#) is set to `true` as defined by [TPS_MANI_01064].

In classic AUTOSAR a fire and forget method can not be described with a [ClientServerOperation](#) since a client-server call always has a response. Therefore, a [VariableDataPrototype](#) is used if the fire and forget method contains input arguments.

If the fire and forget method contains several input arguments then the [VariableDataPrototype](#) needs to be of type Structure that hosts one element for each argument of the fire and forget method. It is important that the order of elements in the Structure

is the same as the order of `ArgumentDataPrototypes` within the `ClientServerOperation`.

This representation ensures that the SOME/IP serialization results in the same byte stream as in the Adaptive Platform where all `arguments` which have the `direction in` are serialized according to the order of the `ArgumentDataPrototypes` within the `ClientServerOperation`.

If the fire and forget method is without any parameters a `Trigger` is used to describe such a method in classic AUTOSAR.

It is important that the SOME/IP `MessageType` is set to `REQUEST_NO_RETURN` if a fire and forget method is transmitted over SOME/IP.

[TPS_MANI_03115]{DRAFT} Mapping between a fire and forget method and elements of Classic Platform PortInterfaces [The mapping between a `method` for which the value of attribute `method.fireAndForget` is set to `true` and elements of Classic Platform `PortInterfaces` is provided by the class `FireAndForgetMethodMapping`.

If the fire and forget method is represented in the classic platform by a `VariableDataPrototype` then this `dataElement` is mapped to a `method` located in a `ServiceInterface`. If the fire and forget method is represented in the classic platform by a `Trigger` then this `trigger` is mapped to a `method` located in a `ServiceInterface`.] (*RS_MANI_00026*)

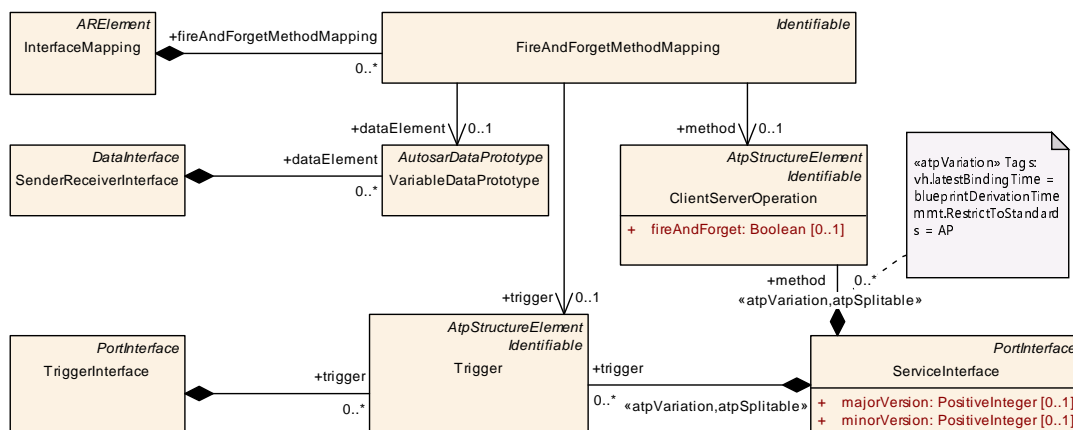


Figure 6.14: Mapping between a fire and forget method and elements of Classic Platform PortInterfaces

[constr_3371]{DRAFT} Mutually exclusive existence of FireAndForgetMethodMapping.dataElement reference and FireAndForgetMethodMapping.trigger reference [A `FireAndForgetMethodMapping` shall never reference a `dataElement` and a `trigger` at the same time.]()

[constr_3376]{DRAFT} FireAndForgetMethodMapping shall reference only fire and forget methods [A `FireAndForgetMethodMapping` is only allowed to reference a `ClientServerOperation` in role `method` for which the value of attribute `method.fireAndForget` is set to `true`.]()

Class	FireAndForgetMethodMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	Mapping of a Fire&Forget Method that is located in a ServiceInterface to a VariableDataPrototype in a SenderReceiverInterface or to a Trigger in a TriggerInterface.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	InterfaceMapping.fireAndForgetMethodMapping			
Attribute	Type	Mult.	Kind	Note
dataElement	VariableDataPrototype	0..1	ref	Reference to a VariableDataPrototype that is located in a SenderReceiverInterface in case that the Fire&Forget Method is represented by this VariableDataPrototype.
method	ClientServerOperation	0..1	ref	Reference to a Fire&Forget Method that is located in a ServiceInterface.
trigger	Trigger	0..1	ref	Reference to a Trigger that is located in a TriggerInterface in case that the Fire&Forget Method is represented by this Trigger.

Table 6.51: FireAndForgetMethodMapping

[advisory_01006]{DRAFT} Existence of reference [FireAndForgetMethodMapping.method](#) [For each [FireAndForgetMethodMapping](#), the reference in the role [FireAndForgetMethodMapping.method](#) should exist at the time when the System Design is finished.]()

[advisory_01007]{DRAFT} Existence of references [FireAndForgetMethodMapping.dataElement](#) and [trigger](#) [For each [FireAndForgetMethodMapping](#), at least one of the references in the role

- [FireAndForgetMethodMapping.dataElement](#)
- [FireAndForgetMethodMapping.trigger](#)

should exist at the time when the System Design is finished.]()

7 Sub-System Design

7.1 Overview

The nature of the *AUTOSAR adaptive platform* as a platform for deploying software units in the field implies that the software units that can be installed in the field need some design-support upfront.

More specifically, the software units that can be deployed in the field typically represent some sort of more or less self-contained driving function.

In other words, the design support for this purpose need to be tailored to facilitate the design of application-level software that communicates with other application level software.

It is assumed that one of the first steps in such a design is the definition of services that are provided and services that are required by the driving function under development.

Such a definition of required and provided services can be used as an input into the design of other such driving functions and, over time, a view of the communication on the level of driving functions is rendered.

It is further assumed that the communication view of the driving functions is mostly of interest for an OEM and the individual driving functions may be sub-contracted to tier-1 suppliers.

This means that for the tier-1 supplier the list of provided and required services of the driving function represents a technical contract against which the function shall be developed.

On design level, meta-class `SoftwareClusterDesign` is used for the formalization of software that might represent such a driving function. In other words, it is assumed that a workflow exists where the design of a certain functionality on the AUTOSAR adaptive platform starts with the creation of a `SoftwareClusterDesign`.

In this case, it is further assumed that the definition of the required and provided service instances for the respective functionality is a good starting point for the development.

Please note that `SoftwareClusterDesign` supports an arbitrary complexity of software and is therefore not bound to the design of, e.g. a single driving function.

7.2 Software Cluster Design

The creation of a `SoftwareCluster` (see section 15.2) represents a complex workflow that has to be done in the deployment phase of the overall methodology for the *AUTOSAR adaptive platform*.

In order to reduce the complexity of this step in the workflow, AUTOSAR supports a front-loading approach for the definition of a `SoftwareCluster`, the modeling of

[SoftwareClusterDesign](#). In this context, the term “front-loading” means that model elements defined in the context of a [SoftwareClusterDesign](#) can be (directly) taken over for the creation of a corresponding [SoftwareCluster](#).

The membership of model elements to a given [SoftwareClusterDesign](#) is expressed by means of references to the respective model elements. The referenced model elements are “claimed” by the referencing [SoftwareClusterDesign](#).

The pattern established by these references is very similar to the pattern established by means of the modeling of [System.fibexElement](#) or [DiagnosticContribution-Set.element](#).

Please note that the modeling of [SoftwareClusterDesign](#) prioritizes the usage of references over the usage of aggregations because the migration from [SoftwareClusterDesign](#) to [SoftwareCluster](#) is much facilitated no actual copying of model elements is required, only the content of references have to be taken over in the migration.

[TPS_MANI_01112]{DRAFT} Semantics of [SoftwareClusterDesign](#) [The existence of a [SoftwareClusterDesign](#) represents the formalized response to requirements that have initially been formulated by an OEM and that may be enriched as the development of the software progresses.

Finally, the [SoftwareClusterDesign](#) shall be taken by the integration as a further input to the definition of the result of the integration step: the definition of the [SoftwareCluster](#).] ([RS_MANI_00035](#))

Just to be sure, the [SoftwareClusterDesign](#) is not intended to be uploaded to the target platform. It is just an early form of the final [SoftwareCluster](#) that indeed gets uploaded. The existence of the [SoftwareClusterDesign](#) is motivated from the methodological point of view.

[constr_1560]{DRAFT} Usage of [SoftwareClusterDesign.requiredARElement](#) [The reference [SoftwareClusterDesign.requiredARElement](#) shall not be used to refer to another [SoftwareClusterDesign](#) or even [SoftwareCluster](#).] ()

[TPS_MANI_01369]{DRAFT} Semantics of reference [SoftwareClusterDesign.requiredARElement](#) [The reference [SoftwareClusterDesign.requiredARElement](#) is used to identify all model elements that are typed by a sub-class of meta-class [ARElement](#). This way, it is possible to express which model elements belong to the enclosing [SoftwareClusterDesign](#).] ([RS_MANI_00035](#))

[TPS_MANI_01211]{DRAFT} Specification of executable software within [SoftwareClusterDesign](#) [One of the most prominent contents of an uploadable software package is the reference to the executable software.

Within the definition of a [SoftwareClusterDesign](#), this reference is implicitly given by means of the reference [SoftwareClusterDesign.containedProcess](#).

The target of `SoftwareClusterDesign.containedProcess` is a `ProcessDesign` that represents the design-level representation of an instance (formalized as `Process`) of the corresponding executable program (the software image), formalized as `Executable`] (*RS_MANI_00035*)

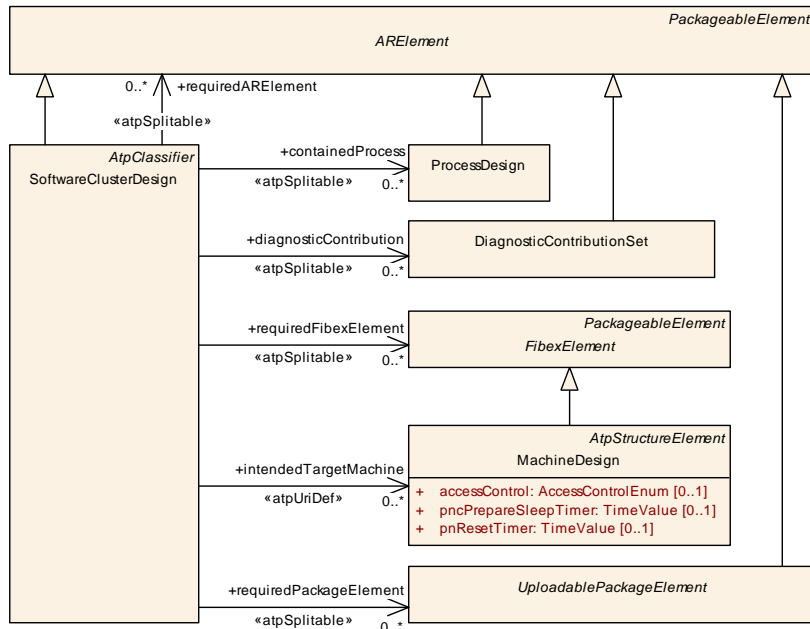


Figure 7.1: Modeling of SoftwareClusterDesign

Class	SoftwareClusterDesign			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SubSystemDesign			
Note	This meta-class represents the ability for the OEM to design the grouping of software uploadable to a specific target Machine. Tags: atp.recommendedPackage=SoftwareClusterDesigns			
Base	ARElement , ARObject , AtpClassifier , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
contained Process	ProcessDesign	*	ref	This reference represent the ProcessDesigns contained in the enclosing SoftwareCluster. Stereotypes: atpSplitable Tags: atp.Splitkey=containedProcess
diagnostic Contribution	DiagnosticContributionSet	*	ref	This reference identifies the corresponding collection of DiagnosticContributionSet. Stereotypes: atpSplitable Tags: atp.Splitkey=diagnosticContribution
intendedTarget Machine	MachineDesign	*	ref	This reference can be taken to identify the Machine Design for which the final SoftwareCluster shall be developed. Stereotypes: atpUriDef





Class	SoftwareClusterDesign			
required ARElement	ARElement	*	ref	This reference represents the collection of ARElements that are required for the completeness of the definition of the SoftwareCluster. Stereotypes: atpSplitable Tags: atp.Splitkey=requiredARElement
requiredFibex Element	FibexElement	*	ref	This reference represents the collection of fibexElements that are required for the completeness of the definition of the SoftwareCluster. Stereotypes: atpSplitable Tags: atp.Splitkey=requiredFibexElement
required Package Element	UploadablePackage Element	*	ref	This reference points to uploadable elements that have been identified as relevant in the context of the enclosing SoftwareClusterDesign. Stereotypes: atpSplitable Tags: atp.Splitkey=requiredPackageElement
root Composition	RootSwClusterDesign ComponentPrototype	0..1	aggr	This aggregation represents the design of the software inside the SwClusterDesign terms of the communication endpoints.

Table 7.1: SoftwareClusterDesign

[constr_3727]{DRAFT} Upper multiplicity of reference in the role [SoftwareClusterDesign.intendedTargetMachine](#) [In the context of [SoftwareClusterDesign](#), the reference in the role [intendedTargetMachine](#) shall exist at most once at the time when the sub-system design is complete.]()

[TPS_MANI_01117]{DRAFT} Semantics of [SoftwareClusterDesign.intendedTargetMachine](#) [The specification of [SoftwareClusterDesign.intendedTargetMachine](#) allows for focusing the specification of an uploadable software package to a specific [MachineDesign](#) from early phases of a development project.] ([RS_MANI_00035](#))

Please note that [SoftwareCluster](#) doesn't have a dedicated reference to the target [Machine](#).

This relation is expressed by means of a reference to [Process](#) that in turn can be mapped to a dedicated [Machine](#) by means of a [ProcessToMachineMapping](#). In this context, [\[constr_1536\]](#) applies.

[TPS_MANI_01118]{DRAFT} Relation between [SoftwareClusterDesign](#) and [DiagnosticContributionSet](#) [An important aspect of the definition of a [SoftwareClusterDesign](#) is the question what diagnostic extract shall be associated with the [SoftwareClusterDesign](#).

For this purpose, a reference from [SoftwareClusterDesign](#) to [DiagnosticContributionSet](#) in the role [diagnosticContribution](#) is provided.

In an early stage of the development process, it is intentionally made possible to reference multiple [DiagnosticContributionSets](#) in order to support the decentralized (e.g. partly done by OEM and partly done by supplier) configuration of the diagnostics stack.] ([RS_MANI_00035](#))

[TPS_MANI_01189]{DRAFT} **Software Cluster and DiagnosticContributionSet.category** [A `DiagnosticContributionSet` used in the context of a `SoftwareCluster` shall set the value of attribute `category` to `DIAGNOSTICS_SWCL_EXTRACT.`] (*RS_MANI_00035*)

Please mind the intentionally introduced difference between `SoftwareCluster` and `SoftwareClusterDesign` in terms of the relation to `DiagnosticContributionSet`.

In other words, the multiplicity of the references to `DiagnosticContributionSet` intentionally differ.

As already explained, the `SoftwareClusterDesign` shall support the decentralized configuration of the `DiagnosticContributionSet` while the `SoftwareCluster` requires the existence of a final (merged) `DiagnosticContributionSet`.

[TPS_MANI_01119]{DRAFT} **Reference to model elements from SoftwareClusterDesign** [`SoftwareClusterDesign` has the ability to define the following references to model elements relevant for the definition of an uploadable software package:

- references to meta-classes derived from `UploadablePackageElement` are formalized by way of `SoftwareClusterDesign.requiredPackageElement`.
- references to meta-classes derived from `ARElement` are formalized by way of `SoftwareClusterDesign.requiredARElement`.
- references to meta-classes derived from `FibexElement` are formalized by way of `SoftwareClusterDesign.requiredFibexElement`.

](*RS_MANI_00035*)

Please note that the conversion of a `SoftwareClusterDesign` to a `SoftwareCluster` is not formalized by AUTOSAR. This step can be done by a tool at the discretion of the integrator.

In other words, in some cases it may be applicable to do this conversion relatively early in the development project while other projects may require to keep the `SoftwareClusterDesign` around for a longer period in time.

7.3 Provided and required Services of Software Cluster Design

In order to support the definition of required and provided services early in the design of a `SoftwareCluster`¹, AUTOSAR supports the definition of a `RootSwClusterDesignComponentPrototype` in the context of a given `SoftwareClusterDesign`.

The `RootSwClusterDesignComponentPrototype` itself refers to a `SwComponentType` that in turn exposes `PortPrototypes` to the outside world.

¹For more information, please refer to section 15.2.

Note that for the specific case of the `RootSwClusterDesignComponentPrototype` it is expected that the referenced `SwComponentType` represents a `CompositionSwComponentType` without any further detailing. A detailing is obviously unnecessary because the only purpose is the exposure of `PortPrototypes` to which `AdaptivePlatformServiceInstances` can be mapped.

A dedicated mapping class, `ServiceInstanceToSwClusterDesignPortPrototypeMapping`, is defined to support the creation of the described relation between `PortPrototype` and `AdaptivePlatformServiceInstance`.

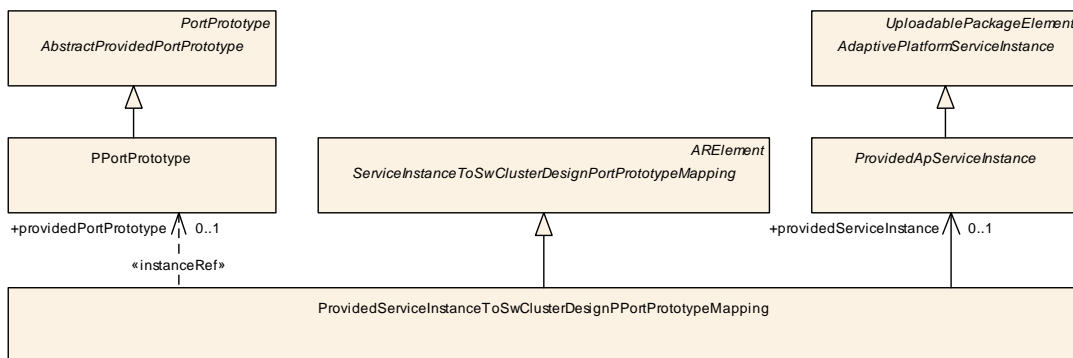


Figure 7.2: Modeling of the `ProvidedServiceInstanceToSwClusterDesignPPort-PrototypeMapping`

[TPS_MANI_01275]{DRAFT} **Semantics of meta-class `ServiceInstanceToSwClusterDesignPortPrototypeMapping`** [The software-component used to type the `RootSwClusterDesignComponentPrototype` typically exposes a set of `PortPrototypes` to the outside world.

These `PortPrototypes` could be used for the specification of required and provided service instances. For this purpose, meta-class `ServiceInstanceToSwClusterDesignPortPrototypeMapping` is used.](RS_MANI_00011)

In Figure 7.4, the `ServiceInstanceToSwClusterDesignPortPrototypeMapping` is represented by a block labeled “mapping” with a circled 1. The block labeled “mapping” with a circled 2 represents the `CompositionPortToExecutablePortMapping`, as described in section 7.4.

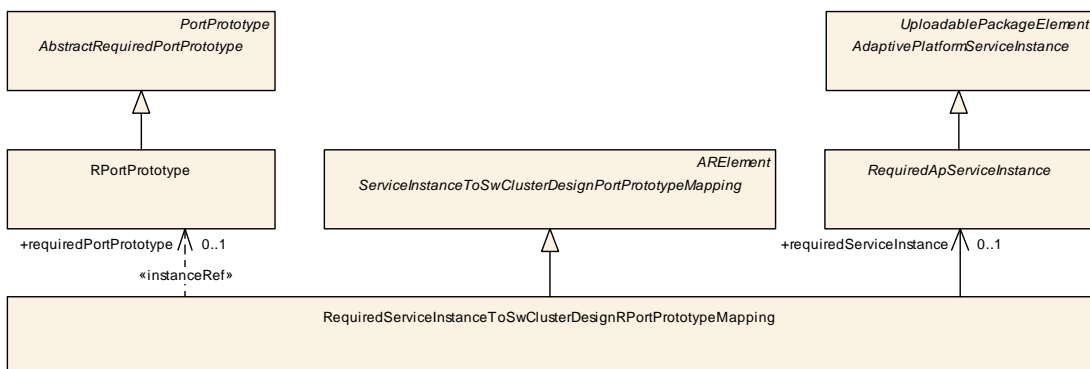


Figure 7.3: Modeling of the `RequiredServiceInstanceToSwClusterDesignRPort-PrototypeMapping`

Class	RootSwClusterDesignComponentPrototype			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define the service endpoints in the scope of a SwClusterDesign.			
Base	ARObject, AtpFeature, AtpPrototype, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	AtpClassifier.atpFeature, SoftwareClusterDesign.rootComposition			
Attribute	Type	Mult.	Kind	Note
applicationType	SwComponentType	0..1	tref	This SwComponentType acts as the Type of the RootSwClusterDesignComponentPrototype. Stereotypes: isOfType

Table 7.2: RootSwClusterDesignComponentPrototype

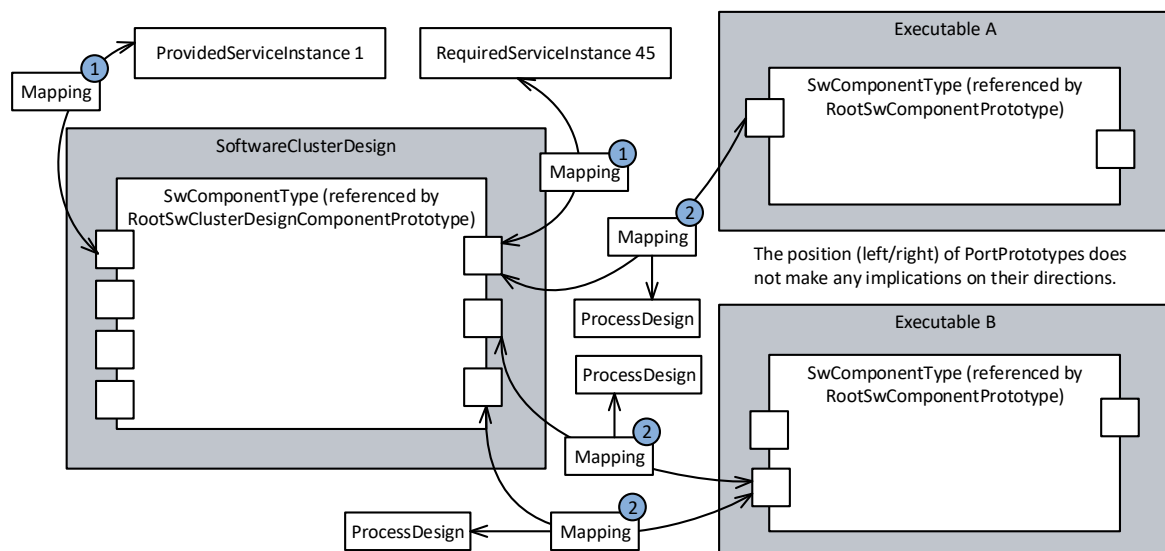


Figure 7.4: Modeling of mappings in the context of SoftwareClusterDesign

[advisory_01008]{DRAFT} Multiplicity of reference in the role **RootSwClusterDesignComponentPrototype.applicationType** [For each **RootSwClusterDesignComponentPrototype**, the reference in the role **applicationType** should exist **at the time when the sub-system design is complete.**]()

Class	ServiceInstanceToSwClusterDesignPortPrototypeMapping (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SubSystemDesign::DesignWorkflow			
Note	This abstract meta-class represents the ability to assign a transport-layer-dependent ServiceInstance to a PortPrototype in the context of the SoftwareClusterDesign. With this mapping it is possible to define the list of provided and required AdaptivePlatformServiceInstances in the scope of the SoftwareClusterDesign.			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Subclasses	ProvidedServiceInstanceToSwClusterDesignPPortPrototypeMapping, RequiredServiceInstanceToSwClusterDesignRPortPrototypeMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 7.3: ServiceInstanceToSwClusterDesignPortPrototypeMapping

Class	RequiredServiceInstanceToSwClusterDesignRPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SubSystemDesign::DesignWorkflow			
Note	This concrete meta-class represents the ability to assign a transport-layer-dependent RequiredService Instance to an RPortPrototype in the context of the SoftwareClusterDesign. With this mapping it is possible to define the list of provided and required AdaptivePlatformServiceInstances in the scope of the SoftwareClusterDesign. Tags: atp.recommendedPackage=ServiceInstanceToSwClusterDesignPortPrototypeMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , ServiceInstanceToSwClusterDesignPortPrototypeMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
requiredPort Prototype	RPortPrototype	0..1	iref	This reference identifies the applicable PortPrototype in the scope of the SwClusterDesign. InstanceRef implemented by: RPortPrototypeInSoftwareClusterDesignInstanceRef
requiredService Instance	RequiredApServiceInstance	0..1	ref	Reference to a RequiredServiceInstance mapped to a given RPortPrototype in the scope of the SwClusterDesign.

Table 7.4: RequiredServiceInstanceToSwClusterDesignRPortPrototypeMapping

Class	ProvidedServiceInstanceToSwClusterDesignPPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SubSystemDesign::DesignWorkflow			
Note	This concrete meta-class represents the ability to assign a transport-layer-dependent ProvidedService Instance to a PPortPrototype in the context of the SoftwareClusterDesign. With this mapping it is possible to define the list of provided and required AdaptivePlatformServiceInstances in the scope of the SoftwareClusterDesign. Tags: atp.recommendedPackage=ServiceInstanceToSwClusterDesignPortPrototypeMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , ServiceInstanceToSwClusterDesignPortPrototypeMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
providedPort Prototype	PPortPrototype	0..1	iref	This reference identifies the applicable PortPrototype in the scope of the SwClusterDesign. InstanceRef implemented by: PPortPrototypeInSoftwareClusterDesignInstanceRef
providedService Instance	ProvidedApServiceInstance	0..1	ref	Reference to a ProvidedServiceInstance mapped to a given PPortPrototype in the scope of the SwClusterDesign.

Table 7.5: ProvidedServiceInstanceToSwClusterDesignPPortPrototypeMapping

7.4 Mapping of Services to Executables

A typical next step in the design workflow could be to decide about the modeling of [Executables](#) inside the [SoftwareClusterDesign](#). The [PortPrototypes](#) used in the modeling of an [Executable](#) actually implement the endpoints to which required and provided service instances shall be mapped.

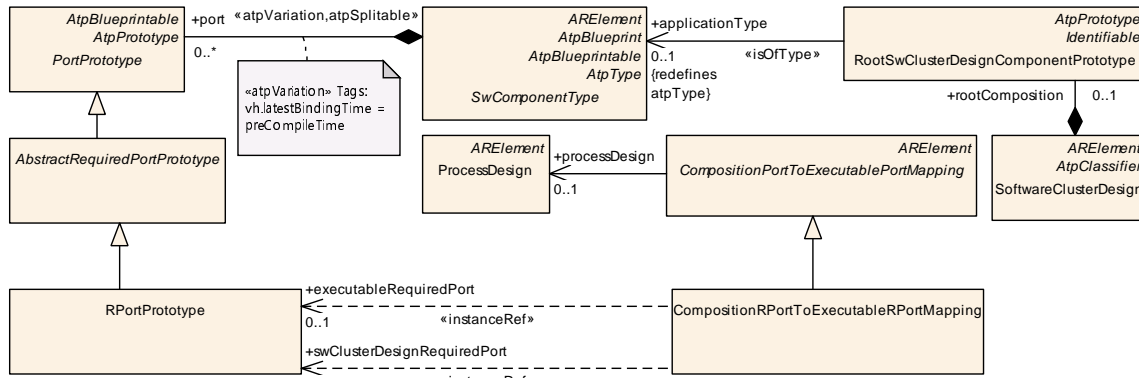


Figure 7.5: Modeling of the RootSwClusterDesignComponentPrototype and the CompositionRPortToExecutableRPortMapping

[TPS_MANI_01276]{DRAFT} Semantics of **CompositionRPortToExecutableRPortMapping** and **CompositionPPortToExecutablePPortMapping** [In the context of the creation of an **SoftwareClusterDesign**, it is not possible to already define the actual mapping of **PortPrototypes** to **AdaptivePlatformServiceInstances**.

To counter this issue, and as an additional guidance for the later creation of the actual **ServiceInstanceToPortPrototypeMappings** it is possible to create another mapping inside the scope of the **SoftwareClusterDesign** that maps the **PortPrototypes** defined in the context of the **RootSwClusterDesignComponentPrototype** to the refined **PortPrototypes** defined in the context of **Executables**.] (**RS_MANI_00011**)

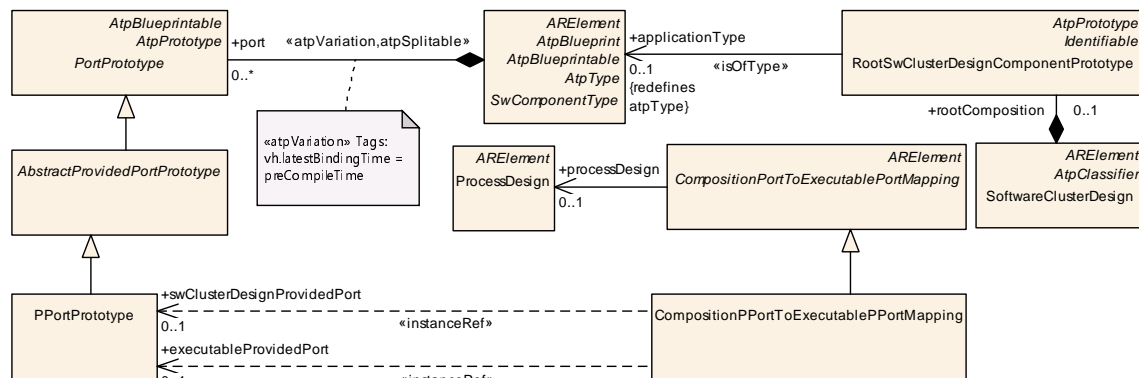


Figure 7.6: Modeling of the RootSwClusterDesignComponentPrototype and the CompositionPPortToExecutablePPortMapping

This way, it is possible to retrace the design decisions on the level of the **RootSwClusterDesignComponentPrototype** one level deeper and provide a guidance for the creation of the **ServiceInstanceToPortPrototypeMapping**, as described in section 11.3.

[TPS_MANI_01282]{DRAFT} **Semantics of reference [CompositionPortToExecutablePortMapping.processDesign](#)** [The reference [CompositionPortToExecutablePortMapping.processDesign](#) identifies the applicable [ProcessDesign](#) for the mapping. This reference therefore disambiguates the existence of multiple [CompositionPortToExecutablePortMapping](#) that refer to the exact same [PortPrototype](#) in the context of an [Executable](#).] ([RS_MANI_00011](#))

The statement made by [TPS_MANI_01282] is further explained in Figure 7.4. Two [CompositionPortToExecutablePortMapping](#) refer to the same [PortPrototype](#) on the surface of the [Executable B](#).

It is important to understand that each of these [CompositionPortToExecutablePortMappings](#) refer to a different [ProcessDesign](#).

This means that, at run-time, the two [CompositionPortToExecutablePortMappings](#) apply to different instances of the [Executable B](#) launched as different [Processes](#) (that each, in turn, refer to one of the [ProcessDesigns](#) referenced by the [Executable B](#)).

Class	CompositionPortToExecutablePortMapping (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SubSystemDesign::DesignWorkflow			
Note	This abstract meta-class acts as a base class for the specification of a mapping between a PortPrototype owned by a RootSwClusterDesignComponentPrototype to a PortPrototype owned by a ComponentPrototype inside an Executable.rootSwComponentType .			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	CompositionPPortToExecutablePPortMapping , CompositionRPortToExecutableRPortMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
processDesign	ProcessDesign	0..1	ref	This reference identifies the impacted ProcessDesign for this mapping. This allows for mapping multiple services to the same PortPrototype on an Executable by also referencing different ProcessDesigns .

Table 7.6: [CompositionPortToExecutablePortMapping](#)

Class	CompositionRPortToExecutableRPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SubSystemDesign::DesignWorkflow			
Note	This meta-class has the ability to associate an RPortPrototype defined in the context of a SwClusterDesign to an RPortPrototype in the context of an Executable . Tags: atp.recommendedPackage= CompositionPortToExecutablePortMappings			
Base	ARElement , ARObject , CollectableElement , CompositionPortToExecutablePortMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
executable RequiredPort	RPortPrototype	0..1	iref	This reference identifies the applicable PortPrototype in the context on an Executable . InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef





Class	CompositionRPortToExecutableRPortMapping			
swClusterDesignRequiredPort	RPortPrototype	0..1	iref	This reference identifies the applicable RPortPrototype in the context of the SwClusterDesign. InstanceRef implemented by: RPortPrototypeInSoftwareClusterDesignInstanceRef

Table 7.7: CompositionRPortToExecutableRPortMapping

Class	CompositionPPortToExecutablePPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SubSystemDesign::DesignWorkflow			
Note	This meta-class has the ability to associate a PPortPrototype defined in the context of a SwClusterDesign to a PPortPrototype in the context of an Executable. Tags: atp.recommendedPackage=CompositionPortToExecutablePortMappings			
Base	ARElement , ARObject , CollectableElement , CompositionPortToExecutablePortMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
executableProvidedPort	PPortPrototype	0..1	iref	This reference identifies the applicable PortPrototype in the context on an Executable. InstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
swClusterDesignProvidedPort	PPortPrototype	0..1	iref	This reference identifies the applicable PPortPrototype in the context of the SwClusterDesign. InstanceRef implemented by: PPortPrototypeInSoftwareClusterDesignInstanceRef

Table 7.8: CompositionPPortToExecutablePPortMapping

8 Execution Manifest

8.1 Overview

The purpose of the execution manifest is to provide information that is needed for the actual deployment of an application (formally modeled as an [SwComponentType](#)) onto the AUTOSAR adaptive platform.

One aspect of the deployment information is the provision of information that could in principle be provided as part of the application software code but which would make the application software code become very much bound to specific usage scenarios.

The general idea is to keep the application software code as independent as possible from the deployment scenario in order to increase the odds that the application software can be reused in different deployment scenarios.

In particular, the usage of [PortPrototypes](#) as a means to express communication with the “outside” of the application software allows for abstracting away the details (the concrete service instance identification) of the service configuration. As far as the model is concerned, the API between the application and the middleware is represented by the [PortPrototype](#).

The application code does not use specific service instances but takes the [PortPrototype](#) as a symbolic replacement for this information. The specifics of this modeling aspect are described in section 11.

8.2 Process

The top-level element of the [Execution Manifest](#) definition is the [Process](#), in reference to the fact that the unit of deployment on the *AUTOSAR adaptive platform* is a binary that, at runtime, makes a POSIX process.

[TPS_MANI_01308]{DRAFT} [Process](#) is not designed for re-usability [Meta-class [Process](#) has **not** been created with the goal of reusing it on different [Machines](#).

However, there is *some* potential for reusing configuration aspects in the definition of the [Process.stateDependentStartupConfig.startupConfig](#).] ([RS_MANI_00006](#))

Class	Process
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest
Note	This meta-class provides information required to execute the referenced executable. Tags: atp.recommendedPackage=Processes
Base	ARElement , ARObject , AbstractExecutionContext , AtpClassifier , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement
Aggregated by	ARPackage.element





Class	Process			
Attribute	Type	Mult.	Kind	Note
design	ProcessDesign	0..1	ref	This reference represents the identification of the design-time representation for the Process that owns the reference.
executable	Executable	*	ref	Reference to executable that is executed in the process. Stereotypes: atpUriDef
functionClusterAffiliation	String	0..1	attr	This attribute specifies which functional cluster the process is affiliated with.
numberOfRestartAttempts	PositiveInteger	0..1	attr	This attribute defines how often a process shall be restarted if the start fails. numberOfRestartAttempts = "0" OR Attribute not existing, start once numberOfRestartAttempts = "1", start a second time
preMapping	Boolean	0..1	attr	This attribute describes whether the executable is preloaded into the memory.
processStateMachine	ModeDeclarationGroupPrototype	0..1	aggr	Set of Process States that are defined for the process.
securityEvent	SecurityEventDefinition	*	ref	The reference identifies the collection of SecurityEvents that can be reported by the enclosing SoftwareCluster. Stereotypes: atpSplitable; atpUriDef Tags: atp.Splitkey=securityEvent atp.Status=candidate
stateDependentStartupConfig	StateDependentStartupConfig	*	aggr	Applicable startup configurations.

Table 8.1: Process

[constr_3732]{DRAFT} Upper multiplicity of reference in the role [Process.executable](#) [In the context of [Process](#), the reference in the role [executable](#) shall exist at most once **at the time when the creation of the manifest is finished.**] ()

Class	AbstractExecutionContext (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest			
Note	This meta-class acts as a base class for entities that execute code on different levels, e.g. container, process, thread, fiber.			
Base	ARElement , ARObject , AtpClassifier , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Subclasses	Process			
Aggregated by	ARPackageElement			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 8.2: AbstractExecutionContext

[TPS_MANI_01337]{DRAFT} Standardized values for attribute [Process.functionClusterAffiliation](#) [The following values of attribute [Process.functionClusterAffiliation](#) are standardized by AUTOSAR:

- **STATE_MANAGEMENT**

- **PLATFORM_HEALTH_MANAGEMENT**

]([RS_MANI_00006](#))

Please note that it is possible to use values other than from the standardized set in attribute `Process.functionClusterAffiliation`.

However, it is important that proprietary values of this attribute are formulated in a way that a potential clash with future standardized values can be avoided.

Clash-avoidance could be implemented by using a company-specific or project-specific prefix, infix, or suffix.

The `preMapping` approach of a `Process` is described in more detail in the SWS Execution Management [10], specifically in the context of [SWS_EM_02109].

8.2.1 Process relates to Executable

[TPS_MANI_01011]{DRAFT} Connection between application design and application deployment [The connection between the *application design* and the *application deployment* is implemented by means of a reference from meta-class `Process` to meta-class `Executable` in the role `executable`.

By modeling the reference in this direction it is possible to keep the design level independent of the deployment level and, at the same time, bind the deployment to a specific design.]([RS_MANI_00006](#))

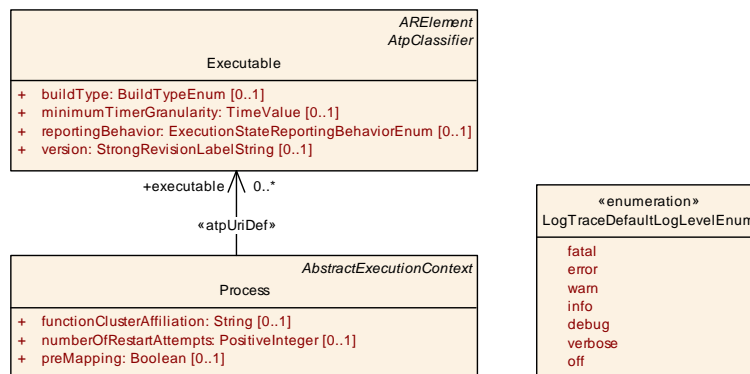


Figure 8.1: Relation of meta-classes `Executable` and `Process`

Please note that the meta-model, as depicted in Figure 8.1 supports the existence of two or more `Processes` that reference the same `Executable`.

This is an indication that the specific `Executable` is supposed to be executed in several instances (i.e. in the form of POSIX processes) on the same platform. Such a situation is sketched in Figure 8.2

It is somehow likely that the startup conditions and startup parameters of different `Processes` may be different (in order to achieve a variation of the functionality of the `Executable`).

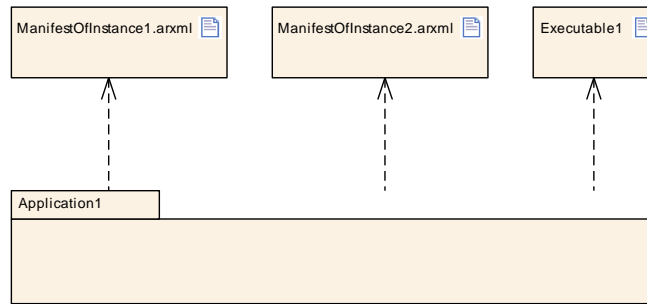


Figure 8.2: Example deployment where one **Executable** is bundled with two ARXML files that each contain the description of one **Process**

Therefore, it is necessary to allow for the definition of startup configurations on a per-**Process**-basis. This aspect is described in section 8.3.

8.2.2 Process States

A **Process** is a state-full entity. The state machine associated with a **Process** is modeled based on the aggregation of a **ModeDeclarationGroupPrototype** in the role **processStateMachine**, as sketched by Figure 8.3.

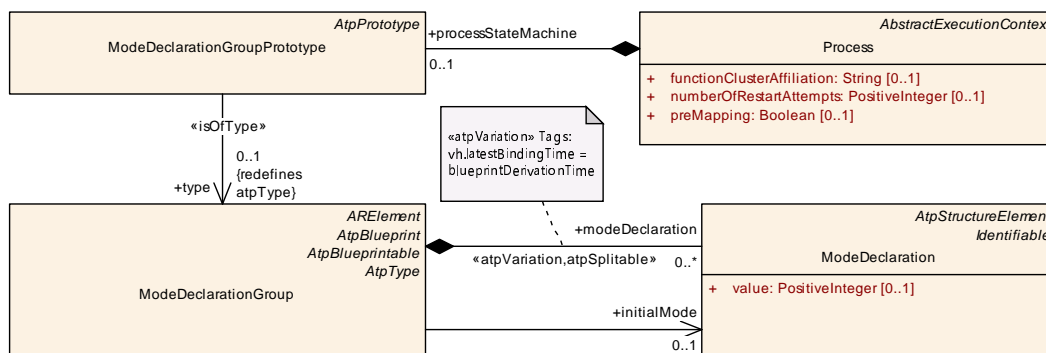


Figure 8.3: Modeling of process states

The supported process states that are defined in the **Process.processStateMachine** are described in more detail in [10].

It is possible to define a so-called *execution dependency*, such that one **Process** can only launch if a referenced other **Process** is in a given process state. The details are explained in section 8.3.5.

8.3 Startup Configuration

The configuration of startup behavior is an essential part of the execution manifest.

[TPS_MANI_01012]{DRAFT} Formal modeling of application startup behavior
[The formal modeling of application startup behavior is implemented by means of the

aggregation of meta-class `StateDependentStartupConfig` in the role `Process`.
`stateDependentStartupConfig.`] ([RS_MANI_0007](#))

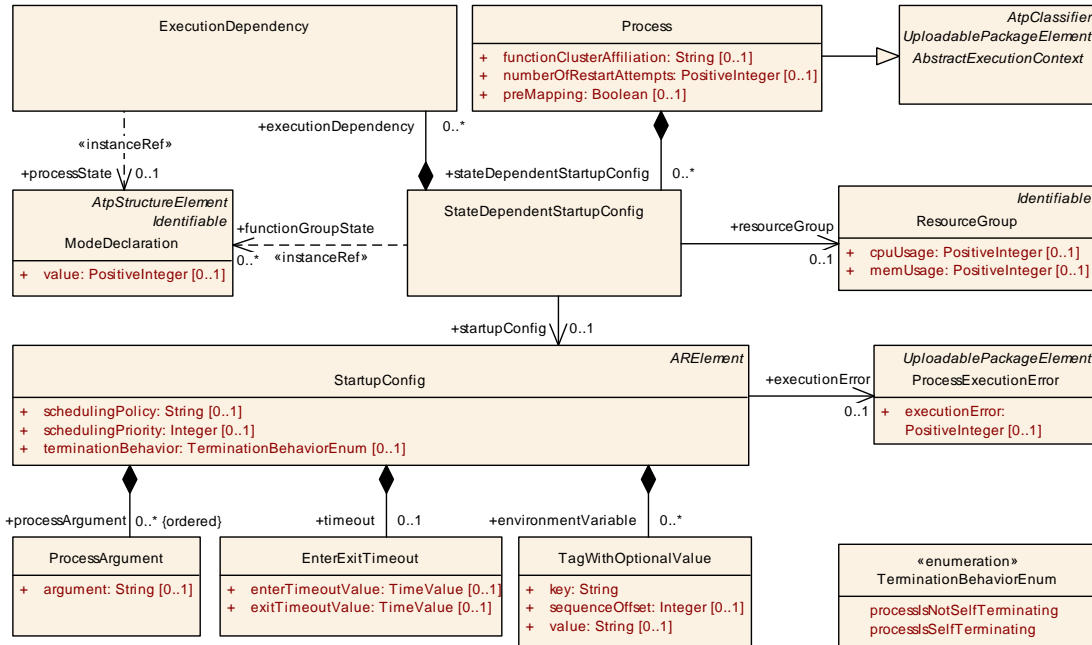


Figure 8.4: Content of a `Process`

8.3.1 State-dependent Startup Configuration

[[TPS_MANI_01013](#)]{DRAFT} **Semantics of meta-class `StateDependentStartupConfig`** [The purpose of meta-class `StateDependentStartupConfig` is to qualify the startup configuration represented by meta-class `StartupConfig` for specific `ModeDeclarations`.

In other words, the intention is to express that the `StartupConfig` is applicable if the state machines that control the startup are in the states represented by the `ModeDeclaration` referenced in the role `StateDependentStartupConfig.functionGroupState.`] ([RS_MANI_0007](#))

As a consequence of the reference from the `StateDependentStartupConfig` to `ModeDeclaration` the `Execution Manifest` is defined for a specific `Machine` to which the binary and the Manifest is deployed.

[[constr_3423](#)]{DRAFT} **`StateDependentStartupConfig` of a `Process` shall reference a `functionGroupState`** [Each `StateDependentStartupConfig` of a `Process` shall reference at least one `ModeDeclaration` in the role `functionGroupState.`] ()

However, the references to `Function Group States` within the context of one `Process` shall only refer to `Function Group States` of the same `Function Group`. This aspect is formalized by [[constr_1688](#)].

[**constr_1688**]{DRAFT} **StateDependentStartupConfig** shall only refer to **Function Group States of the same Function Group** [For all `StateDependentStartupConfigs` aggregated in the role `Process.stateDependentStartupConfig`, references in the role `functionGroupState` to `ModeDeclaration` shall only refer to `ModeDeclarations` aggregated by the same `ModeDeclarationGroup` in the context of the same `ModeDeclarationGroupPrototype` (that represents the actual `Function Group`).]()

It is necessary to specify constraint [**constr_3396**] to regulate the number of `StateDependentStartupConfigs` that refer to the same `ModeDeclaration` in the context of one `Process` because the resulting startup configuration would be ambiguous.

[**constr_3396**]{DRAFT} **Number of Process.stateDependentStartupConfig that refer to the same functionGroupState** [Within the context of a given `Process`, no two `StateDependentStartupConfigs` shall refer to the same `ModeDeclaration` in the role `functionGroupState`.]()

[**TPS_MANI_01046**]{DRAFT} **Semantics of StateDependentStartupConfig.functionGroupState** [The `ModeDeclarations` referenced in the role `StateDependentStartupConfig.functionGroupState` shall be considered in a way such that the `StateDependentStartupConfig` applies if **any** of the referenced `ModeDeclarations` is active.

In other words, the `ModeDeclarations` are or-ed for the determination of whether a `StateDependentStartupConfig` is applicable.](*RS_MANI_00007*)

[**constr_3424**]{DRAFT} **StateDependentStartupConfig shall never reference the functionGroupState Off** [A `StateDependentStartupConfig` shall never reference the `ModeDeclaration` that has the `shortName Off` in the role `functionGroupState`. Please note that the `Off ModeDeclaration` is a special state in a `Function Group` as defined by [**TPS_MANI_03195**].]()

[**constr_1618**]{DRAFT} **Ability to shut down** [In the context of one `Machine`, at least one `Process` shall have a `stateDependentStartupConfig.functionGroupState` that has the `shortName Shutdown`.]()

[**constr_1619**]{DRAFT} **Ability to restart** [In the context of one `Machine`, at least one `Process` shall have a `stateDependentStartupConfig.functionGroupState` that has the `shortName Restart`.]()

[**TPS_MANI_01209**]{DRAFT} **Definition of environment variables in process scope** [It is possible to define environment variables in the scope of any given `Process`.

For this purpose the aggregation of `TagWithOptionalValue` in the role `StartupConfig.environmentVariable` exists.

The name of the environment variable shall be specified by means of the attribute `TagWithOptionalValue.key`, the value can be modeled by means of `TagWithOptionalValue.value`.

This encloses the ability to define environment variables with empty values. For this purpose, the attribute `TagWithOptionalValue.value` shall simply be omitted.] (*RS_MANI_00007*)

Class	StateDependentStartupConfig			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest			
Note	This meta-class defines the startup configuration for the process depending on a collection of machine states.			
Base	<i>ARObject</i>			
Aggregated by	Process.stateDependentStartupConfig			
Attribute	Type	Mult.	Kind	Note
execution Dependency	ExecutionDependency	*	aggr	This attribute defines that all processes that are referenced via the ExecutionDependency shall be launched and shall reach a certain ProcessState before the referencing process is started.
functionGroup State	ModeDeclaration	*	iref	This represent the applicable functionGroupMode. InstanceRef implemented by: FunctionGroupStateInFunctionGroupSetInstanceRef
resource Consumption	ResourceConsumption	0..1	aggr	This aggregation provides the ability to define resource consumption boundaries on a per-process-startup-config basis.
resourceGroup	ResourceGroup	0..1	ref	Reference to an applicable resource group.
startupConfig	StartupConfig	0..1	ref	Reference to a reusable startup configuration with startup parameters.

Table 8.3: StateDependentStartupConfig

[constr_10175]{DRAFT} Multiplicity of attribute [StateDependentStartupConfig.resourceGroup](#) [For each [StateDependentStartupConfig](#), the attribute [resourceGroup](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10176]{DRAFT} Multiplicity of attribute [StateDependentStartupConfig.startupConfig](#) [For each [StateDependentStartupConfig](#), the attribute [startupConfig](#) shall exist **at the time when the creation of the manifest is finished.**]()

Class	StartupConfig			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest			
Note	This meta-class represents a reusable startup configuration for processes.. Tags: atp.recommendedPackage=StartupConfigs			
Base	ARElement , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
environment Variable	TagWithOptionalValue	*	aggr	This aggregation represents the collection of environment variables that shall be added to the respective Process's environment prior to launch.
executionError	ProcessExecutionError	0..1	ref	this reference is used to identify the applicable execution error





Class	StartupConfig			
process Argument (ordered)	ProcessArgument	*	aggr	This aggregation represents the collection of command-line arguments applicable to the enclosing StartupConfig.
scheduling Policy	String	0..1	attr	This attribute represents the ability to define the scheduling policy for the initial thread of the application.
scheduling Priority	Integer	0..1	attr	This is the scheduling priority requested by the application itself.
termination Behavior	TerminationBehavior Enum	0..1	attr	This attribute defines the termination behavior of the Process.
timeout	EnterExitTimeout	0..1	aggr	This aggregation can be used to specify the timeouts for launching and terminating the process depending on the StartupConfig.

Table 8.4: StartupConfig

[TPS_MANI_01277]{DRAFT} **Definition of a start-up timeout for a [StartupConfig](#) of a [Process](#)** [Meta-class [StartupConfig](#) provides the ability to define a start-up timeout for a [Process](#) by means of the attribute [enterTimeoutValue](#) that is aggregated by meta-class [EnterExitTimeout](#) that is aggregated by the [StartupConfig](#) in the role [timeout](#).] ([RS_MANI_00007](#))

[TPS_MANI_01278]{DRAFT} **Definition of a termination timeout for a [StartupConfig](#) of a [Process](#)** [Meta-class [StartupConfig](#) provides the ability to define a termination timeout for a [Process](#) by means of the attribute [exitTimeoutValue](#) that is aggregated by meta-class [EnterExitTimeout](#) that is aggregated by the [StartupConfig](#) in the role [timeout](#).] ([RS_MANI_00007](#))

8.3.2 Scheduling

[TPS_MANI_01061]{DRAFT} **Requirements on scheduling** [The attributes [StartupConfig.schedulingPolicy](#) and [StartupConfig.schedulingPriority](#) make requirements on the scheduling of the main thread of a process that is created out of launching the corresponding [Executable](#).] ([RS_MANI_00007](#))

[TPS_MANI_01328]{DRAFT} **Standardized values for attribute [StartupConfig.schedulingPolicy](#)** [The following values are standardized for attribute [StartupConfig.schedulingPolicy](#):

- **SCHED_RR**
- **SCHED_FIFO**
- **SCHED_OTHER**

] ([RS_MANI_00007](#))

It is possible to use a custom, non-standardized value for the attribute [StartupConfig.schedulingPolicy](#) but this option comes with the obligation to use a value that

is guaranteed to not clash with possible future extensions of the collection of standardized values.

[TPS_MANI_01188]{DRAFT} Semantics of attribute `schedulingPriority` [The value of attribute `StartupConfig.schedulingPriority` shall be interpreted such that the higher values represent a higher scheduling priority.](*RS_MANI_00007*)

[constr_1692]{DRAFT} Value of `schedulingPriority` [The value of attribute `StartupConfig.schedulingPriority` shall be set to a positive integer value.]()

8.3.3 Process Arguments

Please find more information about the interpretation of `ProcessArgument` in the SWS Execution Manifest [10].

[constr_1769]{DRAFT} Existence of `ProcessArgument.argument` [For each `ProcessArgument`, attribute `argument` shall exist at the time when manifest creation is finished.]()

Class	ProcessArgument			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest			
Note	This meta-class has the ability to define command line arguments for processing by the Main function.			
Base	<i>ARObject</i>			
Aggregated by	StartupConfig.processArgument			
Attribute	Type	Mult.	Kind	Note
argument	String	0..1	attr	This represents one command-line argument to be processed by the executable software.

Table 8.5: ProcessArgument

8.3.4 Association with Resource Group

Meta-class `StateDependentStartupConfig` also supports the specification of a relation to a resource group.

[TPS_MANI_01017]{DRAFT} Relation of startup configuration to resource group [The modeling of a resource group is possible by means of meta-class `ResourceGroup` in the `OsModuleInstantiation` of the `Machine` and the assignment of a `Process` to a `ResourceGroup` is supported by the association from `StateDependentStartupConfig` to `ResourceGroup` in the role `resourceGroup`.](*RS_MANI_00007*)

[constr_3413]{DRAFT} `StateDependentStartupConfig` of a `Process` is mapped to exactly one `ResourceGroup` [Each `StateDependentStartupConfig` of a `Process` shall be assigned to exactly one `ResourceGroup` that is defined in the Machine Manifest.]()

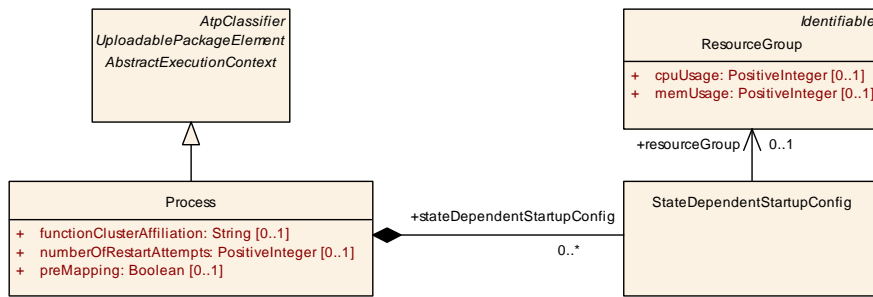


Figure 8.5: Modeling of how **Process** relates to **ResourceGroup**

8.3.5 Execution Dependency

The modeling of an execution dependency makes two **Processes** become associated to each other by means of the definition of an **ExecutionDependency**.

But since the reference that defines the execution dependency is modeled as an `<<instanceRef>>`, the referenced **Process** needs to be extracted from the context references in the `<<instanceRef>>`.

Once the two **Processes** are identified it is necessary for the validity of the startup dependency that they refer to the identical **Function Group**.

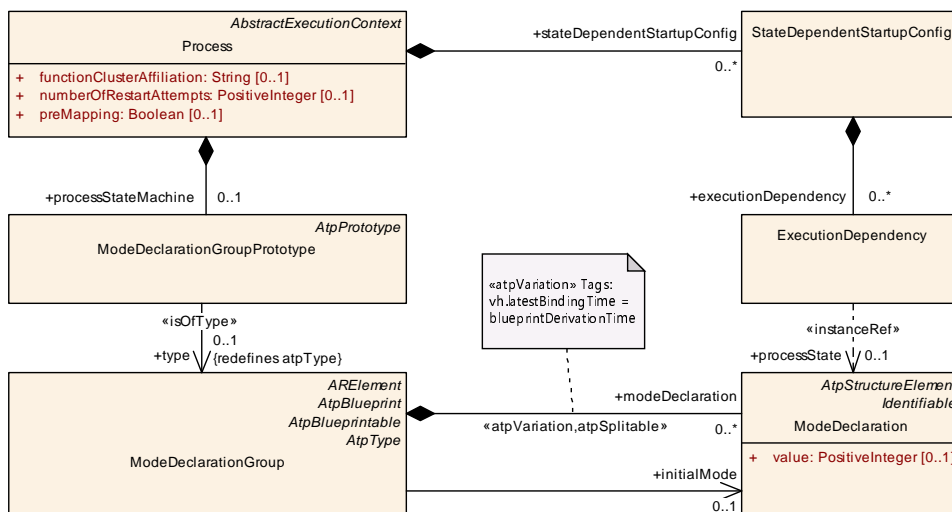


Figure 8.6: Modeling of how **Process** relates to **ModeDeclaration** owned by another **Process**

[TPS_MANI_01041]{DRAFT} **Startup configuration supports the definition of a launch sequence dependency** [The modeling of startup configuration also supports the definition of a launch sequence dependency, formalized by the meta-class **ExecutionDependency** that is aggregated by **StateDependentStartupConfig** in the role **executionDependency**.

The `ExecutionDependency` allows to define a dependency to a process that needs to be in a specific process state before the process that aggregates the `ExecutionDependency` via `StateDependentStartupConfig` is launched. | (RS_MANI_00007)

[constr_1689]{DRAFT} Modeling of a startup dependency between different Processes [The existence of attribute `Process.stateDependentStartupConfig.executionDependency` is only valid if

- the owner of the `stateDependentStartupConfig.executionDependency` (in other words: the **referencing Process**) and
- the owner of the `ModeDeclarationGroupPrototype` referenced in the role `contextModeDeclarationGroupPrototype` within the reference `stateDependentStartupConfig.executionDependency.processState` (i.e. the **referenced Process**)

refer to the **identical Function Group State** formalized as `ModeDeclaration`. | ()

Figure 8.7 provides an exemplary explanation of [constr_1689]. In this example, `Process "B"` (the referencing `Process` as of [constr_1689]) defines an `executionDependency` to `Process "A"`.

This `executionDependency` is only valid if both `Process "A"` and `Process "B"` aggregate a `StateDependentStartupConfig` that refers to the same `Function Group State "MD"` within `Function Group "FG"`.

`Process "A"` can be found by following the `ExecutionDependency` (specifically the `contextModeDeclarationGroupPrototype`) and the `<<instanceRef>>` that goes from the `ExecutionDependency` to the `Process State "PS"`.

The **owner** of "PS" is `Process "B"`, and if "B" refers to `Function Group State "MD"` within `Function Group "FG"` and if "A" refers to `Function Group State "MD"` within "FG" then the constraint [constr_1689] is fulfilled.

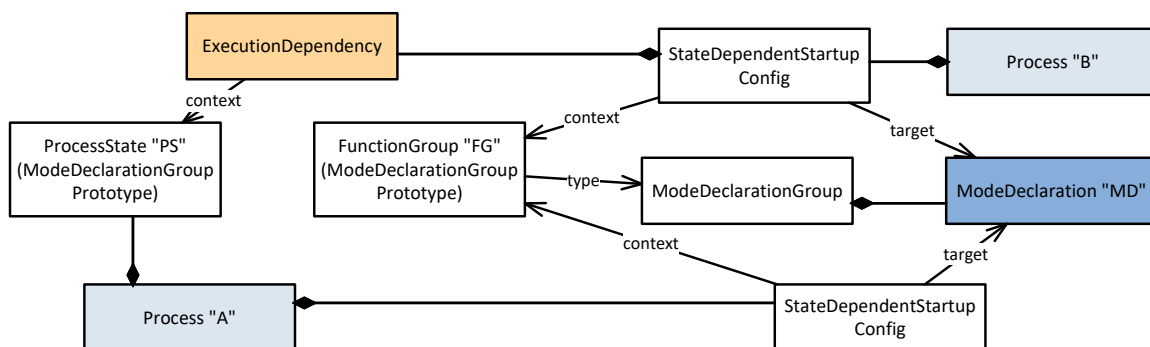


Figure 8.7: Explanation of dependencies from one Process to another

[constr_10411]{DRAFT} **Existence of ExecutionDependency and references to Function Group States** [Each StateDependentStartupConfig that aggregates at least one ExecutionDependency in the role executionDependency shall reference at most one ModeDeclaration in the role functionGroupState.

This rule shall be imposed **at the time when the creation of the manifest is finished.**]()

There are scenarios where potential references to more than one functionGroupState in the presence of an ExecutionDependency lead to a conflict at runtime (specifically if the Process referenced in the ExecutionDependency is self-terminating). The prevention of such a scenario is the reason for the existence of [constr_10411].

For the exploration of such a scenario, Figure 8.8 sketches a scenario that is not allowed in the presence of [constr_10411].

In the sketched scenario in Figure 8.8, the execution of Process “B” depends on the launch and sub-sequent termination of Process “A”. Process “A” owns two StateDependentStartupConfigs, one that references the Function Group State “FGS1” and another that references Function Group State “FGS2”.

At runtime, this means that in the event of switching the Function Group to Function Group State “FGS1” (or “FGS2”) both Processes “A” and “B” want to be executed.

Thanks to the existence of the ExecutionDependency, a POSIX-process that represents Process “A” is launched first, then a POSIX-process that represents Process “B”.

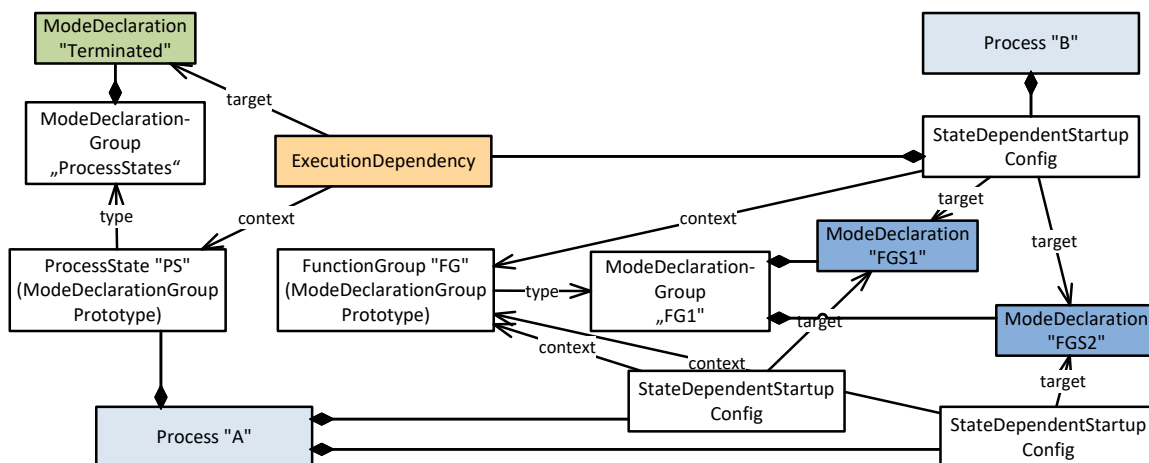


Figure 8.8: StateDependentStartupConfig references more than one Function Group State (invalid configuration)

Now, if the Function Group State switched from “FGS1” to “FGS2” (or vice versa), it is (with respect to the modeling of the example) expected that the same sequence of execution will be repeated. But instead, the following sequence will occur:

- a new POSIX-process that represents *Process* “A” will be launched and
- the POSIX-process that represents *Process* “B” will **not** be terminated and re-launched because *Process* “B” aggregates a *StateDependentStartupConfig* that references both *Function Group States* “FGS1” and “FGS2”.

As a result, the order of execution (“A” launches and terminates, then “B” launches) as defined by the *ExecutionDependency* cannot be implemented in the event of a switch of *Function Group States* between the two *Function Group States* referenced by the *StateDependentStartupConfig* aggregated by *Process* “B”.

In order to prevent this contradiction between modeled semantics and real-world behavior, [constr_10411] has been created.

On the other hand, the scenario depicted in Figure 8.9 is cleared according to [constr_10411].

In the example depicted in Figure 8.9 it is expected that, upon *Function Group State* “FGS1” becoming active, a POSIX-process representing *Process* “A” is launched and, at some time later, terminates.

Then, a POSIX-process representing *Process* “B” is executed. Of course, the same sequence would occur upon the *Function Group State* being switched from any other *Function Group State* except “FGS1” to “FGS2”.

When the *Function Group* is switched to “FGS2”, the POSIX-process that represents *Process* “B” terminates as the exit from “FGS1” happens.

As “FGS2” is entered, a POSIX-process representing *Process* “A” is launched. After it terminates, a POSIX-process that represents *Process* “B” starts being executed, which is exactly the expected sequence.

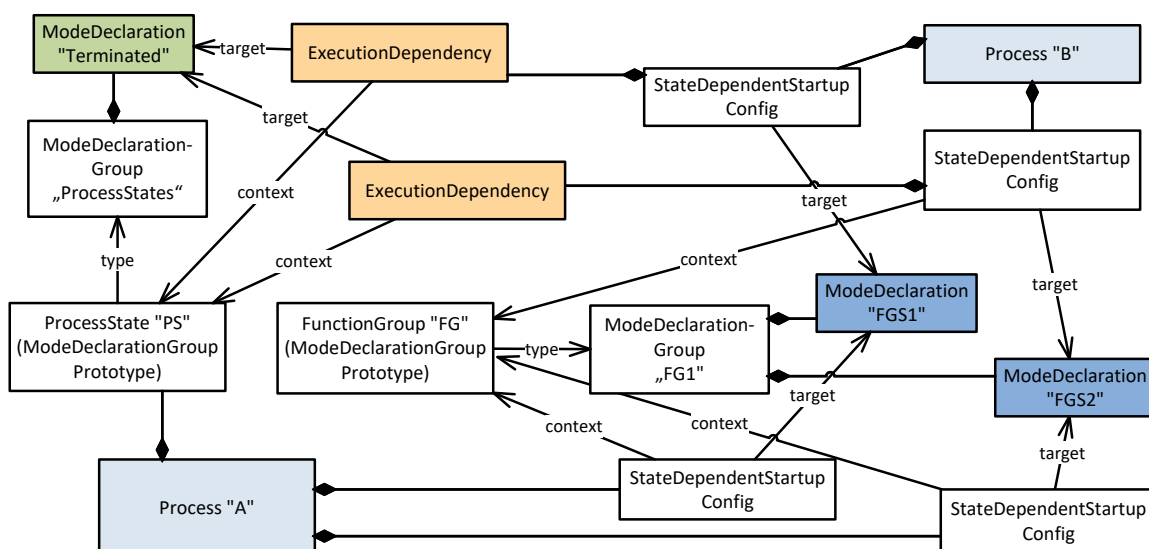


Figure 8.9: Two *StateDependentStartupConfigs* that each reference just one *Function Group State*

To summarize the example behavior, the intended execution dependency is realized when

- one of the referenced [Function Group States](#) becomes active or
- a switch from one referenced [Function Group State](#) to the other referenced [Function Group State](#) OCCURS.

Class	ExecutionDependency			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest			
Note	This element defines a ProcessState in which a dependent process needs to be before the process that aggregates the ExecutionDependency element can be started.			
Base	ARObject			
Aggregated by	StateDependentStartupConfig.executionDependency			
Attribute	Type	Mult.	Kind	Note
processState	ModeDeclaration	0..1	iref	This represent the applicable modeDeclaration that represents an ProcessState. InstanceRef implemented by: ModelnProcessInstanceRef

Table 8.6: ExecutionDependency

[constr_1606]{DRAFT} Processes with mutual ExecutionDependencies [A [Process.stateDependentStartupConfig.executionDependency](#) shall not refer to any [ModeDeclaration](#) owned by a second [Process](#) that in turn refers via [stateDependentStartupConfig.executionDependency](#) to any [ModeDeclaration](#) owned by the first [Process](#).]()

8.3.6 Assignment of Processes to Function Group states

There are use cases where starting and terminating of individual groups of processes is necessary. This is supported in AUTOSAR by [Function Groups](#) that group processes together.

A [Function Group](#) may have a number of [Function Group States](#), e.g. Running, Idle, Terminating. The [StateDependentStartupConfig](#) of a [Process](#) can be assigned to a [Function Group State](#) and the start-up of the [Process](#) will then depend on this assignment.

The modeling of a [Function Group](#) and its [Function Group States](#) is described in [section 8.4](#) in more detail. The usage of Function Groups is described in more detail in [10].

[TPS_MANI_03152]{DRAFT} Assignment of a StateDependentStartupConfig to a Function Group State [The [StateDependentStartupConfig](#) is assigned to a [Function Group State](#) with the [functionGroupState](#) reference.]([RS-MANI_00041](#))

8.3.7 Resource Consumption Boundaries

[TPS_MANI_01269]{DRAFT} Specification of boundaries for resource consumption [It is possible to specify boundaries for resource consumption, specifically in terms of memory consumption for memory of a given startup configuration of a `Process`: the formalization of process memory usage is represented by meta-class `MemoryUsage`, aggregated via meta-class `ResourceConsumption` at `StateDependentStartupConfig`.

The actual value of the memory usage is computed out of the sum of all aggregated `ResourceConsumption.memoryUsage`.] (*RS_MANI_00020*)

Please note the difference between the ability of defining resource consumption boundaries for a single `Process`, as opposed to the ability to associate a `Process` with a `ResourceGroup` that has the ability to also define resource consumption boundaries, albeit on a more coarse-grained level.

In contrast to that, the `StateDependentStartupConfig.resourceConsumption` allows for a fine-grained definition that can even observe the differences in resource consumption with respect to different startup configurations.



Figure 8.10: Modeling of resource consumption boundaries for a given `Process`

Class	ResourceConsumption			
Package	M2::AUTOSARTemplates::CommonStructure::ResourceConsumption			
Note	Description of consumed resources by one implementation of a software.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	EcuResourceEstimation.bswResourceEstimation, EcuResourceEstimation.rteResourceEstimation, Implementation.resourceConsumption, StateDependentStartupConfig.resourceConsumption			
Attribute	Type	Mult.	Kind	Note
memoryUsage	MemoryUsage	*	aggr	Collection of the memory allocated by the owner. Stereotypes: atpSplittable Tags: atp.Splitkey=memoryUsage.shortName atp.Status=draft

Table 8.7: ResourceConsumption

Class	MemoryUsage			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest			
Note	This meta-class is used to describe the memory consumption.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	ResourceConsumption.memoryUsage			
Attribute	Type	Mult.	Kind	Note
memory Consumption	PositiveInteger	0..1	attr	Provides a formal worst case system usage. The unit is byte.

Table 8.8: MemoryUsage

8.3.8 Error and Termination Behavior

[TPS_MANI_01334]{DRAFT} Semantics of `StartupConfig.terminationBehavior` [The attribute `StartupConfig.terminationBehavior` defines the termination behavior of the `Process` in terms of whether (or not) the `Process` that references the enclosing `StartupConfig` in the role `stateDependentStartupConfig.startupConfig` is configured to self-terminate.] (*RS_MANI_00007*)

Enumeration	TerminationBehaviorEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest
Note	This enumeration provides options for controlling of how a Process terminates.
Aggregated by	<code>StartupConfig.terminationBehavior</code>
Literal	Description
processIsNotSelf Terminating	The Process terminates only on request from Execution Management. Tags: atp.EnumerationLiteralIndex=0
processIsSelf Terminating	The Process is allowed to terminate without request from Execution Management. Tags: atp.EnumerationLiteralIndex=1

Table 8.9: TerminationBehaviorEnum

[constr_10007]{DRAFT} Existence of `ProcessExecutionError.executionError` [For each `ProcessExecutionError`, attribute `executionError` shall exist at the time when manifest creation is finished.] ()

[constr_10008]{DRAFT} Value of `ProcessExecutionError.executionError` [The value of attribute `ProcessExecutionError.executionError` shall at least be set to 1 (or higher).] ()

Class	ProcessExecutionError			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest			
Note	This meta-class has the ability to describe the value of a execution error along with a documentation of its semantics. Tags: atp.recommendedPackage=ProcessExecutionErrors			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
executionError	PositiveInteger	0..1	attr	This attribute defines the numeric value which Execution Management and Platform Health Management reports to State Management if the Process terminates unexpectedly or violates its supervision. It shall give further error information for error recovery.

Table 8.10: ProcessExecutionError

8.4 Function Groups

8.4.1 Semantics of Function Group

Function Groups with Function Group States individually control groups of functionally coherent Application processes. The Process state may depend on a mode that is defined in the Function Group in case that the StateDependentStartupConfig refers to the Function Group State with the functionGroupState reference.

The usage of Function Groups is described in more detail in [10].

[TPS_MANI_03145]{DRAFT} Description of a Function Group [By defining a ModeDeclarationGroupPrototype aggregated in the role FunctionGroupSet. functionGroup it is possible to define a Function Group that has a shortName and a set of Modes (States).

The ModeDeclarationGroupPrototype points to a reusable ModeDeclarationGroup in the role type that contains the different modes as ModeDeclarations and a designated initialMode.](RS_MANI_00041)

[TPS_MANI_03194]{DRAFT} Function Group State [A Function Group State is described by a ModeDeclaration within a ModeDeclarationGroup that is referenced in the role type by a ModeDeclarationGroupPrototype aggregated as functionGroup by a FunctionGroupSet. The Function Group State is identified by its shortName.](RS_MANI_00041)

The modeling described in [TPS_MANI_03145] and [TPS_MANI_03194] is depicted in Figure 8.11.

[TPS_MANI_03195]{DRAFT} Off state in Function Group [Each functionGroup shall define a ModeDeclaration with the shortName Off. This ModeDeclaration shall also be referenced in the role initialMode by ModeDeclarationGroup that types the respective functionGroup.](RS_MANI_00041)

[constr_1786]{DRAFT} Restriction to use functionGroup in terms of SoftwareCluster [Each functionGroup shall only be referenced in the role claimedFunctionGroup by at most one SoftwareCluster.]()

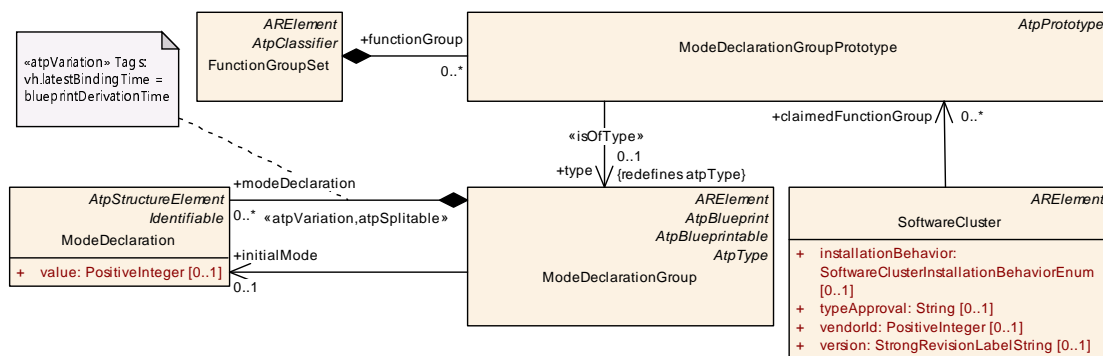


Figure 8.11: Configuration of Function Groups

[constr_1787]{DRAFT} Restricted use of Function Groups in the context of a SoftwareCluster [All Processes referenced by a SoftwareCluster in the role containedProcess shall only aggregate StateDependentStartupConfigs where the reference functionGroupState refers to a ModeDeclarationGroup-Prototype (as context) that is also referenced by the same SoftwareCluster in the role claimedFunctionGroup.]()

The description of SoftwareCluster can be found in section 15.

[constr_10023]{DRAFT} Mandatory content of any functionGroup [All ModeDeclarationGroupPrototypes aggregated by a FunctionGroupSet in the role functionGroup shall refer to a ModeDeclarationGroup that contains one ModeDeclaration with the shortName Verify.]()

Class	FunctionGroupSet			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General			
Note	This meta-class provides the ability to create arbitrary collections of function groups. Tags: atp.recommendedPackage=FunctionGroupSets			
Base	ARElement , ARObject , AtpClassifier , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
functionGroup	ModeDeclarationGroupPrototype	*	aggr	This aggregation represents the collection of function groups.

Table 8.11: FunctionGroupSet

Class	ModeDeclarationGroupPrototype			
Package	M2::AUTOSARTemplates::CommonStructure::ModeDeclaration			
Note	The ModeDeclarationGroupPrototype specifies a set of Modes (ModeDeclarationGroup) which is provided or required in the given context.			
Base	ARObject , AtpFeature , AtpPrototype , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	AtpClassifier.atpFeature , BswModuleDescription.providedModeGroup , BswModuleDescription.requiredModeGroup , FirewallStateSwitchInterface.firewallStateMachine , FunctionGroupSet.functionGroup , ModeSwitchInterface.modeGroup , Process.processStateMachine , StateManagementStateNotification.stateMachine			
Attribute	Type	Mult.	Kind	Note
type	ModeDeclarationGroup	0..1	tref	The "collection of ModeDeclarations" (= ModeDeclarationGroup) supported by a component Stereotypes: isOfType

Table 8.12: ModeDeclarationGroupPrototype

Class	ModeDeclarationGroup			
Package	M2::AUTOSARTemplates::CommonStructure::ModeDeclaration			
Note	A collection of Mode Declarations. Also, the initial mode is explicitly identified. Tags: atp.recommendedPackage=ModeDeclarationGroups			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			





Class		ModeDeclarationGroup		
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
initialMode	ModeDeclaration	0..1	ref	The initial mode of the ModeDeclarationGroup. This mode is active before any mode switches occurred.
mode Declaration	ModeDeclaration	*	aggr	The ModeDeclarations collected in this ModeDeclaration Group. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=modeDeclaration.shortName, mode Declaration.variationPoint.shortLabel vh.latestBindingTime=blueprintDerivationTime

Table 8.13: ModeDeclarationGroup

Class		ModeDeclaration		
Package	M2::AUTOSARTemplates::CommonStructure::ModeDeclaration			
Note	Declaration of one Mode. The name and semantics of a specific mode is not defined in the meta-model.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	AtpClassifier.atpFeature, ModeDeclarationGroup.modeDeclaration			
Attribute	Type	Mult.	Kind	Note
value	PositiveInteger	0..1	attr	The RTE shall take the value of this attribute for generating the source code representation of this Mode Declaration.

Table 8.14: ModeDeclaration

8.4.2 Machine Function Group

Please note that one `functionGroup` claimed by one `SoftwareCluster` of category `PLATFORM_CORE` takes the role of a "machine function group".

This `functionGroup` is required to have a dedicated `shortName` and it also is required to define a certain minimal, but extensible set of `ModeDeclarations` that also have standardized `shortNames`.

[TPS_MANI_01330]{DRAFT} Definition of machine Function Group [Exactly one `functionGroup` shall exist that has the `shortName` "MachineFG" and that is typed by a `ModeDeclarationGroup` that defines at least the following list of `ModeDeclarations` with the `shortNames`

- **Off,**
- **Verify,**
- **Startup,**
- **Shutdown, and**
- **Restart.**

](RS_MANI_00041, RS_MANI_00021)

Please note that the startup of a `Process` may depend on Modes that are defined in the context of a `SoftwareCluster` of category `PLATFORM_CORE`. The `StateDependentStartupConfig` is described in chapter 8.3.

[constr_1789]{DRAFT} **Scope of machine Function Group** [The `functionGroup` that represents the `Function Group` group (see [TPS_MANI_01330]) shall only be referenced in the role `claimedFunctionGroup` by a `SoftwareCluster` of category `PLATFORM_CORE`.]

8.5 Reporting of Security Events

It is possible to report so-called security events (formalized by meta-class `SecurityEventDefinition`) from the context of a `Process`.

This approach works for application-level software as well as for functional clusters with the exception of the Execution Manager (because the Execution Manager is itself not modeled as a `Process`).

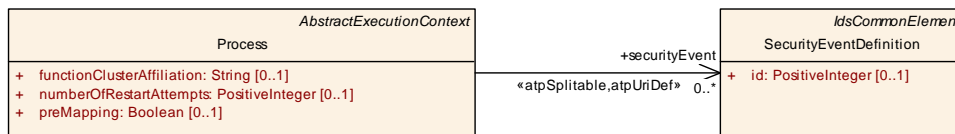


Figure 8.12: Modeling of support for the reporting of `SecurityEventDefinition` on deployment level

Please find more information about the semantics and usage of security events in the TPS Security Extract Template [21].

Class	SecurityEventDefinition			
Package	M2::AUTOSARTemplates::SecurityExtractTemplate			
Note	This meta-class defines a security-related event as part of the intrusion detection system. Tags: atp.Status=candidate atp.recommendedPackage=SecurityEventDefinitions			
Base	ARElement , ARObject , CollectableElement , Identifiable , IdsCommonElement , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
eventSymbol Name	SymbolProps	0..1	aggr	This aggregation defines optionally an alternative Event Name for the <code>SecurityEventDefinition</code> in case there is a collision of shortNames. Stereotypes: <code>atpSplittable</code> Tags: <code>atp.Splitkey=eventSymbolName.shortName</code> <code>atp.Status=candidate</code>





<i>Class</i>	SecurityEventDefinition			
id	PositiveInteger	0..1	attr	This attribute represents the numerical identification of the defined security event. The identification shall be unique within the scope of the IDS. Tags: atp.Status=candidate

Table 8.15: SecurityEventDefinition

9 Machine Manifest

9.1 Machine

The *Machine* meta-class defines the entity on which one *Adaptive AUTOSAR Software Stack* is running with an operating system. The *Machine* may be physical or virtual.

Some aspects of the actual *Machine* are already available from the System Design (see chapter 6.2) at the *MachineDesign*.

The information defined at the *MachineDesign* is available to the *Machine* as well since *Machine* has a reference to the *MachineDesign* in the role *machineDesign* (see figure 5.1).

[TPS_MANI_03035]{DRAFT} Content of the Machine configuration [The purpose of the *Machine* is to provide machine specific configuration settings.] (*RS_MANI_00020*, *RS_MANI_00021*, *RS_MANI_00022*, *RS_MANI_00023*)

An overview of the *Machine* meta-class is sketched in Figure 9.1.

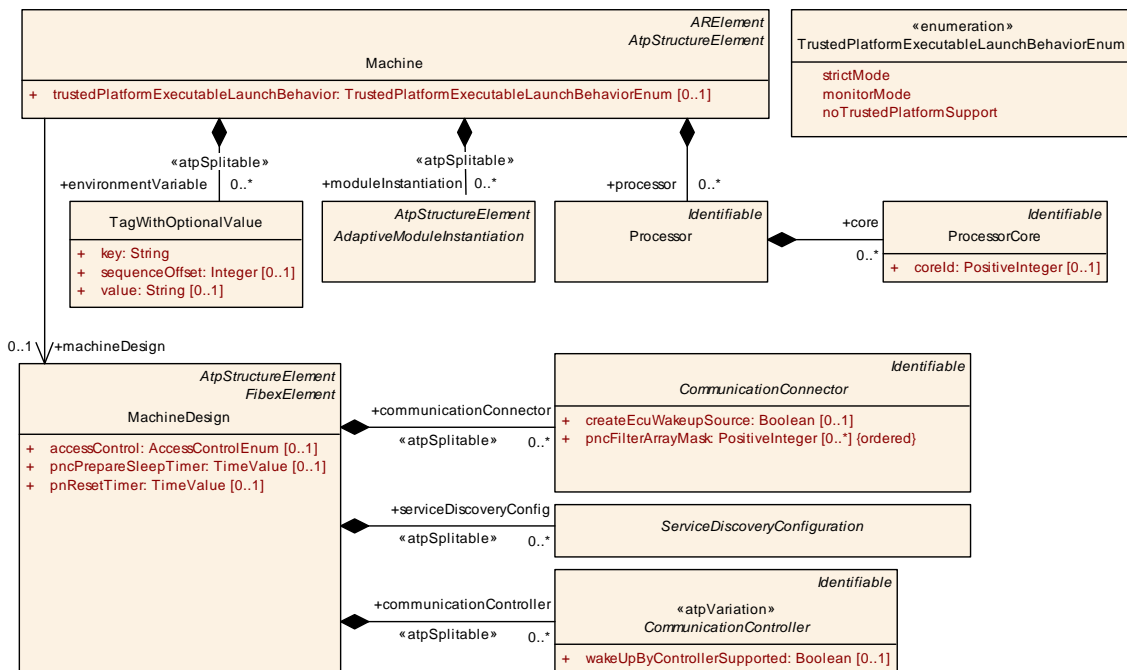


Figure 9.1: Overview about the content of the Machine configuration

[TPS_MANI_01273]{DRAFT} Support for trusted Platform [If attribute *Machine.trustedPlatformExecutableLaunchBehavior* is set to a value that is different from *noTrustedPlatformSupport* then features of the "trusted platform" are activated, depending on the concrete value of *Machine.trustedPlatformExecutableLaunchBehavior*.] (*RS_MANI_00022*)

Class	Machine			
Package	M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest			
Note	Machine that represents an Adaptive Autosar Software Stack. Tags: atp.recommendedPackage=Machines			
Base	ARElement , ARObject , AtpClassifier , AtpFeature , AtpStructureElement , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element , AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
default Application Timeout	EnterExitTimeout	0..1	aggr	This aggregation defines a default timeout in the context of a given Machine with respect to the launching and termination of applications.
environment Variable	TagWithOptionalValue	*	aggr	This aggregation represents the collection of environment variables that shall be added to the environment defined on the level of the enclosing Machine. Stereotypes: atpSplitable Tags: atp.Splitkey=environmentVariable
machineDesign	MachineDesign	0..1	ref	Reference to the MachineDesign this Machine is implementing.
module Instantiation	AdaptiveModule Instantiation	*	aggr	Configuration of Adaptive Autosar module instances that are running on the machine. Stereotypes: atpSplitable Tags: atp.Splitkey=moduleInstantiation.shortName
processor	Processor	*	aggr	This represents the collection of processors owned by the enclosing machine.
secure Communication Deployment	SecureCommunication Deployment	*	aggr	Deployment of secure communication protocol configuration settings to crypto module entities. Stereotypes: atpSplitable Tags: atp.Splitkey=secureCommunication Deployment.shortName
trustedPlatform Executable LaunchBehavior	TrustedPlatform ExecutableLaunch BehaviorEnum	0..1	attr	This attribute controls the behavior of how authentication affects the ability to launch for each Executable.

Table 9.1: Machine

[constr_10169]{DRAFT} Multiplicity of reference in the role [Machine.machineDesign](#) [For each [Machine](#), the reference in the role [machineDesign](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10170]{DRAFT} Multiplicity of attribute [Machine.trustedPlatformExecutableLaunchBehavior](#) [For each [Machine](#), the attribute [trustedPlatformExecutableLaunchBehavior](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10171]{DRAFT} Multiplicity of attribute [Machine.processor](#) [For each [Machine](#), at least one aggregation on the role [processor](#) shall exist **at the time when the creation of the manifest is finished.**]()

Enumeration	TrustedPlatformExecutableLaunchBehaviorEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest
Note	This enumeration provides options for controlling the behavior of how authentication affects the ability to launch an Executable.
Aggregated by	Machine.trustedPlatformExecutableLaunchBehavior
Literal	Description
monitorMode	An Executable shall always launch, even if the corresponding authentication fails Tags: atp.EnumerationLiteralIndex=1
noTrustedPlatformSupport	This value shall be used if there is no TrustedPlatform support on the Machine Tags: atp.EnumerationLiteralIndex=2
strictMode	An Executable shall not launch if the corresponding authentication fails. Tags: atp.EnumerationLiteralIndex=0

Table 9.2: TrustedPlatformExecutableLaunchBehaviorEnum

9.2 Processor

The [Machine](#) is able to aggregate one or several [Processors](#), as depicted by Figure 9.1. Each [Processor](#) consists of one or several [ProcessorCores](#).

Meta-class [ProcessorCore](#) provides attribute `coreId` that can be used e.g. in a bit-mask to better control the utilization of processing resources.

[constr_1549]{DRAFT} Value of [ProcessorCore.coreId](#) [The value of [ProcessorCore.coreId](#) shall be unique in the context of the enclosing [Processor](#).]()

Class	Processor			
Package	M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest			
Note	This represents a processor for the execution of an AUTOSAR adaptive platform			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	Machine.processor			
Attribute	Type	Mult.	Kind	Note
core	ProcessorCore	*	aggr	This represents the collection of cores owned by the enclosing processor.

Table 9.3: Processor

[constr_10172]{DRAFT} Multiplicity of attribute [Processor.core](#) [For each [Processor](#), the attribute `core` shall exist **at the time when the creation of the manifest is finished**.]()

Class	ProcessorCore
Package	M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest
Note	This meta-class represents the ability to model a processor core for the execution of an AUTOSAR adaptive platform.
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable





Class	ProcessorCore			
Aggregated by	Processor.core			
Attribute	Type	Mult.	Kind	Note
coreId	PositiveInteger	0..1	attr	This attribute represents a numerical value assigned to the specific core. The value can be taken e.g. for use in a bitmask.

Table 9.4: ProcessorCore

[constr_10173]{DRAFT} **Multiplicity of attribute ProcessorCore.coreId** [For each ProcessorCore, the attribute coreId shall exist **at the time when the creation of the manifest is finished.**]()

9.3 Environment Variable

[TPS_MANI_01208]{DRAFT} **Definition of environment variables in the scope of a Machine** [It is possible to define environment variables in the scope of the entire Machine.

For this purpose the aggregation of TagWithOptionalValue in the role Machine.environmentVariable exists.

The name of the environment variable shall be specified by means of the attribute TagWithOptionalValue.key, the value can be modeled by means of TagWithOptionalValue.value.

This encloses the ability to define environment variables with empty values. For this purpose, the attribute TagWithOptionalValue.value shall simply be omitted.] (RS_MANI_00022, RS_MANI_00023)

Please note that the aggregation Machine.environmentVariable has been defined with the stereotype <<atpSplittable>>. The consequence of this modeling is that it is possible to contribute to the definition of environment variables from **different sources**.

As an example, assume two partial models (sketched in Listing 9.1 and 9.2) which both add a folder to the search path of a machine running on an adaptive platform ECU.

```

<MACHINE>
  <SHORT-NAME>Machine</SHORT-NAME>
  <ENVIRONMENT-VARIABLES>
    <TAG-WITH-OPTIONAL-VALUE>
      <KEY>PATH</KEY>
      <SEQUENCE-OFFSET>10</SEQUENCE-OFFSET>
      <VALUE>/usr/application-x/bin</VALUE>
    </TAG-WITH-OPTIONAL-VALUE>
  </ENVIRONMENT-VARIABLES>
</MACHINE>
    
```

Listing 9.1: Example for the definition of environmentVariable (file 1)

```

<MACHINE>
  <SHORT-NAME>Machine</SHORT-NAME>
  <ENVIRONMENT-VARIABLES>
    <TAG-WITH-OPTIONAL-VALUE>
      <KEY>PATH</KEY>
      <SEQUENCE-OFFSET>20</SEQUENCE-OFFSET>
      <VALUE>/usr/application-y/bin</VALUE>
    </TAG-WITH-OPTIONAL-VALUE>
  </ENVIRONMENT-VARIABLES>
</MACHINE>
    
```

Listing 9.2: Example for the definition of environmentVariable (file 2)

Merging the splittable elements from the partial models results in the following content. Please note that the merged model exists only internally in the AUTOSAR tool. The Listing 9.3 is therefore shown **only for illustration**.

```

<MACHINE>
  <SHORT-NAME>Machine</SHORT-NAME>
  <ENVIRONMENT-VARIABLES>
    <TAG-WITH-OPTIONAL-VALUE>
      <KEY>PATH</KEY>
      <SEQUENCE-OFFSET>10</SEQUENCE-OFFSET>
      <VALUE>/usr/application-x/bin</VALUE>
    </TAG-WITH-OPTIONAL-VALUE>
    <TAG-WITH-OPTIONAL-VALUE>
      <KEY>PATH</KEY>
      <SEQUENCE-OFFSET>20</SEQUENCE-OFFSET>
      <VALUE>/usr/application-y/bin</VALUE>
    </TAG-WITH-OPTIONAL-VALUE>
  </ENVIRONMENT-VARIABLES>
</MACHINE>
    
```

Listing 9.3: Example for the definition of environmentVariable (merged)

The generator for the target machine configuration may use this information to create the following environment variable:

```
PATH=/usr/application-x/bin;/usr/application-y/bin;
```

9.4 Process To Machine Mapping

9.4.1 General Modeling Approach

[TPS_MANI_03147]{DRAFT} **Mapping of a [Process](#) to a [Machine](#)** [The meta-class [ProcessToMachineMapping](#) provides the ability to map a [Process](#) to a [Machine](#).] ([RS_MANI_00006](#))

[constr_1553]{DRAFT} **Restriction for [ProcessToMachineMapping](#)** [The following restrictions apply for the usage of [ProcessToMachineMapping](#):

1. Each combination of [Process](#) and [Machine](#) shall only be referenced by one [ProcessToMachineMapping](#) in the role [process](#) or [machine](#).

- Each `Process` shall only be referenced by a single `ProcessToMachineMapping` in the role `process`.

]()

Please note that [constr_1553] does not imply that a given `Machine` shall only be referenced by a single `ProcessToMachineMapping`. It only says that one `Process` shall only be mapped once, to exactly one `Machine`.

[constr_5004]{DRAFT} Mapping of a `Process` to a `Machine` is mandatory in the Execution Manifest [Each `Process` shall be mapped by a `ProcessToMachineMapping` to one `Machine`.]()

[constr_5004] means that a formal description of the assignment of a `Process` to a `Machine` shall be provided in the Execution Manifest, even though the Manifest will be uploaded to the `Machine` in combination with other artifacts to which the Manifest applies. The formal `ProcessToMachineMapping` was introduced because it is useful in the processing of the model in many cases.

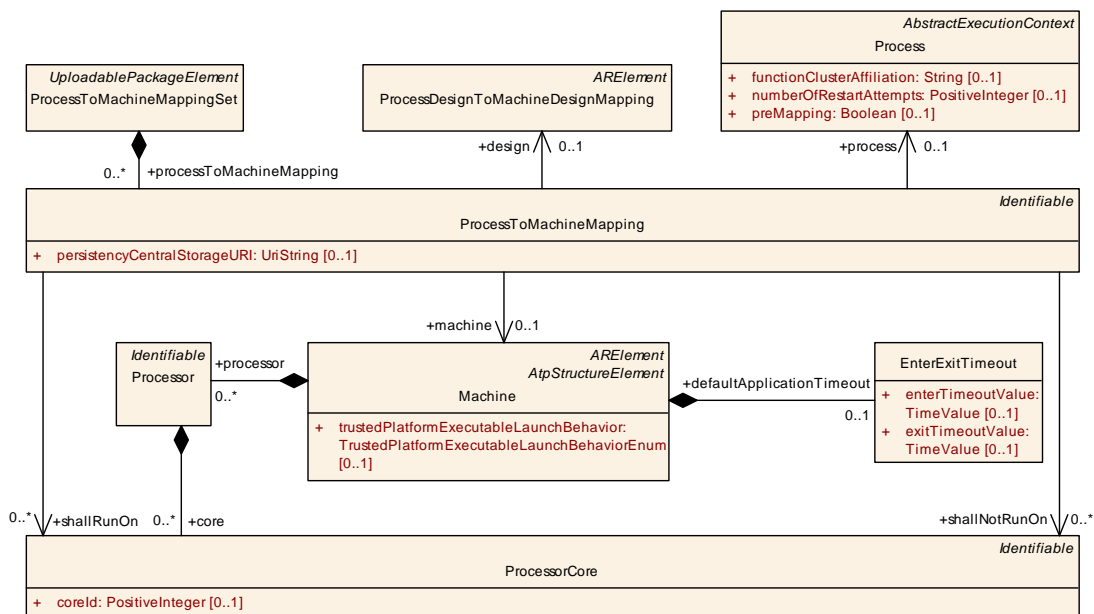


Figure 9.2: Mapping of a `Process` to a `Machine`

Please note that according to the AUTOSAR Methodology the Execution Manifest is created on the basis of an existing Machine Manifest and therefore the link to the `Machine` can always be created in the Execution Manifest.

[constr_10090]{DRAFT} Existence of `ProcessToMachineMapping.persistencyCentralStorageURI` [Attribute `ProcessToMachineMapping.persistencyCentralStorageURI` shall exist if the `Process` referenced in the role `ProcessToMachineMapping.process` is also referenced by at least one of

- `PersistencyPortPrototypeToDeploymentMapping` in the role `process`

- [FunctionalClusterInteractsWithPersistencyDeploymentMapping](#) in the role `process`

at the time when the manifest is complete.]()

Class	ProcessToMachineMappingSet			
Package	M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest			
Note	This meta-class acts as a bucket for collecting ProcessToMachineMappings. Tags: atp.recommendedPackage=ProcessToMachineMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
processToMachineMapping	ProcessToMachineMapping	*	aggr	This represents the collection of ProcessToMachine Mappings of the enclosing ProcessToMachineMapping Set.

Table 9.5: ProcessToMachineMappingSet

Class	ProcessToMachineMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest			
Note	This meta-class has the ability to associate a Process with a Machine. This relation involves the definition of further properties, e.g. timeouts.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	ProcessToMachineMappingSet.processToMachineMapping			
Attribute	Type	Mult.	Kind	Note
design	ProcessDesignToMachineDesignMapping	0..1	ref	This reference represents the identification of the design-time representation for the ProcessToMachine Mapping that owns the reference.
machine	Machine	0..1	ref	This reference identifies the Machine in the context of the ProcessToMachineMapping.
nonOsModuleInstantiation	NonOsModuleInstantiation	0..1	ref	This supports the optional case that the process represents a platform module.
persistencyCentralStorageURI	UriString	0..1	attr	This attribute identifies a central place for the mapped Process to store the list of available storages and version information.
process	Process	0..1	ref	This reference identifies the Process in the context of the ProcessToMachineMapping.
shallNotRunOn	ProcessorCore	*	ref	This reference indicates a collection of cores onto which the mapped process shall not be executing.
shallRunOn	ProcessorCore	*	ref	This reference indicates a collection of cores onto which the mapped process shall be executing.

Table 9.6: ProcessToMachineMapping

[constr_10174]{DRAFT} Multiplicity of the reference in the role [ProcessToMachineMapping.process](#) [For each [ProcessToMachineMapping](#), the reference in the role `process` shall exist **at the time when the creation of the manifest is finished.**]()

9.4.2 Core Affinity

[TPS_MANI_03148]{DRAFT} Description of Core affinity [The meta-class `ProcessToMachineMapping` provides the ability to restrict the assignment of processes to selected `ProcessorCores` with the two references `shallRunOn` and `shallNotRunOn`.] (*RS_MANI_00020*)

[constr_3393]{DRAFT} Usage of `shallRunOn` and `shallNotRunOn` references [The `ProcessorCore` that is referenced by a `ProcessToMachineMapping` in the role `shallRunOn` or `shallNotRunOn` shall be aggregated by the `Machine` that is referenced in the role `machine` by the same `ProcessToMachineMapping`.] ()

[constr_1676]{DRAFT} Consistency of references `shallRunOn` and `shallNotRunOn` [Within the context of one `ProcessToMachineMapping`, all `ProcessorCores` referenced in the role `shallRunOn` or `shallNotRunOn` shall be aggregated by the same `Processor`.] ()

If a model defines that a given `Process` shall run on a select set of `ProcessorCores` then there is hardly a use case to (in addition) also specify the opposite, i.e. that the `Process` shall not run on another set of `ProcessorCores`, and vice versa.

In other words, either there is a motivation to identify the `ProcessorCores` on which a `Process` is supposed to run or there is a motivation to do the exact opposite and specify the `ProcessorCores` where the `Process` is not supposed to run.

This conclusion provides the motivation for the existence of `[constr_1677]`.

[constr_1677]{DRAFT} Mutual exclusive existence of references `shallRunOn` and `shallNotRunOn` [For any given `ProcessToMachineMapping`, either the reference in the role `shallRunOn` or the reference in the role `shallNotRunOn` may exist.] ()

9.4.3 Default Start-up and Termination Timeout

[TPS_MANI_03151]{DRAFT} Default value for termination timeout [The meta-class `Machine` provides the ability to define a default value for termination timeout of applications in the context of the `Machine` with the attribute `exitTimeoutValue` that is available in the `EnterExitTimeout` meta-class that is aggregated by the `Machine` in the role `defaultApplicationTimeout`.] (*RS_MANI_00007*)

[constr_3394]{DRAFT} Default value for start-up timeout on the `Machine` is not configurable [The attribute `enterTimeoutValue` that is available in the `EnterExitTimeout` is not allowed to be used if the `EnterExitTimeout` is aggregated by the `Machine` in the role `defaultApplicationTimeout`.] ()

Class	EnterExitTimeout			
Package	M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest			
Note	This meta-class represents the ability to specify a pair of timeouts, one for entering, and one for exiting.			
Base	<i>ARObject</i>			
Aggregated by	Machine.defaultApplicationTimeout , StartupConfig.timeout			
Attribute	Type	Mult.	Kind	Note
enterTimeout Value	TimeValue	0..1	attr	This attribute represents the value of the enter timeout in seconds.
exitTimeout Value	TimeValue	0..1	attr	This attribute represents the value of the exit timeout in seconds.

Table 9.7: EnterExitTimeout

10 Platform Module Development

The model of platform modules and their instantiation has two major use-cases:

- provide dedicated attributes to configure the platform modules
- define the potential start of the module's executable as process.

The two use-cases are combined in one modeling approach: the `Machine.moduleInstantiation`, which collects sub-classes of `AdaptiveModuleInstantiation`. This modeling approach boils down to the variety of platform module models found in this chapter.

The `OsModuleInstantiation` defines several attributes to be configured for the `Os`, however the `OsModuleInstantiation` is the only `AdaptiveModuleInstantiation` where it is not possible to map it to a `Process` model element.

Of course there will be `processes` running the `Os` on the `Machine` anyway, however, these `processes` are not modeled.

Then there is the scenario where dedicated sub-classes of `NonOsModuleInstantiation` exist. Here the specific attributes are provided individually per sub-class, e.g. `NmInstantiation` or `LogAndTraceInstantiation`.

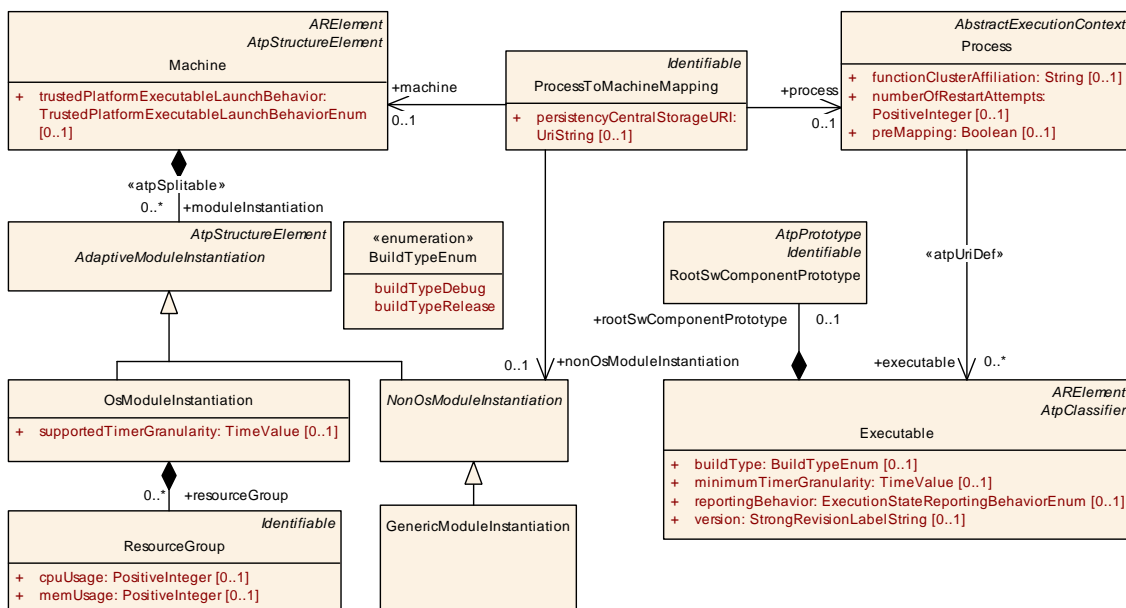


Figure 10.1: Adaptive Autosar Module Configuration

Those `NonOsModuleInstantiations` are independent from the startup behavior implementation. If a stack implementation decides to implement a specific functional cluster in a dedicated `Process`, then the specific `NonOsModuleInstantiation` will also be part of a `ProcessToMachineMapping`.

But, if the stack implementation decides to implement a specific functional cluster as a library (or make the functionality part of another functional cluster), then the specific

[NonOsModuleInstantiation](#) just defines the configuration values for that functionality and does not explicitly take part in a [ProcessToMachineMapping](#).

Another scenario is a rather distributed nature of a functional cluster, where there is no need to provide centralized configuration means. This is applicable for example to [PersistencyDeployment](#) or [PlatformHealthManagementContribution](#).

The functional behavior of the functional cluster is determined by the sum of several contributions. There is no single configuration entity provided.

Nevertheless, if a stack implementation decides to implement such a distributed functional cluster as a single [Executable](#), the [GenericModuleInstantiation](#) can be used to define the startup behavior for a specific machine.

The configuration settings for individual Adaptive Autosar modules are covered by specializations of the abstract class [AdaptiveModuleInstantiation](#).

Class	<i>AdaptiveModuleInstantiation</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModuleImplementation			
Note	This meta-class defines the abstract attributes for the configuration of an adaptive autosar module instance on a specific machine.			
Base	<i>ARObject</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	NonOsModuleInstantiation , OsModuleInstantiation			
Aggregated by	<i>AtpClassifier.atpFeature</i> , Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.1: AdaptiveModuleInstantiation

Each Adaptive Autosar module other than OS can be assigned to a [Process](#) with the [ProcessToMachineMapping](#).

[constr_1490]{DRAFT} Allowed value for [Executable.category](#) if [ProcessToMachineMapping](#) references a [NonOsModuleInstantiation](#) [If a [ProcessToMachineMapping](#) references a [NonOsModuleInstantiation](#), then the [Process](#) referenced in the role [ProcessToMachineMapping.process](#) shall only refer (in the role [Process.executable](#)) to an [Executable](#) where attribute [Executable.category](#) is set to `PLATFORM_LEVEL` (see [\[constr_1605\]](#)).]()

Please note that the model relation described in [\[constr_1490\]](#) is sketched in [Figure 10.1](#).

The meta-class [GenericModuleInstantiation](#) can be used to define configuration settings of generic modules and modules that are not standardized by AUTOSAR. Different modules are distinguishable by the [category](#) attribute.

Please note that both elements are [Identifiable](#) and therefore are able to describe special data ([sdg](#)), by which means it is possible to define generic custom settings that

are not represented by the standard model. For more information, please refer to the AUTOSAR Generic Structure Template [7].

[TPS_MANI_03096]{DRAFT} **Machine-specific configuration settings for a generic module** [The *Machine*-specific configuration settings for a generic module are collected in *GenericModuleInstantiation* where the value of attribute *category* value denotes the module.] (*RS_MANI_00023*)

Class	GenericModuleInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModuleImplementation			
Note	This meta-class defines the attributes for the generic module configuration on a specific machine. Different modules are distinguishable by the category attribute. This element can also be used to describe modules that are not standardized by AUTOSAR.			
Base	<i>ARObject</i> , <i>AdaptiveModuleInstantiation</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>NonOsModuleInstantiation</i> , <i>Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i> , <i>Machine.moduleInstantiation</i>			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.2: GenericModuleInstantiation

10.1 OS Module configuration

[TPS_MANI_03098]{DRAFT} **Machine-specific configuration settings for the OS module** [The *Machine*-specific configuration settings for the OS module are collected in *OsModuleInstantiation*.] (*RS_MANI_00023*)

Class	OsModuleInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModuleImplementation			
Note	This meta-class defines the attributes for the OS configuration on a specific machine.			
Base	<i>ARObject</i> , <i>AdaptiveModuleInstantiation</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i> , <i>Machine.moduleInstantiation</i>			
Attribute	Type	Mult.	Kind	Note
resourceGroup	<i>ResourceGroup</i>	*	aggr	This represents the collection of ResourceGroups owned by the enclosing OsModuleImplementation.
supportedTimerGranularity	TimeValue	0..1	attr	This attribute describes the supported timer granularity (TimeValue of one tick).

Table 10.3: OsModuleInstantiation

Class	NonOsModuleInstantiation (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation			
Note	This meta-class defines the abstract attributes for the configuration of an adaptive autosar module other than the OS module.			
Base	ARObject, AdaptiveModuleInstantiation , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	AdaptiveFirewallModuleInstantiation , CryptoModuleInstantiation , DeterministicSyncInstantiation , DolpInstantiation , GenericModuleInstantiation , IamModuleInstantiation , IdsPlatformInstantiation , LogAndTraceInstantiation , NmInstantiation , SovdModuleInstantiation , StateManagementModuleInstantiation , TimeSyncModuleInstantiation , UcmModuleInstantiation			
Aggregated by	AtpClassifier.atpFeature , Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 10.4: NonOsModuleInstantiation

AUTOSAR supports the configuration of [ResourceGroups](#) in the [OsModuleInstantiation](#) of the [Machine](#) that correspond for example to cgroups (aka control groups) in Linux. [ResourceGroups](#) provide a mechanism to manage system resources by partitioning constraints like [cpuUsage](#) and [memUsage](#) into groups that limit the resource usage for a collection of processes (see also [TPS_MANI_01017]).

[constr_1661]{DRAFT} Multiplicity of [OsModuleInstantiation.resourceGroup](#)
 [Any given [OsModuleInstantiation](#) shall always define at least one [resourceGroup](#).]()

The rationale for [constr_1661] is that the [StateDependentStartupConfig](#) requires a reference to a [ResourceGroup](#).

More information about the semantics of meta-class [ResourceGroup](#) can be found in [SWS_OSI_02001].

Class	ResourceGroup			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation			
Note	This meta-class represents a resource group that limits the resource usage of a collection of processes.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	OsModuleInstantiation.resourceGroup			
Attribute	Type	Mult.	Kind	Note
cpuUsage	PositiveInteger	0..1	attr	CPU resource limit in percentage of the total CPU capacity on the machine.
memUsage	PositiveInteger	0..1	attr	Memory limit in bytes.

Table 10.5: ResourceGroup

10.2 Persistency Deployment

10.2.1 Overview

This chapter explains the part of the support for persistent storage in terms of mapping of concrete storage models to the corresponding parts of the application software.

[TPS_MANI_01205]{DRAFT} Semantics of meta-class [PersistencyDeployment](#)
 [Abstract meta-class [PersistencyDeployment](#) provides shared attributes to more specific specializations.] ([RS_MANI_00027](#))

[TPS_MANI_01380]{DRAFT} Usage of [PersistencyDeployment](#) [Meta-class [PersistencyDeployment](#) can be used in different scenarios:

- Persistency is used in combination with the application software by means of [PersistencyPortPrototypeToDeploymentMapping](#).
- Persistency is used in combination with another functional cluster by means of [FunctionalClusterInteractsWithPersistencyDeploymentMapping](#).

] ([RS_MANI_00027](#))

Class	PersistencyDeployment (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This abstract meta-class serves as a base class for concrete classes representing different aspects of persistency.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadableExclusivePackageElement , UploadablePackageElement			
Subclasses	PersistencyFileStorage , PersistencyKeyValueStorage			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
deploymentUri (ordered)	PersistencyDeploymentUri	*	aggr	This aggregation represents the collection of URIs relevant for the enclosing PersistencyDeployment .
maximum AllowedSize	PositiveUnlimitedInteger	0..1	attr	The value of this attribute represents the maximum size (unit: bytes) allowed at deployment time for the enclosing PersistencyDeployment .
minimum SustainedSize	PositiveInteger	0..1	attr	The value of this attribute represents the minimum size (unit: bytes) guaranteed at deployment time for the enclosing PersistencyDeployment .
redundancy Handling	PersistencyRedundancyHandling	*	aggr	This aggregation represents the chosen approaches to handle redundancy.
updateStrategy	PersistencyCollectionLevelUpdateStrategyEnum	0..1	attr	This attribute shall be used to specify the update strategy of the respective PersistencyDeployment as a whole.
version	StrongRevisionLabelString	0..1	attr	The attribute represents the version of the PersistencyFileStorage or PersistencyKeyValueStorage .

Table 10.6: PersistencyDeployment

Class	PersistencyDeploymentUri			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class represents the ability to contain URIs relevant for the persistency deployment.			
Base	ARObject			
Aggregated by	PersistencyDeployment.deploymentUri			
Attribute	Type	Mult.	Kind	Note
uri	UriString	0..1	attr	This attribute holds the storage location for the concrete subclass of PersistencyDeployment, e.g. file on the file system.

Table 10.7: PersistencyDeploymentUri

[constr_10177]{DRAFT} Multiplicity of attribute [PersistencyDeployment.updateStrategy](#) [For each [PersistencyDeployment](#), the attribute [updateStrategy](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10365]{DRAFT} Existence of [PersistencyDeployment.deploymentUri](#) [For each concrete sub-class of [PersistencyDeployment](#), attribute [deploymentUri](#) shall exist **at the time when the creation of the manifest is finished.**]()

The possibility that attribute [deploymentUri](#) has a multiplicity greater than 1 is only foreseen to be utilized if redundancy handling on the basis of m-out-of-n is activated, i.e. the aggregation of [PersistencyRedundancyMOutOfN](#) is aggregated in the role [PersistencyDeployment.redundancyHandling](#).

In this case, the actual multiplicity of [PersistencyDeployment.deploymentUri](#) in an AUTOSAR model shall be one of

- 1: in this case all copies are stored in one location.
- 2: in this case, the "main" copy is stored in the location [deploymentUri\[0\]](#) and all other copies are stored at the location [deploymentUri\[1\]](#)
- the value of [PersistencyRedundancyMOutOfN.n](#): each copy is stored in the location [deploymentUri\[i\]](#), where $0 \leq i < n$

Please find more details about the storage strategy in the SWS Persistency [12].

[constr_10366]{DRAFT} Possible multiplicities of [PersistencyDeployment.deploymentUri](#) [Possible multiplicities of [PersistencyDeployment.deploymentUri](#) shall be one of

- 1
- 2
- value of attribute [PersistencyRedundancyMOutOfN.n](#)

This rule shall be imposed **at the time when the creation of the manifest is finished.**]()

[constr_10367]{DRAFT} Condition for the multiplicity of attribute `PersistencyDeployment.deploymentUri` [The multiplicity of attribute `PersistencyDeployment.deploymentUri` shall only be greater than 1 if meta-class `PersistencyRedundancyMOutOfN` is aggregated in the role `PersistencyDeployment.redundancyHandling` and attribute `PersistencyDeployment.redundancyHandling.scope` is set to the value `PersistencyRedundancyHandlingScopeEnum.persistencyRedundancyHandlingScopeStorage`.

This rule shall be imposed **at the time when the creation of the manifest is finished.**]()

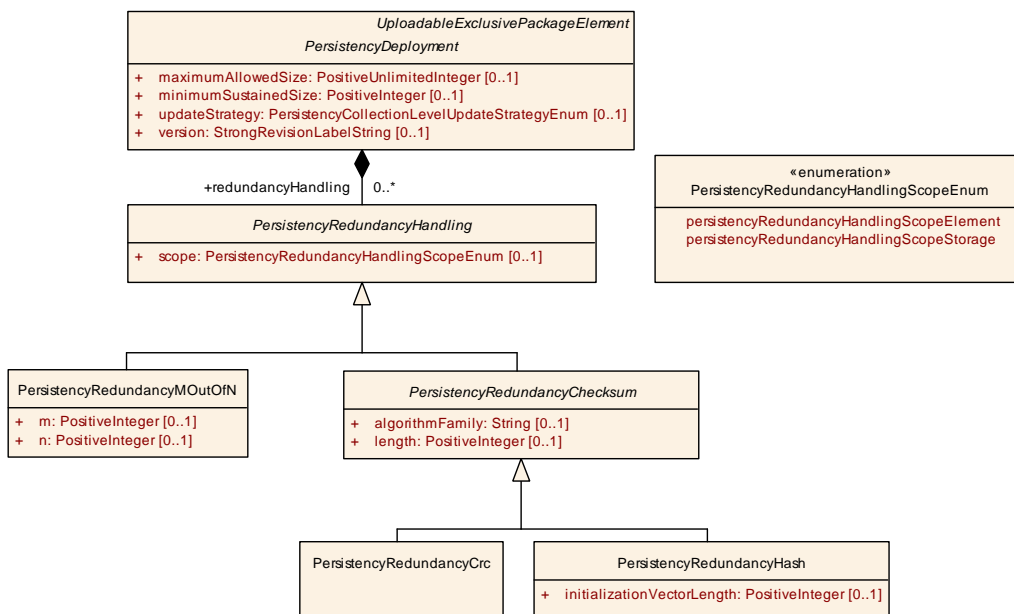


Figure 10.2: Modeling of the abstract base class `PersistencyDeployment`

[constr_10035]{DRAFT} Completeness of the `PersistencyDeployment.version` [The `PersistencyDeployment.version` shall contain all the following parts:

- Major version
- Minor version
- Patch version
- Additional labels for pre-release version and build metadata

at the time when the manifest is complete.]()

The `version` is used to determine whether an update or rollback of persistent data is required. When an application opens the `PersistencyFileStorage` or `PersistencyKeyValueStorage`, the Persistency module will check the `PersistencyDeployment.version` in the manifest against the stored version information.

If the stored version is lower than the manifest version, the Persistency module will update persistent data after creating a backup of the data (see [SWS_PER_00386] for more details).

If the stored version is higher than the manifest version, a rollback of the persistent data from the backup is required (see [SWS_PER_00396] for more details).

[TPS_MANI_01321]{DRAFT} **Semantics of meta-class `PersistencyDeploymentElement`** [Meta-class `PersistencyDeploymentElement` represents an abstract base class for the modeling of different aspects of persistency on element level.] (*RS_MANI_00027*)

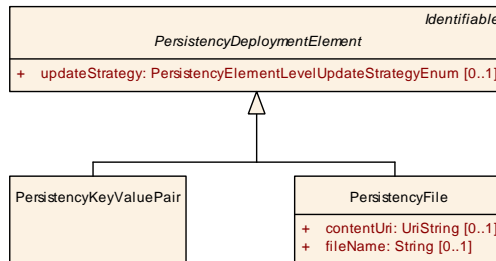


Figure 10.3: Modeling of the abstract base class `PersistencyDeploymentElement`

Class	<i>PersistencyDeploymentElement</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This abstract meta-class serves as a base class for concrete classes representing different aspects of elements of a PersistencyDeployment.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	PersistencyFile, PersistencyKeyValuePair			
Attribute	Type	Mult.	Kind	Note
updateStrategy	PersistencyElementLevelUpdateStrategyEnum	0..1	attr	This attribute can be used to specify the update strategy of the respective PersistencyDeploymentElement.

Table 10.8: PersistencyDeploymentElement

[TPS_MANI_01322]{DRAFT} **Semantics of meta-class `PersistencyPortPrototypeToDeploymentMapping`** [Meta-class `PersistencyPortPrototypeToDeploymentMapping` represents an abstract base class for the modeling of the mapping of concrete persistency cases (key-value storage, file storage) to a `PortPrototype` and a `Process`.] (*RS_MANI_00027*)

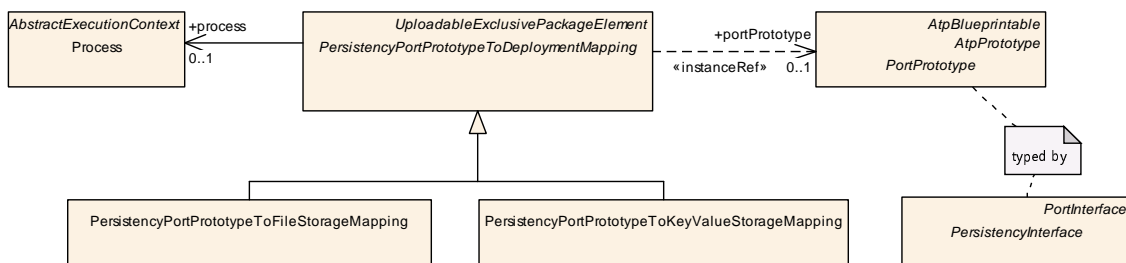


Figure 10.4: Modeling of the abstract base class `PersistencyPortPrototypeToDeploymentMapping`

Class	PersistencyPortPrototypeToDeploymentMapping (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This abstract bas class implements the shared functionality of all mapping between a PortPrototype, a Process, and a specific subclass of PersistencyDeployment.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadableExclusivePackageElement , UploadablePackageElement			
Subclasses	PersistencyPortPrototypeToFileStorageMapping , PersistencyPortPrototypeToKeyValueStorageMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
portPrototype	PortPrototype	0..1	iref	This reference represents the mapped PortPrototype. InstanceRef implemented by: PortPrototypeInExecutableInstanceRef
process	Process	0..1	ref	This reference represents the process required as context for the mapping.

Table 10.9: PersistencyPortPrototypeToDeploymentMapping

[constr_10178]{DRAFT} Multiplicity of the reference in the role [PersistencyPortPrototypeToDeploymentMapping.process](#) [For each [PersistencyPortPrototypeToDeploymentMapping](#), the reference in the role [process](#) shall exist **at the time when the creation of the manifest is finished.**](/)

10.2.1.1 Redundancy Handling

[TPS_MANI_01206]{DRAFT} Modeling of redundancy in the context of [PersistencyDeployment](#) [The deployment level provides the ability to provide a more detailed definition of redundant behavior for both key-value storage and file storage.

This modeling is attached to the abstract base class [PersistencyDeployment](#) in order to let both aspects of persistency on the *AUTOSAR adaptive platform* benefit from the existence of meta-class [PersistencyRedundancyHandling](#).]([RS_MANI_00027](#))

[constr_1710]{DRAFT} Consistency of values of attributes [PersistencyInterface.redundancy](#) and [PersistencyRedundancyHandling.scope](#) [If attribute [PersistencyInterface.redundancy](#) is set to value [PersistencyRedundancyEnum.redundantPerElement](#) then attribute [PersistencyRedundancyHandling.scope](#) shall be set to [PersistencyRedundancyHandlingScopeEnum.persistencyRedundancyHandlingScopeElement](#) for at least one [PersistencyRedundancyHandling](#) aggregated by the corresponding [PersistencyDeployment](#).](/)

[TPS_MANI_01371]{DRAFT} [PersistencyDeployment.redundancyHandling](#) does not exist [If no aggregation in the role [redundancyHandling](#) exists for a specific [PersistencyDeployment](#), then the configuration of the redundancy handling shall be taken from the value of [PersistencyInterface.redundancyHandling](#), if this aggregation exists.]([RS_MANI_00027](#))

10.2.1.2 Update Handling

[TPS_MANI_01155]{DRAFT} **PersistencyDeployment.updateStrategy** overrides **PersistencyInterface.updateStrategy** [The value of attribute `PersistencyDeployment.updateStrategy` shall overrule the value of `PersistencyInterface.updateStrategy` for any combination of `PersistencyInterface` mapped to a `PersistencyDeployment` by means of a `PersistencyPortPrototypeToDeploymentMapping`.] (*RS_MANI_00027*)

[TPS_MANI_01147]{DRAFT} **Semantics of `PersistencyDeployment.updateStrategy`** [The attribute `PersistencyDeployment.updateStrategy` shall be used to specify the strategy for updating the actual persistent elements.

This update strategy shall be applied to the `PersistencyDeployment` as a whole except for the explicitly modeled `PersistencyDeploymentElements` that define their own `updateStrategy`.] (*RS_MANI_00027*)

[TPS_MANI_01157]{DRAFT} **Semantics of `updateStrategy` on collection level** [The semantics of attribute `updateStrategy` on collection level is specified in Table 10.10.] (*RS_MANI_00027*)

<code>updateStrategy</code>	Use Case: Installation	Use Case: Update
<code>delete</code>	irrelevant	delete all elements not contained in current manifest
<code>keepExisting</code>	irrelevant	keep all elements not contained in current manifest

Table 10.10: Semantics of `updateStrategy` on collection level

[TPS_MANI_01313]{DRAFT} **Definition of `updateStrategy` on element level** [The definition of the update strategy on element level is modeled by means of the abstract base class `PersistencyDeploymentElement` (and its attribute `updateStrategy`) from which the concrete sub-classes for persistency elements are derived.] (*RS_MANI_00027*)

[TPS_MANI_01159]{DRAFT} **Semantics of `updateStrategy` on element level** [The semantics of attribute `updateStrategy` on element level is specified in Table 10.11.] (*RS_MANI_00027*)

<code>updateStrategy</code>	Use Case: Installation	Use Case: Update
<code>delete</code>	don't create	remove
<code>keepExisting</code>	create	do nothing
<code>overwrite</code>	create	replace

Table 10.11: Semantics of `updateStrategy` on element level

[TPS_MANI_01148]{DRAFT} **Semantics of `PersistencyDeploymentElement.updateStrategy`** [The attribute `PersistencyDeploymentElement.updateStrategy` can be used to specify the strategy for updating the actual persistent element that corresponds to `PersistencyDeploymentElement`.] (*RS_MANI_00027*)

[TPS_MANI_01156]{DRAFT} **PersistencyDeploymentElement.updateStrategy overrides PersistencyDeployment.updateStrategy** [The value specified for `PersistencyDeploymentElement.updateStrategy` overrides the value of `PersistencyDeployment.updateStrategy` for this specific `PersistencyDeploymentElement`.] (*RS_MANI_00027*)

[TPS_MANI_01182]{DRAFT} **Value of PersistencyDeploymentElement.updateStrategy overrides PersistencyInterfaceElement.updateStrategy** [The value of attribute `PersistencyDeploymentElement.updateStrategy` overrides the value of attribute `PersistencyInterfaceElement.updateStrategy`] (*RS_MANI_00027*)

This means that the integrator of the software gets the authority to either agree to the designer's point of view or else overrule the designer's decision based on superior knowledge regarding the integration strategy.

10.2.1.3 Size Handling

[TPS_MANI_01196]{DRAFT} **Semantics of PersistencyDeployment.minimumSustainedSize** [Attribute `PersistencyDeployment.minimumSustainedSize` can be used for the definition of a **minimum amount of storage** that the `PersistencyDeployment` will need to allocate from an integrator's point of view.

It is the responsibility of the underlying platform to make sure that this minimum amount of storage is available at any time.] (*RS_MANI_00027*)

[TPS_MANI_01197]{DRAFT} **Semantics of PersistencyDeployment.maximumAllowedSize** [Attribute `PersistencyDeployment.maximumAllowedSize` can be used for the definition of the **maximum amount of storage** that the `PersistencyDeployment` may allocate at runtime from an integrator's point of view.

The existence of `PersistencyDeployment.maximumAllowedSize` does not constitute a binding requirement to the platform that this amount of storage shall be available at any time.] (*RS_MANI_00027*)

For explanation, the amount of storage available shall be at least the sum of the values of `minimumSustainedSize`.

That said, it is consequently plausible that storage might be exceeded if more than the minimum amount of storage (let alone the maximum amount) is allocated by all the key-value storage at the same time.

10.2.1.4 Security Handling

The encryption and/or authentication of data stored in a Key-Value Storage or File Storage is described in the manifest by `PersistencyDeploymentToCryptoKeySlotMapping` or `PersistencyDeploymentElementToCryptoKeySlotMapping` that are described in more detail in chapter 14.4 and chapter 14.5.

If the `PersistencyDeploymentToCryptoKeySlotMapping.keySlotUsage` or `PersistencyDeploymentElementToCryptoKeySlotMapping.keySlotUsage` is set to `encryption`, the Persistency cluster shall encrypt the data before storing it to the persistent memory or shall decrypt the data after reading it from persistent memory.

If the `PersistencyDeploymentToCryptoKeySlotMapping.keySlotUsage` or `PersistencyDeploymentElementToCryptoKeySlotMapping.keySlotUsage` is set to `verification`, the Persistency cluster shall sign the data before storing it to the persistent memory or verify the signature of the data after reading it from persistent memory.

Please note that the `PersistencyDeploymentToCryptoKeySlotMapping` is able to define a `verificationHash` that shall be used by the `PersistencyCluster` to verify the data. The same is true for the `PersistencyDeploymentElementToCryptoKeySlotMapping.verificationHash`.

10.2.1.5 Preference Rules

In the context of the modeling of persistency design (see section 3.8) and deployment (section 10.2), information can be available on the *design* and *deployment* level, and on *storage* and *element* level. In general, the following rules apply regarding the preference of this information:

- if a configuration item exists in the context of the *design element level*, then the value of this configuration item shall be preferred over the value of a corresponding configuration item available on the *design storage level*.
- if a configuration item exists in the context of the *deployment element level*, then the value of this configuration item shall be preferred over the value of a corresponding configuration item available on the *deployment storage level*.
- if a configuration item exists in the context of the *deployment storage level*, then the value of this configuration item shall be preferred over the value of a corresponding configuration item available on the *design storage level*.
- if a configuration item exists in the context of the *deployment element level*, then the value of this configuration item shall be preferred over the value of a corresponding configuration item available on the *design element level*.

In other words, there is a growing priority of the value of a configuration item starting from *design storage level*, to *design element level*, to *deployment storage level*, and finally to *deployment element level*.

On the other hand, models may exist that leave out certain information on the deployment level in favor of implicitly taking over the corresponding information from design level. This approach is not encouraged because (where possible) model semantics should preferably be defined explicitly rather than implied by rules.

Nevertheless, the following rules apply:

- if a configuration item exists on the *deployment storage level* but is missing on the *deployment element level*, then the *deployment element level* shall implicitly take over the value from the *deployment storage level*.
- if a configuration item exists on the *design storage level* but is missing on the *deployment storage level*, then the *deployment storage level* shall implicitly take over the value from the *design storage level*.
- if a configuration item exists on the *design element level* but is missing on the *deployment element level*, then the *deployment element level* shall implicitly take over the value from the *design element level*.
- if a configuration item exists on the *design storage level* but is missing on the *design element level*, then the *design element level* implicitly takes over the value from the *design storage level*.

10.2.2 Deployment of Persistent Key-Value Storage

[TPS_MANI_01079]{DRAFT} **Semantics of meta-class [PersistencyKeyValueStorage](#)** [Meta-class [PersistencyKeyValueStorage](#) represents an actual key-value storage used for persistently storing data.] ([RS_MANI_00027](#))

Class	PersistencyKeyValueStorage			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class represents the ability to model a key-value storage on deployment level. Tags: atp.recommendedPackage=PersistencyKeyValueStorages			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PersistencyDeployment , Referrable , UploadableExclusivePackageElement , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
keyValuePair	PersistencyKeyValuePair	*	aggr	This aggregation represents the key-value-pairs owned by the enclosing PersistencyKeyValueStorage .

Table 10.12: PersistencyKeyValueStorage

[TPS_MANI_01144]{DRAFT} **Semantics of [PersistencyKeyValuePair](#)** [Meta-class [PersistencyKeyValuePair](#) represents an **entry** to a key-value storage (formalized by [PersistencyKeyValueStorage](#)) used for persistently storing data.] ([RS_MANI_00027](#))

[constr_10102]{DRAFT} **Existence of initial values for [PersistencyKeyValuePair](#)** [For each [PersistencyKeyValuePair](#), if the value of attribute [updateStrategy](#) is set to either of the values

- [keepExisting](#) or
- [overwrite](#),

then attribute [PersistencyKeyValuePair.initValue](#) shall exist.]()

Class	PersistencyKeyValuePair			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class represents the ability to formally model a key-value pair in the context of the deployment of persistency.			
Base	ARObject , Identifiable , MultilanguageReferrable , PersistencyDeploymentElement , Referrable			
Aggregated by	PersistencyKeyValueStorage.keyValuePair			
Attribute	Type	Mult.	Kind	Note
initValue	ValueSpecification	0..1	aggr	This aggregation represents the ability to define an initial value for the value side of the key-value pair. Please note that it does not make sense to configure an initial value if the PersistencyDeploymentElement.updateStrategy is set to the value delete .
valueDataType	AbstractImplementationDataType	0..1	ref	This reference represents the data type applicable for the value of the key-value pair.

Table 10.13: [PersistencyKeyValuePair](#)

[constr_10179]{DRAFT} **Multiplicity of attribute [PersistencyKeyValuePair.valueDataType](#)** [For each [PersistencyKeyValuePair](#), the attribute [valueDataType](#) shall exist **at the time when the creation of the manifest is finished**.]()

[constr_10083]{DRAFT} **Existence of initial values for [PersistencyKeyValuePair](#)** [For each [PersistencyKeyValuePair](#), if the value of attribute [updateStrategy](#) is set to the value [delete](#), then attribute [PersistencyKeyValuePair.initValue](#) shall not exist.]()

The modeling of [PersistencyKeyValuePair](#) aggregated in the role [PersistencyKeyValueStorage.keyValuePair](#) is optional. It would be possible to use persistency functionality regardless of the existence of [keyValuePair](#).

However, the presence of [keyValuePair](#) gives more freedom and ways for the customization of behavior.

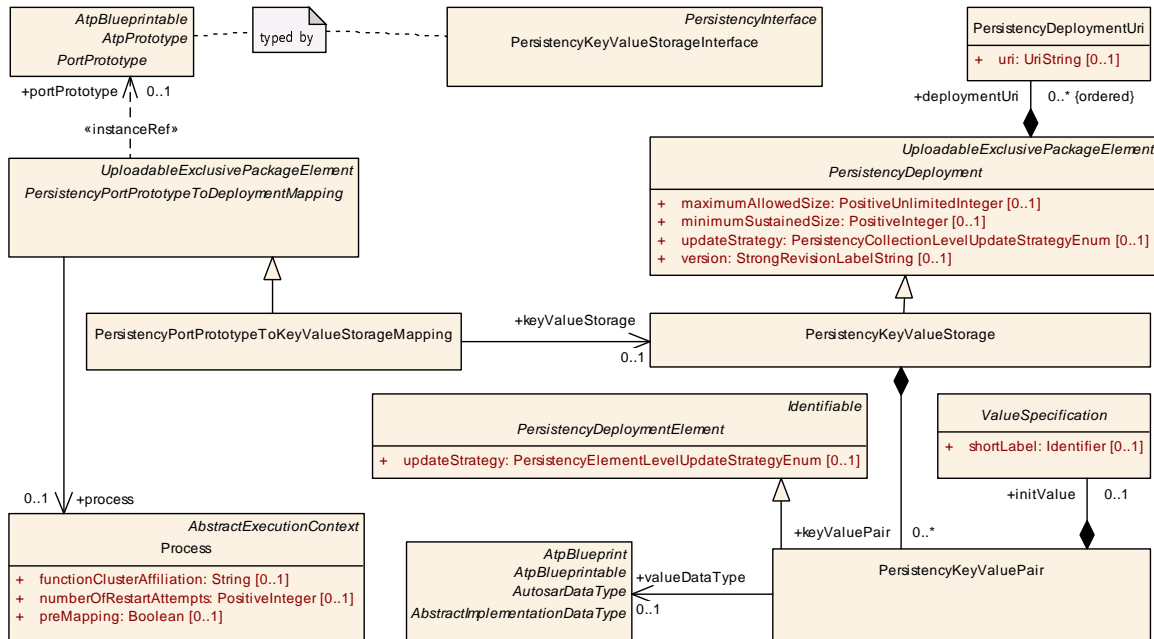


Figure 10.5: Connect a specific **PortPrototype** to a **PersistencyKeyValueTypeStorage**

[TPS_MANI_01078]{DRAFT} Semantics of **PersistencyPortPrototypeToKey-ValueStorageMapping** [Meta-class **PersistencyPortPrototypeToKey-ValueStorageMapping** has the ability to map a specific **PortPrototype** referenced in the role **portPrototype** to a **PersistencyKeyValueTypeStorage** referenced in the role **keyValueStorage**.

The mapping also comprises a reference to meta-class **process** in order to accommodate for the fact that identical combinations of **keyValueStorage** and **portPrototype** may or may not apply for a given **Process** that represents the enclosing **Executable** at runtime.] (*RS_MANI_00027*)

[constr_1555]{DRAFT} Restriction applicable for **PersistencyPortPrototypeToKey-ValueStorageMapping.portPrototype** [The reference **PersistencyPortPrototypeToKey-ValueStorageMapping.portPrototype** shall only be used for a **PortPrototype** typed by a **PersistencyKeyValueTypeStorageInterface**.] ()

Class	PersistencyPortPrototypeToKeyValueTypeStorageMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class represents the ability to define a mapping between a PortPrototype and a key-value storage. Tags: atp.recommendedPackage=PersistencyPortPrototypeToKeyValueTypeStorageMappings			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>PersistencyPortPrototypeToDeploymentMapping</i> , <i>Referrable</i> , <i>UploadableExclusivePackageElement</i> , <i>UploadablePackageElement</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
keyValueStorage	PersistencyKeyValueTypeStorage	0..1	ref	This reference represents the mapped key-value storage.

Table 10.14: **PersistencyPortPrototypeToKeyValueTypeStorageMapping**

[constr_10180]{DRAFT} Multiplicity of the reference in the role `PersistencyPortPrototypeToKeyValueStorageMapping.keyValueStorage` [For each `PersistencyPortPrototypeToKeyValueStorageMapping`, the reference in the role `keyValueStorage` shall exist **at the time when the creation of the manifest is finished.**](*)*

Please note that typically the existence of `PersistencyKeyValueStorage.keyValuePair` depends on the existence of `PersistencyKeyValueStorageInterface.dataElement`.

On the other hand, if a `PersistencyKeyValueStorage` contains `PersistencyKeyValuePairs` that do not correspond to any `dataElements` of the `PersistencyKeyValueStorageInterface` that is mapped (indirectly) via `PersistencyPortPrototypeToKeyValueStorageMapping` then those `keyValuePairs` are created within the `PersistencyKeyValueStorage`.

[TPS_MANI_01146]{DRAFT} Initial value for `PersistencyKeyValuePair` [It is possible to define an initial value for a given `PersistencyKeyValuePair` by means of the aggregation of `ValueSpecification` in the role `initValue`.](*RS_MANI_00027*)

[constr_1554]{DRAFT} Restriction regarding attribute `PersistencyKeyValuePair.initValue` [The concrete sub-class of `ValueSpecification` aggregated in the role `PersistencyKeyValuePair.initValue` shall not (after resolving a possible redirection by means of `ConstantReference`) be a `ReferenceValueSpecification`.](*)*

[TPS_MANI_01315]{DRAFT} `PersistencyKeyValuePair.initValue` overrides `PersistencyDataRequiredComSpec.initValue` [The value of attribute `PersistencyKeyValuePair.initValue` shall overrule the value of `PersistencyDataRequiredComSpec.initValue` for any combination of `PersistencyKeyValueStorageInterface` mapped to a `PersistencyKeyValueStorage` by means of a `PersistencyPortPrototypeToKeyValueStorageMapping`.](*RS_MANI_00027*)

This means that the integrator of the software gets the authority to either agree to the designer's point of view or else overrule the designer's decision based on superior knowledge regarding the integration strategy.

[constr_1582]{DRAFT} `PersistencyKeyValuePair.valueDataType` shall match to `AbstractImplementationDataType` for the corresponding `PersistencyDataElement` [Each `PersistencyKeyValuePair.valueDataType` shall match the `AbstractImplementationDataType` that either directly or indirectly (via the applicable `DataTypeMap`) types the corresponding (based on identical values of the respective `shortName`) `PersistencyDataElement`.](*)*

[constr_1666]{DRAFT} References from `PersistencyPortPrototypeToKeyValueStorageMapping` to `PersistencyKeyValueStorage` [Each `PersistencyKeyValueStorage` shall only be referenced by at most one `PersistencyPortPrototypeToKeyValueStorageMapping`.](*)*

[TPS_MANI_01323]{DRAFT} Matching pairs of **PersistencyDataElement** and **PersistencyKeyValuePair** [Matching pairs of **PersistencyDataElement** and **PersistencyKeyValuePair** shall be identified by having the identical value of attribute `shortName` within the scope of a **PersistencyKeyValueStorageInterface** (or a **PortPrototype** typed by the **PersistencyKeyValueStorageInterface**) mapped to a **PersistencyKeyValueStorage** by means of a **PersistencyPortPrototypeToKeyValueStorageMapping**.] (*RS_MANI_00027*)

10.2.3 Deployment of File Storage

[TPS_MANI_01150]{DRAFT} Semantics of **PersistencyFileStorage** [A **PortPrototype** typed by a **PersistencyFileStorageInterface** actually builds an abstraction for an entire directory of files.

This abstraction is also visible in the deployment by means of the existence of the companion meta-class **PersistencyFileStorage**.

This approach allows for the dynamic creation and/or deletion of files during runtime while still keeping the structural model of the file interaction static.] (*RS_MANI_00027*)

At one point, however, it is necessary to boil down the relation of such a **PortPrototype** typed by a **PersistencyFileStorageInterface** to individual files and how these individual files are represented on the file system themselves.

This aspect is covered by the modeling of meta-class **PersistencyPortPrototypeToFileStorageMapping**, as depicted in Figure 10.6.

Class	PersistencyFileStorage			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class comes with the ability to define a collection of single files (directory) that creates the deployment-side counterpart to a PortPrototype typed by a PersistencyFileStorageInterface . Tags: atp.recommendedPackage=PersistencyFileStorages			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PersistencyDeployment , Referrable , UploadableExclusivePackageElement , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
file	PersistencyFile	*	aggr	This aggregation represents the collection of files aggregated by the PersistencyFileStorage .

Table 10.15: PersistencyFileStorage

[TPS_MANI_01080]{DRAFT} Semantics of meta-class **PersistencyPortPrototypeToFileStorageMapping** [Meta-class **PersistencyPortPrototypeToFileStorageMapping** creates a mapping between a **PortPrototype** referenced in the role `portPrototype` to a **PersistencyFileStorage** referenced in the role `fileStorage` under consideration of a **Process** referenced in the role `process`.] (*RS_MANI_00027*)

Class	PersistencyPortPrototypeToFileStorageMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class represents the ability to define a mapping between a collection of files on deployment level to a given PortPrototype. Tags: atp.recommendedPackage=PersistencyPortPrototypeToFileStorageMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PersistencyPortPrototypeToDeploymentMapping , Referrable , UploadableExclusivePackageElement , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
fileStorage	PersistencyFileStorage	0..1	ref	This reference represents the mapped file storage.

Table 10.16: PersistencyPortPrototypeToFileStorageMapping

[constr_10182]{DRAFT} Multiplicity of the reference in the role [PersistencyPortPrototypeToFileStorageMapping.fileStorage](#) [For each [PersistencyPortPrototypeToFileStorageMapping](#), the reference in the role [fileStorage](#) shall exist **at the time when the creation of the manifest is finished.**]*()*

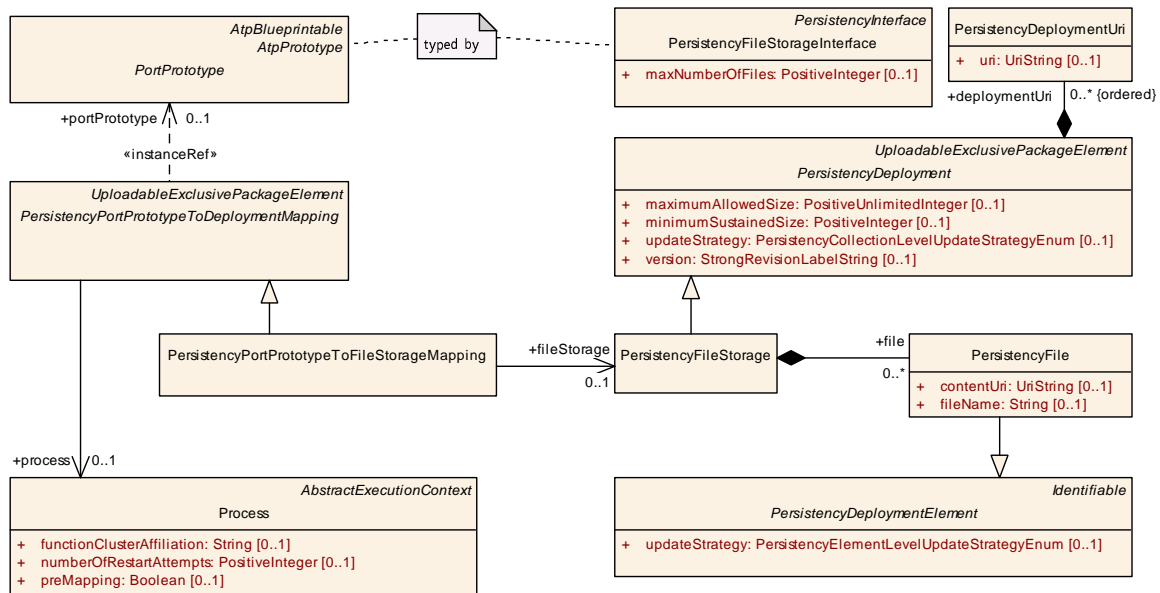


Figure 10.6: Connect a specific [PortPrototype](#) to a [PersistencyFile](#)

[TPS_MANI_01149]{DRAFT} Semantics of [PersistencyFileStorage.file](#) [The usage of [PersistencyFileStorage.file](#) allows for the explicit modeling of elements of the [PersistencyFileStorage](#).

The creation of this aggregation is optional. It can be used to define the update strategy and/or initial content of selected files.] ([RS_MANI_00027](#))

[constr_10103]{DRAFT} Existence of initial values for [PersistencyFile](#) [For each [PersistencyFile](#), if the value of attribute [updateStrategy](#) is set to either of the values

- [keepExisting](#) or

- `overwrite`,

then attribute `PersistencyFile.contentUri` shall exist. `()`

[constr_1556]{DRAFT} Restriction applicable for `PersistencyPortPrototypeToFileStorageMapping.portPrototype` [The reference `PersistencyPortPrototypeToFileStorageMapping.portPrototype` shall only be used for a `PortPrototype` typed by a `PersistencyFileStorageInterface`. `()`

Class	PersistencyFile			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class represents the model of a file as part of the persistency on deployment level. Tags: atp.recommendedPackage=PersistencyFiles			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PersistencyDeploymentElement</code> , <code>Referrable</code>			
Aggregated by	<code>PersistencyFileStorage.file</code>			
Attribute	Type	Mult.	Kind	Note
<code>contentUri</code>	<code>UriString</code>	0..1	attr	This attribute represents the URI that identifies the initial content of the <code>PersistencyFile</code> .
<code>fileName</code>	<code>String</code>	0..1	attr	This attribute holds filename part of the storage location for the <code>PersistencyFile</code> , e.g. file on the file system.

Table 10.17: PersistencyFile

[constr_10183]{DRAFT} Multiplicity of attribute `PersistencyFile.fileName` [For each `PersistencyFile`, the attribute `fileName` shall exist **at the time when the creation of the manifest is finished**. `()`

[constr_10082]{DRAFT} Existence of initial values for `PersistencyFile` [For each `PersistencyFile`, if the value of attribute `updateStrategy` is set to the value `delete`, then attribute `PersistencyFile.contentUri` shall not exist. `()`

[TPS_MANI_01179]{DRAFT} Semantics of `PersistencyFileElement.contentUri/PersistencyFile.contentUri` vs. `PersistencyDeployment.deploymentUri` and `PersistencyFileElement.fileName/PersistencyFile.fileName` [Attributes `PersistencyFileElement.contentUri` and (after deployment) `PersistencyFile.contentUri` describe the URI of the file storage that is used to initialize the `PersistencyFile` (used during install or update).

On the other hand, the combination of `PersistencyDeployment.deploymentUri` and the `PersistencyFileElement.fileName` or (after deployment) `PersistencyFile.fileName` denote the position of the `PersistencyFile` in the ECU (used at run-time). `(RS_MANI_00027)`

[constr_1589]{DRAFT} Value of `file.fileName` [Within the scope of any given `PersistencyFileStorage`, the value of all `file.fileName` shall be unique.

A `fileName` is considered unique if there are no other `fileNames` with **exactly** the same sequence of characters¹. `()`

¹The characters “x” and “X” are not considered as identical characters for this purpose.

[TPS_MANI_01187]{DRAFT} **Matching pairs of `PersistencyFileElement` and `PersistencyFile`** [Matching pairs of `PersistencyFileElement` and `PersistencyFile` shall be identified by having the identical value of attribute `shortName` within the scope of a `PersistencyFileStorageInterface` (or a `PortPrototype` typed by the `PersistencyFileStorageInterface`) mapped to a `PersistencyFileStorage` by means of a `PersistencyPortPrototypeToFileStorageMapping`.] (*RS_MANI_00027*)

[constr_1613]{DRAFT} **File name of matching pairs of `PersistencyFileElement` and `PersistencyFile`** [The value of attributes `PersistencyFileElement.fileName` and `PersistencyFile.fileName` shall be identical for matching pairs (as identified by the application of [TPS_MANI_01187]) of `PersistencyFileStorage` and `PersistencyFile`.] ()

[constr_1667]{DRAFT} **References from `PersistencyPortPrototypeToFileStorageMapping` to `PersistencyFileStorage`** [Each `PersistencyFileStorage` shall only be referenced by at most one `PersistencyPortPrototypeToFileStorageMapping`.] ()

10.3 Platform Health Management Deployment

10.3.1 Overview

This chapter explains the interaction of application software with the Platform Health Management [11].

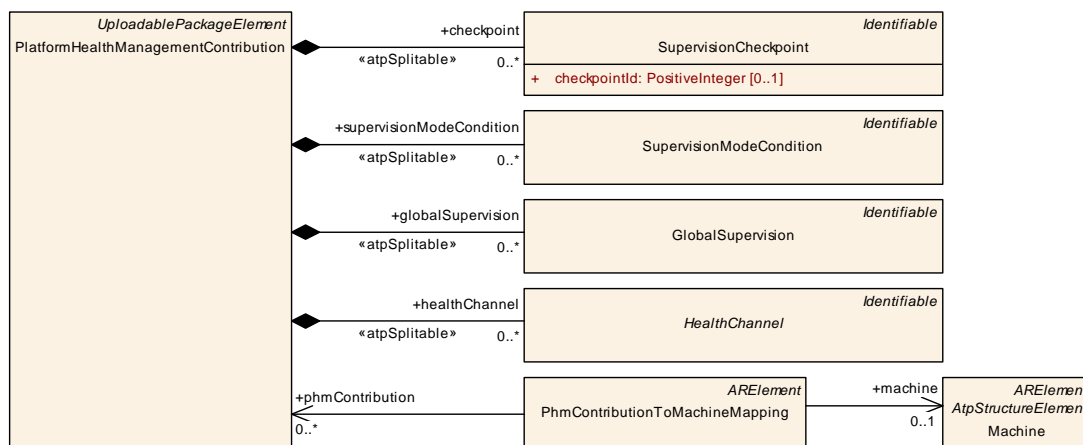


Figure 10.7: Modeling of `PlatformHealthManagementContribution`

The `PlatformHealthManagementContribution` allows describing aspects for the deployment of configuration how the Platform Health Management shall behave during runtime.

[TPS_MANI_03544]{DRAFT} **Definition of `PlatformHealthManagementContribution`** [The meta-class `PlatformHealthManagementContribution` allows to

define a set of configuration entities for the Platform Health Management.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

The `PlatformHealthManagementContribution` is structured into several aspects which will be described in the following sections:

- Supervision (section [10.3.3](#))
- Health channels (section [10.3.4](#))
- Recovery Notification (section [10.3.5](#))

Class	PlatformHealthManagementContribution			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element defines a contribution to the Platform Health Management. Tags: atp.recommendedPackage=PlatformHealthManagementContributions			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
checkpoint	SupervisionCheckpoint	*	aggr	Collection of checkpoints in the context of a Platform HealthManagementContribution. Stereotypes: atpSplitable Tags: atp.Splitkey=checkpoint.shortName xml.sequenceOffset=10
global Supervision	GlobalSupervision	*	aggr	Collection of GlobalSupervisions in the context of a PlatformHealthManagementContribution. Stereotypes: atpSplitable Tags: atp.Splitkey=globalSupervision.shortName xml.sequenceOffset=30
healthChannel	HealthChannel	*	aggr	Collection of HealthChannels in the context of a Platform HealthManagementContribution. Stereotypes: atpSplitable Tags: atp.Splitkey=healthChannel.shortName xml.sequenceOffset=40
supervision ModeCondition	SupervisionModeCondition	*	aggr	Collection of SupervisionModeConditions in the context of a PlatformHealthManagementContribution. Stereotypes: atpSplitable Tags: atp.Splitkey=supervisionModeCondition.shortName xml.sequenceOffset=20

Table 10.18: PlatformHealthManagementContribution

[TPS_MANI_03502]{DRAFT} **Enabling of `PlatformHealthManagementContribution` on a `Machine`** [To enable an instance of `PlatformHealthManagementContribution` on a specific `Machine` the `PlatformHealthManagementContribution` shall be mapped to the `Machine` via a `PhmContributionToMachineMapping`.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[constr_3568]{DRAFT} **No support for cross `PlatformHealthManagementContribution` references** [All references originating on elements aggregated by one

`PlatformHealthManagementContribution` shall only refer to elements that are part of the same `PlatformHealthManagementContribution` aggregation chain.]
()

Class	PhmContributionToMachineMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element associates one or more PlatformHealthManagementContributions with a Machine. Tags: atp.recommendedPackage=PhmContributionToMachineMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
machine	Machine	0..1	ref	This reference identifies the Machine in the context of the PhmContributionToMachineMapping.
phm Contribution	PlatformHealthManagementContribution	*	ref	This reference identifies one or more PlatformHealthManagementContributions in the context of a PhmContributionToMachineMapping.

Table 10.19: PhmContributionToMachineMapping

An application software can define the usage of several Platform Health Management supervisions (see chapter 3.10.2) and health channels (see chapter 3.10.3).

In order to define the interaction between the application software and the Platform Health Management the `PlatformHealthManagementContribution` creates its own representations of the `RPortPrototypes` typed by the `PhmSupervisedEntityInterface` and `PhmHealthChannelInterface` and creates relations to the application software `RPortPrototypes` (see figure 10.8).

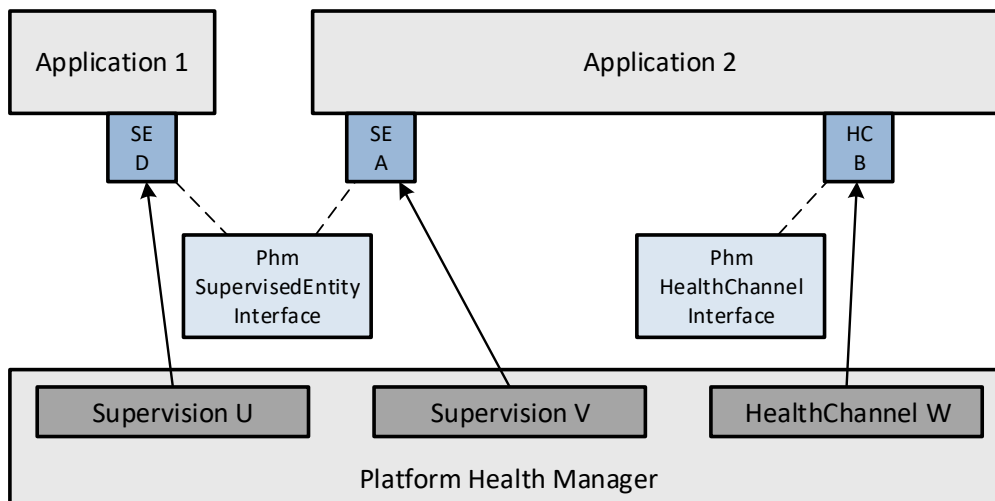


Figure 10.8: Interaction of application software with the platform health manager

In chapter 3.10.2 it is explained that the application software just calls methods in the context of the respective `RPortPrototypes` to interact with the Platform Health Management. From the application developer these methods have no addressing information, because the identity of the `RPortPrototype` is the identification in the scope of the application software.

The deployed structure (according to figure 10.7) however requires more information when an `API` at the Platform Health Manager is called, namely:

- `RPortPrototype.shortName` i.e. `InstanceSpecifier`
- `Process` identification during runtime.

These additional arguments have to be injected to the `API` by the implementation of the interaction between the software component and the Platform Health Management (which implements the relations from figure 10.7). The order of this argument injection is determined by the specification of the Platform Health Management APIs.

10.3.2 Relation between design and deployment

The application design in chapters 3.10.2 and 3.10.3 uses the declarations provided in the Interface definitions for `PhmSupervisedEntityInterface` and `PhmHealthChannelInterface`. Specifically the handling of ids (`checkpointId` and `statusId`) requires a synchronized usage with the respective Interface definition.

It is required to establish a contract between the application code and the Phm deployment. The application code shall only use such id values which are declared at the respective Interface definitions (see [TPS_MANI_03624]).

During the configuration of the PHM the PHM artifacts are created. At deployment state there is no access to the design model available, thus the numeric values used for `checkpointId` and `statusId` at the Interface definition (`PhmSupervisedEntityInterface` and `PhmHealthChannelInterface`) are not available to the Phm.

Therefore the numeric values for `checkpointId` and `statusId` are replicated in the deployment model of the PHM:

- `SupervisionCheckpoint.checkpointId` replicates `PhmCheckpoint.checkpointId`
- `HealthChannelExternalReportedStatus.statusId` replicates `PhmHealthChannelStatus.statusId`

It is a methodological task to make sure that the Ids correspond to each other and match in value. This consistency can be checked using specific tooling on the deployment model and the design model (see also [TPS_MANI_03624]).

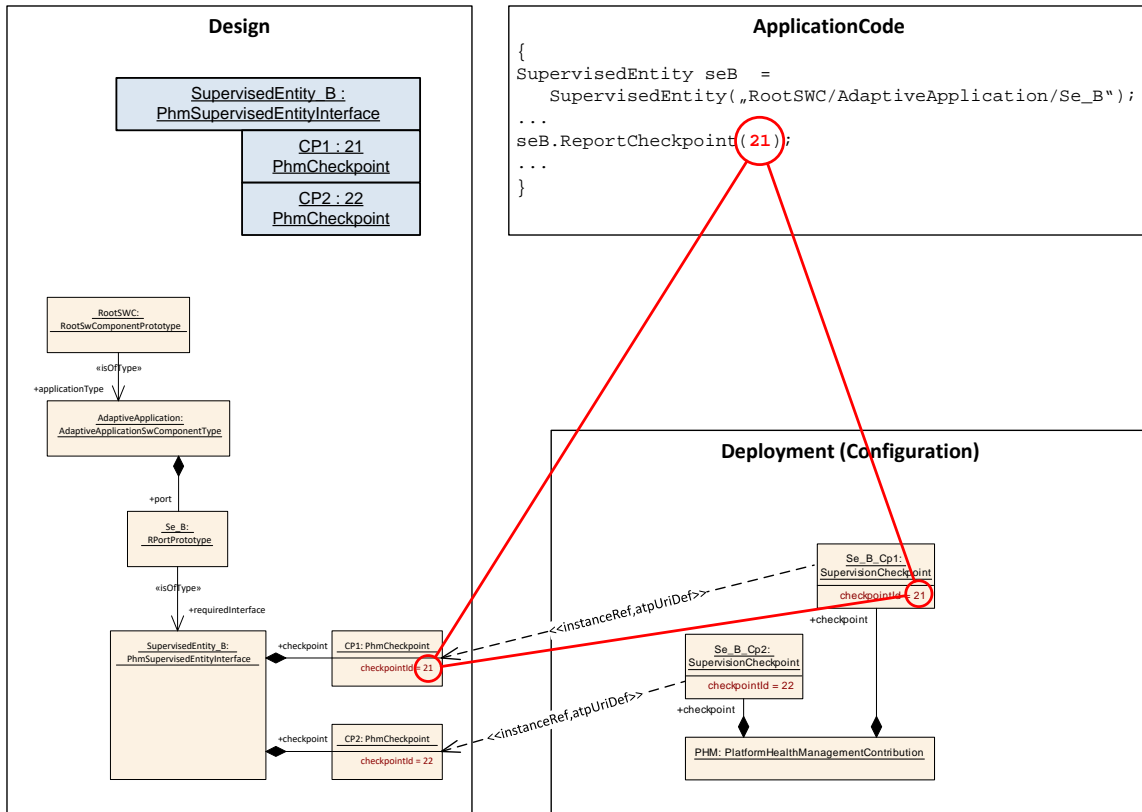


Figure 10.9: Example how IDs have to be in sync

The example in Figure 10.9 illustrates that the used IDs have to in sync in order to let design, code, and configuration work together.

10.3.3 Supervision deployment

In the application design chapter of this document the declaration of supervised entities and checkpoints has been described (see section 3.10.2). These declarations provide the view on supervision from the application software code point. Since the application *Executable* can be started multiple times (via individual *Processes*), the configuration of the Platform Health Management needs to cope with these individual *Executable* instances.

[TPS_MANI_03503]{DRAFT} Applicability of checkpoints to a specific Process
 [The reference *SupervisionCheckpoint.process* defines to which specific *Process* this *SupervisionCheckpoint* definition shall be applied to.] (*RS_MANI_00023*, *RS_MANI_00032*)

This means that only if a *PhmCheckpoint* is reported from the context of this *Process* it is considered to be this *SupervisionCheckpoint*.

Note: If the *SupervisionCheckpoint* represents the supervision of the *Execution Management* process, it will not be possible to configure *SupervisionCheckpoint.process* (unless there is a dummy configuration of *Execution Management* process) as the process for Execution Management is not a modeled *Process*.

It is up to the Adaptive Platform Stack Vendor to define the mechanism how to identify the *SupervisionCheckpoint* (thereby the supervisions *AliveSupervision*, *DeadlineSupervision*, and *LogicalSupervision*) corresponding to the *Execution Management*.

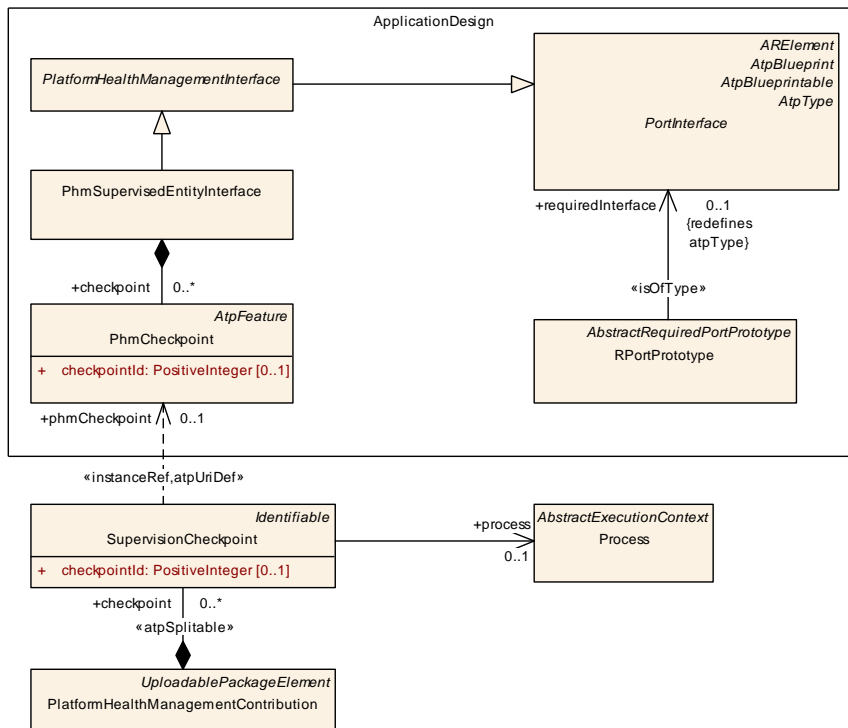


Figure 10.10: Modeling of *SupervisionCheckpoint*

For the Platform Health Management supervision to take effect it is required to define the instance the application is executed in, thus the reference to a *Process* has to be taken into account. In the model the *Process* also defines under which conditions (*StateDependentStartupConfig*) and with which arguments (*ProcessArgument*) the *Executable* will be started.

To also define the conditions for the supervision the state dependency is defined at the supervisions as well, see chapter 10.3.3.2.

For the configuration of the Platform Health Management the definition of *SupervisionCheckpoint* is used to stand in for the corresponding *PhmCheckpoint* including the execution context of the respective *Process*.

The attribute *SupervisionCheckpoint.phmCheckpoint* replicates the value of the referenced *PhmCheckpoint.checkpointId*. During deployment the *PhmSupervisedEntityInterface* and its content is no longer available and therefore needs to be made available to the Phm.

[TPS_MANI_03626]{DRAFT} **Consistency of `SupervisionCheckpoint.phmCheckpoint` and `PhmCheckpoint.checkpointId`** [The value of `SupervisionCheckpoint.phmCheckpoint` shall be identical to the value of `PhmCheckpoint.checkpointId` which is referenced in `SupervisionCheckpoint.phmCheckpoint`.] (*RS_MANI_00023, RS_MANI_00032*)

[TPS_MANI_03505]{DRAFT} **Existence of `SupervisionCheckpoint`** [For each `PhmCheckpoint` in the scope of a `Process` and `RPortPrototype` typed by a `PhmSupervisedEntityInterface` in the application definition, a `SupervisionCheckpoint` shall be defined. The correspondence of the two is defined by the instance reference `SupervisionCheckpoint.phmCheckpoint`.] (*RS_MANI_00023, RS_MANI_00032*)

Since every possibly reported `PhmCheckpoint` is represented by a corresponding `SupervisionCheckpoint`, it is possible to explicitly exclude a set of `SupervisionCheckpoints` from the supervision activities using the `NoCheckpointSupervision` definition (see section 10.3.3.9).

Class	SupervisionCheckpoint			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element contains an instance reference to a <code>RPortPrototype</code> representing a checkpoint for Platform Health Management.			
Base	<i>ARObject, Identifiable, MultilanguageReferrable, Referrable</i>			
Aggregated by	<code>PlatformHealthManagementContribution.checkpoint</code>			
Attribute	Type	Mult.	Kind	Note
checkpointId	PositiveInteger	0..1	attr	Defines the numeric value which is used to identify the reporting of this <code>SupervisionCheckpoint</code> to the Phm.
phmCheckpoint	<code>PhmCheckpoint</code>	0..1	iref	Instance reference to the <code>PhmCheckpoint</code> defined in the context of a <code>PortInterface</code> . Stereotypes: <code>atpUriDefInstanceRef</code> implemented by: <code>PhmCheckpointInExecutableInstanceRef</code>
process	<code>Process</code>	0..1	ref	Reference to the <code>Process</code> this checkpoint shall be monitored.

Table 10.20: SupervisionCheckpoint

[TPS_MANI_03651]{DRAFT} **Mandatory `SupervisionCheckpoint.process` reference** [Unless the `SupervisionCheckpoint` refers to a `PhmCheckpoint` which is defined in the scope of the *Execution Management*, each `SupervisionCheckpoint` shall define a process reference **at the time when the integration into a `SoftwareCluster` is finished**.] (*RS_MANI_00023, RS_MANI_00032*)

[constr_3649]{DRAFT} **Consistent `SupervisionCheckpoint.process` reference** [If a `SupervisionCheckpoint` refers to a `Process` in the role `process`, then

- the `SupervisionCheckpoint` shall refer to a `PhmCheckpoint` which is defined in a `PhmSupervisedEntityInterface` and
- that `PhmSupervisedEntityInterface` types an `RPortPrototype` of an `AdaptiveApplicationSwComponentType` and

- that `AdaptiveApplicationSwComponentType` is used in the scope of an `Executable` and
- that `Executable` is referenced by the same `Process` as `SupervisionCheckpoint.process`.

]()

[constr_1742]{DRAFT} Multiplicity of reference `SupervisionCheckpoint.phmCheckpoint` [At the time of deployment of a `SupervisionCheckpoint`, one reference to meta-class `PhmCheckpoint` in the role `phmCheckpoint` shall exist.]()

[constr_1764]{DRAFT} Counterpart of `PhmCheckpoint` [Each `PhmCheckpoint` shall be referenced once and only once in the role `targetPhmCheckpoint` by a `PhmCheckpointInExecutableInstanceRef` with the same `Executable` and chain of `contextComponentPrototype` and `contextRPortPrototype` that is aggregated by a `SupervisionCheckpoint` in combination with a specific `Process`. This reference shall exist **at the time when the integration into a `SoftwareCluster` is finished.**]()

This means that each `SupervisionCheckpoint` is the unique representation of the corresponding `PhmCheckpoint` instance in the context of a `PhmCheckpointInExecutableInstanceRef` and one `Process`.

Please note that the detailed modeling of the `<<InstanceRef>>` from `SupervisionCheckpoint` to `PhmCheckpoint` is documented in section C.6.

10.3.3.1 Global supervision

The `GlobalSupervision` collects `PhmSupervisions` (`AliveSupervisions`, `LogicalSupervisions`, `DeadlineSupervisions`, `NoCheckpointSupervisions`, and `NoSupervisions`) and aggregates the individual states of these `Alive`, `Deadline`, and `Logical Supervisions` into one `GlobalSupervision` status (see also figure 10.11).

[constr_3623]{DRAFT} `SupervisionCheckpoints` in the context of a `GlobalSupervision` [All `SupervisionCheckpoints` belonging to the same `PhmSupervisedEntityInterface` instance (`SupervisionCheckpoints` with identical `PhmCheckpointInExecutableInstanceRef.contextRootSwComponentPrototype`, `contextComponentPrototype`, `contextRPortPrototype`, and `process` references) shall only be referenced by `PhmSupervisions` which are aggregated by the same `GlobalSupervision`.]()

[constr_3624]{DRAFT} At least one `Supervision` defined in the context of a `GlobalSupervision` [At least one `AliveSupervision`, `LogicalSupervision`, or `DeadlineSupervision` shall be defined in the scope of a `GlobalSupervision` **at the time when the integration into a `SoftwareCluster` is finished.**]()

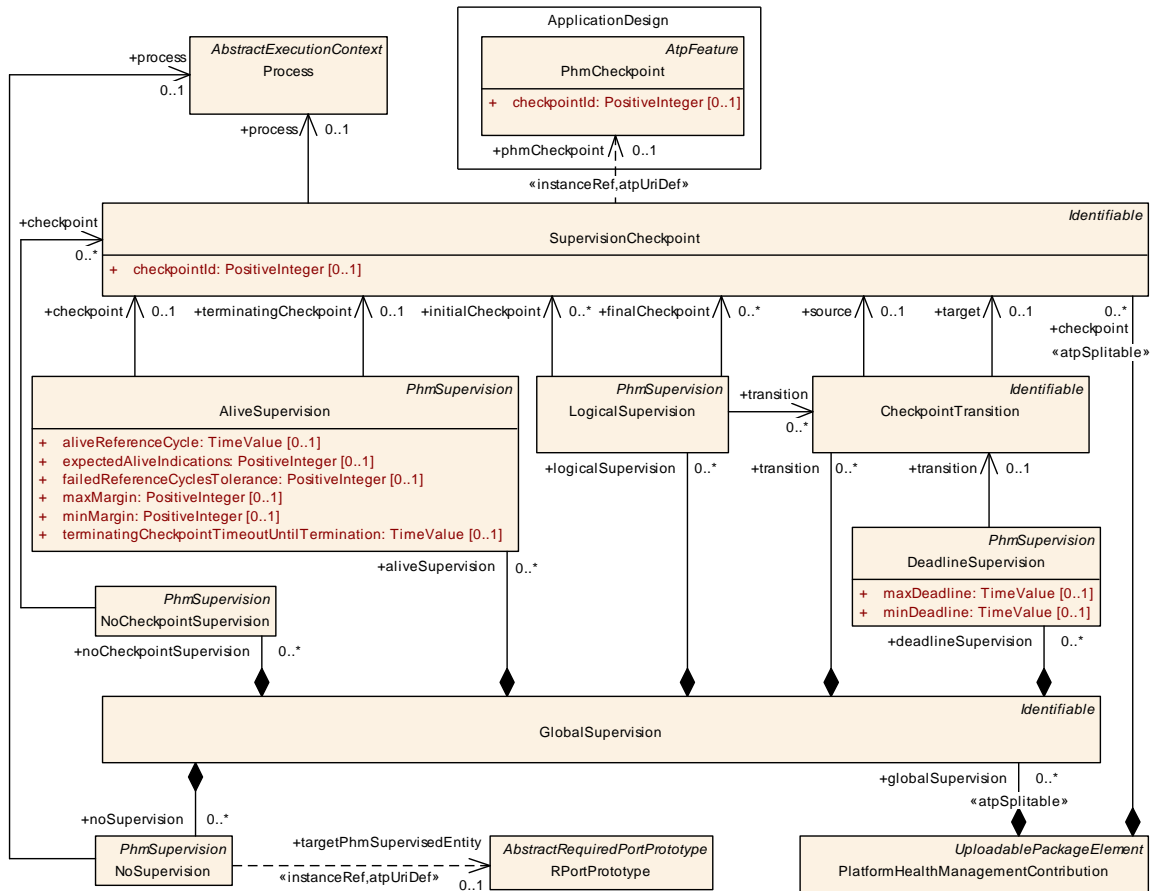


Figure 10.11: Modeling of GlobalSupervision

[TPS_MANI_03512]{DRAFT} **Applicability of global supervision without Process context** [The aggregated **AliveSupervisions**, **LogicalSupervisions**, and **DeadlineSupervisions** contributing to a specific **GlobalSupervision** may refer to **SupervisionCheckpoints** where each **SupervisionCheckpoint** may refer to a different **Process**.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

With [TPS_MANI_03512] the **GlobalSupervision** and the aggregation **AliveSupervisions**, **LogicalSupervisions**, and **DeadlineSupervisions** can be used to establish three use-cases:

- compose the status of one **Executable** instance (**Process**) in case all aggregated **PhmSupervisions** are defined with the same **Process** context.
- compose the status of several **Executable** instances (**Processes**) of a **FunctionGroup** in case the aggregated **PhmSupervisions** are defined with (partially) different **Process** contexts within a **FunctionGroup** context.
- compose the status of all **Executable** instances (**Processes**) of a **FunctionGroup** in case the aggregated **PhmSupervisions** are defined with (all) different **Process** contexts within a **FunctionGroup** context.

[constr_3625]{DRAFT} **DeadlineSupervision** referencing **CheckpointTransition** in the context of a **GlobalSupervision** [DeadlineSupervision aggregated in a GlobalSupervision shall only refer to a CheckpointTransition which is aggregated by the same GlobalSupervision.]()

[constr_3626]{DRAFT} **LogicalSupervision** referencing **CheckpointTransition** in the context of a **GlobalSupervision** [LogicalSupervision aggregated in a GlobalSupervision shall only refer to CheckpointTransitions that are aggregated by the same GlobalSupervision.]()

Class	GlobalSupervision			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element defines a collection of AliveSupervisions, DeadlineSupervisions, and LogicalSupervisions in order to provide an aggregated supervision state.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	PlatformHealthManagementContribution.globalSupervision			
Attribute	Type	Mult.	Kind	Note
alive Supervision	AliveSupervision	*	aggr	Collection of AliveSupervisions in the context of this GlobalSupervision.
deadline Supervision	DeadlineSupervision	*	aggr	Collection of DeadlineSupervisions in the context of this GlobalSupervision.
logical Supervision	LogicalSupervision	*	aggr	Collection of LogicalSupervisions in the context of this GlobalSupervision.
noCheckpoint Supervision	NoCheckpointSupervision	*	aggr	Definition of No Checkpoint Supervision.
noSupervision	NoSupervision	*	aggr	Collection of NoSupervisions in the context of this GlobalSupervision.
supervision Mode	SupervisionMode	*	aggr	Collection of SupervisionModes in the context of this GlobalSupervision. Stereotypes: atpSplitable Tags: atp.Splitkey=supervisionMode.shortName
transition	CheckpointTransition	*	aggr	Collection of CheckpointTransitions in the context of this GlobalSupervision.

Table 10.21: GlobalSupervision

10.3.3.2 Supervision Mode

Expected execution (timing or sequence) of the Software can change based on certain conditions. Hence, the value of the Supervision attributes might have to be changed based on conditions as well. **SupervisionMode** defines the Supervision attributes which change based on the referenced **modeCondition**.

The Execution Management may use **Function Groups** and **Function Group States** to define the startup conditions of application software. The behavior of the application software can change based on the **Function Group State**. Hence the monitoring shall also be configurable based on **Function Group State** changes.

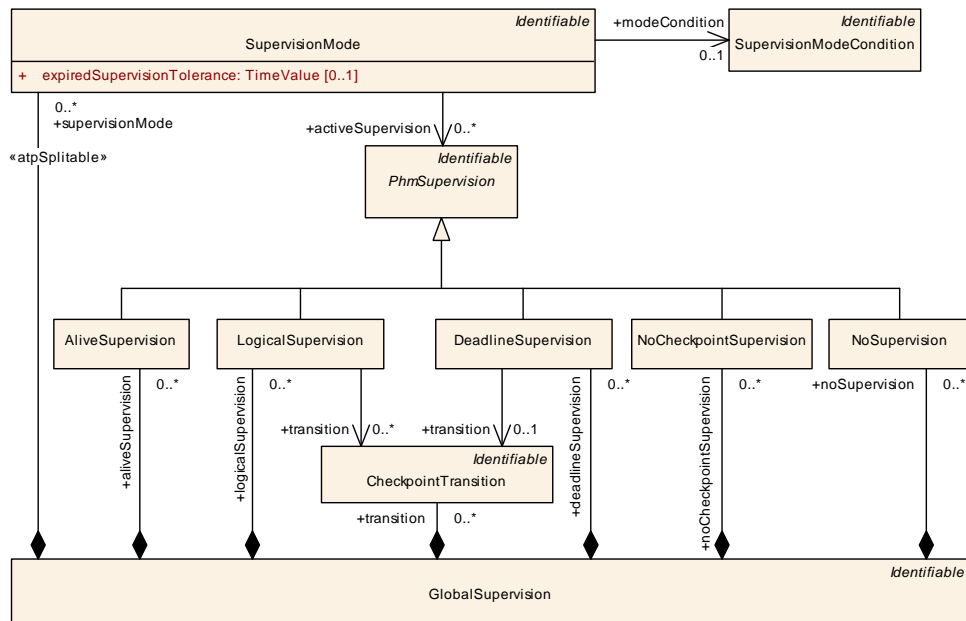


Figure 10.12: Mode dependent supervision

A `SupervisionMode` does define a set of `PhmSupervisions` in the role `activeSupervision` which shall be active while this `SupervisionMode` is active. This modeling allows for one specific `PhmSupervision` to be defined as active in several `SupervisionModes`.

[TPS_MANI_03513]{DRAFT} Collection of supervisions into a `GlobalSupervision` [The `PhmSupervisions` referenced from a `SupervisionMode` in the role `activeSupervision` are taken into account to evaluate the supervision status of the `GlobalSupervision` in that particular `SupervisionMode`.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[TPS_MANI_03633]{DRAFT} Semantics of several `supervisionMode` references for one supervision [If a `PhmSupervision` is referenced in the role `activeSupervision` then this `PhmSupervision` will be active while the referencing `SupervisionMode` is active.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

Class	SupervisionMode			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element defines a <code>SupervisionMode</code> .			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>			
Aggregated by	<code>GlobalSupervision.supervisionMode</code>			
Attribute	Type	Mult.	Kind	Note
active Supervision	<code>PhmSupervision</code>	*	ref	The reference defines which <code>PhmSupervisions</code> shall be active in this specific <code>SupervisionMode</code> .
expired Supervision Tolerance	<code>TimeValue</code>	0..1	attr	Defines in this <code>SupervisionMode</code> the acceptable amount of time with EXPIRED supervision status of the enclosing <code>GlobalSupervision</code> before it is considered STOPPED.





Class	SupervisionMode			
modeCondition	SupervisionModeCondition	0..1	ref	Reference to SupervisionModeCondition (Condition under which the configuration made under this SupervisionMode are to be applied).

Table 10.22: SupervisionMode

[TPS_MANI_03514]{DRAFT} **Expiration tolerance for [SupervisionMode](#)** [The attribute [SupervisionMode.expiredSupervisionTolerance](#) defines the time which a [GlobalSupervision](#) is maintained in the state *expired* before it is considered *stopped* in that particular [SupervisionMode](#).] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[constr_3639]{DRAFT} **Existence of [SupervisionMode.expiredSupervisionTolerance](#)** [If the [SupervisionMode](#) refers to a [PhmSupervision](#) that in turn references a [SupervisionCheckpoint](#) and that [SupervisionCheckpoint](#) refers to a [Process](#) where the [Executable](#) has the attribute [category](#) set to APPLICATION_LEVEL, then the attribute [expiredSupervisionTolerance](#) shall NOT exist **at the time when the integration into a [SoftwareCluster](#) is finished.**

For each [SupervisionMode](#) the attribute [expiredSupervisionTolerance](#) shall exist **at the time when the integration into a [SoftwareCluster](#) is finished.**]()

[constr_3640]{DRAFT} **Existence of [SupervisionMode.modeCondition](#)** [For each [SupervisionMode](#) the attribute [modeCondition](#) shall exist **at the time when the integration into a [SoftwareCluster](#) is finished.**]()

10.3.3.3 Supervision Mode condition

Each [SupervisionMode](#) refers to exactly one [SupervisionModeCondition](#) in the role [modeCondition](#). The [SupervisionModeCondition](#) defines an collection of one or several [stateReferences](#) which are combined to provide a single logical state.

The reference to [Function Groups](#) and their [Function Group States](#) is essential for the definition of [SupervisionModeConditions](#) as the supervised [Processes](#) are started and stopped according to changes in [Function Group States](#).

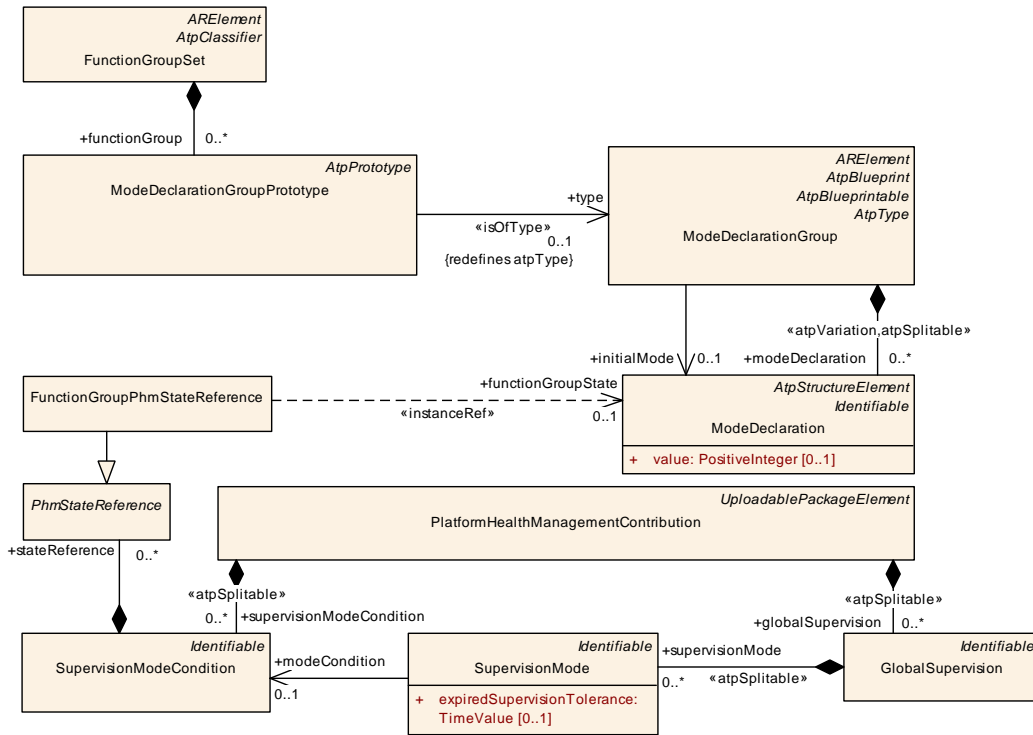


Figure 10.13: Modeling of SupervisionMode

Class	SupervisionModeCondition			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element defines a SupervisionModeCondition in the context of platform health management contribution.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	PlatformHealthManagementContribution.supervisionModeCondition			
Attribute	Type	Mult.	Kind	Note
stateReference	PhmStateReference	*	aggr	Collection of stateReferences.

Table 10.23: SupervisionModeCondition

[constr_3627]{DRAFT} **Existence of SupervisionModeCondition.stateReference** [At the time of deployment of SupervisionModeCondition, at least one aggregation of PhmStateReference in the role SupervisionModeCondition.stateReference shall exist.]()

Class	FunctionGroupPhmStateReference			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Function Group state dependency.			
Base	ARObject, PhmStateReference			
Aggregated by	SupervisionModeCondition.stateReference			
Attribute	Type	Mult.	Kind	Note





Class	FunctionGroupPhmStateReference			
functionGroupState	ModeDeclaration	0..1	iref	This represent the applicable functionGroupState. InstanceRef implemented by: FunctionGroupStateInFunctionGroupSetInstanceRef

Table 10.24: FunctionGroupPhmStateReference

[constr_3628]{DRAFT} Reference to Function Group State from a SupervisionModeCondition [If a Function Group State is referenced by a SupervisionModeCondition in the scope of one GlobalSupervision, then that same Function Group State shall NOT be referenced by any other SupervisionModeCondition in the scope of the same GlobalSupervision.]()

Rational for [constr_3628]: It is guaranteed that only one of the SupervisionModes is active at any point in time. The SupervisionModeConditions referenced under a GlobalSupervision in the context of SupervisionMode shall be mutually exclusive.

E.g. Following SupervisionModeConditions referenced under the same GlobalSupervision in the context of SupervisionMode is not allowed:

- SupervisionModeCondition_1:
(FunctionGroup_X in State 'a') or (FunctionGroup_X in State 'b')
- SupervisionModeCondition_2:
(FunctionGroup_X in State 'a') or (FunctionGroup_X in State 'c')

In the above example, (FunctionGroup_X in State 'a') is common between the 2 SupervisionModeConditions.

[constr_3629]{DRAFT} Identical Function Group in the scope of a GlobalSupervision [Within the context of one GlobalSupervision, all SupervisionMode.modeCondition shall only aggregate FunctionGroupPhmStateReferences in the role stateReference where the reference FunctionGroupPhmStateReference.functionGroupState.contextModeDeclarationGroupPrototype refers to the identical ModeDeclarationGroupPrototype (that implements the Function Group, as far as state management is concerned).]()

That is, within the context of one GlobalSupervision, all SupervisionMode.modeCondition.stateReference shall reference states(modes) of the same Function Group.

[constr_3630]{DRAFT} GlobalSupervision and Process relation [Within the context of one GlobalSupervision, all aggregated PhmSupervisions shall refer to SupervisionCheckpoints where the referenced Process aggregates a stateDependentStartupConfig that in turn refers to a functionGroupState where the contextModeDeclarationGroupPrototype refers to the identical ModeDeclarationGroupPrototype (that implements the Function Group, as far as state management is concerned).]()

That is, all `PhmSupervisions` aggregated in a `GlobalSupervision` are referencing `SupervisionCheckpoints` corresponding to `Processes` that are configured to be executed in state/s of the same `Function Group`.

[constr_3631]{DRAFT} Global supervision restricted to one Function Group
[The `Function Group` (`ModeDeclarationGroupPrototype`) referenced in [constr_3629] and [constr_3630] shall be identical for one particular `GlobalSupervision`.]()

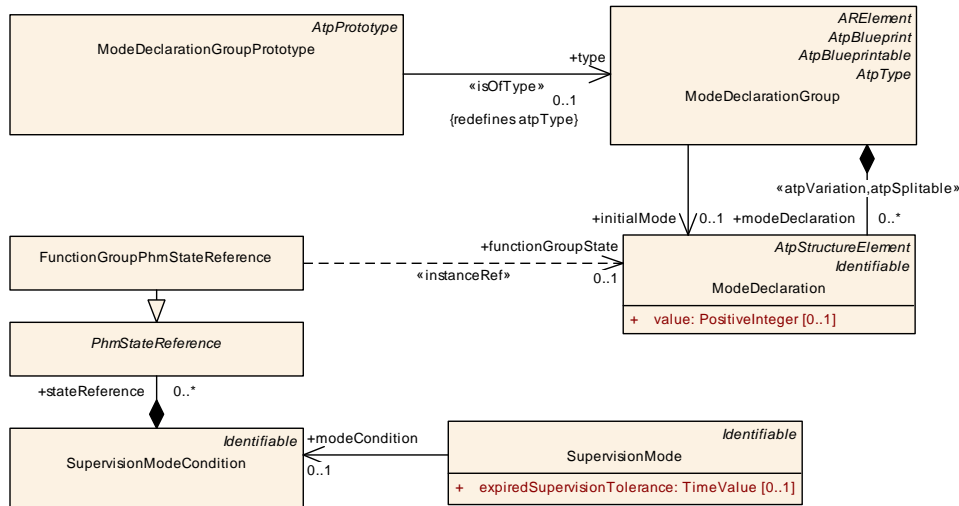


Figure 10.14: Modeling of `FunctionGroupPhmStateReference`

[constr_3632]{DRAFT} Supervision of a Supervised Entity Instance in the scope of a Function Group State
[A Supervised Entity Instance shall be configured with checkpoint supervision (all `SupervisionCheckpoints` of the Supervised Entity Instance are covered by `AliveSupervision`, `DeadlineSupervision`, `LogicalSupervision`, `NoCheckpointSupervision`) or `NoSupervision` in all `Function Group States` in which the corresponding `Process` is configured to be executed.]()

Rationale for [constr_3632]: The configuration of supervision for a specific Supervised Entity Instance is not missed unintentionally in a `Function Group State`.

Note that [constr_3632] requires for the Supervised Entity Instance to be part of the supervision definition in all `Function Group States` in which the corresponding `Process` is configured to be executed. In case there is no supervision required in a specific `Function Group State` (because the Supervised Entity Instance does not need to be supervised in that specific `Function Group State`), then `NoSupervision` can be configured for that Supervised Entity Instance.

Note: If a `Process` survives a `Function Group State` change running (because the `Process` is defined to be running in two consecutive `Function Group States`), then it is important that the configuration of the `activeSupervision` for the Supervised Entity Instances corresponding to the `Process` is identical for the `SupervisionModes` that corresponds to the affected `Function Group States`. This relations can not be formally expressed (because the possible `Function Group State`

transitions are not formalized) and therefore this restriction can not be defined as a constraint.

A possible mitigation strategy is to define different `Process` arguments and therefore force a re-start of the `Process`, even if the `Function Group States` have been switched consecutively.

10.3.3.4 NoSupervision definition

In the scope of a `GlobalSupervision`, a `NoSupervision` can be defined for a Supervised Entity Instance as a whole. A `NoSupervision` can be configured to indicate that this Supervised Entity Instance shall not be monitored by the Phm in a specific `SupervisionMode`.

The Supervised Entity Instance is identified using the `NoSupervision.targetPhmSupervisedEntity` instance ref and `NoSupervision.process` reference.

Class	NoSupervision			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Defines explicitly that NO supervision shall be applied for a specific Supervised Entity instance.			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PhmSupervision</code> , <code>Referrable</code>			
Aggregated by	<code>GlobalSupervision.noSupervision</code>			
Attribute	Type	Mult.	Kind	Note
process	<code>Process</code>	0..1	ref	Reference to the Process this NoSupervision applies to.
targetPhmSupervisedEntity	<code>RPortPrototype</code>	0..1	iref	Instance reference to the RPortPrototype which represents the Supervised Entity instance. Stereotypes: <code>atpUriDefInstanceRef</code> implemented by: <code>RPortPrototypeInExecutableInstanceRef</code>

Table 10.25: NoSupervision

[constr_3674]{DRAFT} Existence of `NoSupervision.targetPhmSupervisedEntity` [For each `NoSupervision` the attribute `targetPhmSupervisedEntity` shall exist at the time when the integration into a `SoftwareCluster` is finished.]()

[constr_3675]{DRAFT} Existence of `NoSupervision.process` [For each `NoSupervision` the attribute `process` shall exist at the time when the integration into a `SoftwareCluster` is finished.]()

[constr_3676]{DRAFT} Exclusive usage of `NoSupervision` [For a Supervised Entity Instance, in a given `SupervisionMode`, either a checkpoint supervision (`AliveSupervision`, `DeadlineSupervision`, `LogicalSupervision`, and/or `NoCheckpointSupervision` referencing all `SupervisionCheckpoints` corresponding to the Supervised Entity Instance) or `NoSupervision` shall be configured, but not both.]()

Note: The `NoSupervision` approach disables the supervision for all the `SupervisionCheckpoints` of a Supervised Entity Instance.

10.3.3.5 AliveSupervision definition

In the scope of a `GlobalSupervision` an `AliveSupervision` can be defined for a specific `SupervisionCheckpoint`. `AliveSupervision` can be used to define in which timing boundaries one specific checkpoint shall be monitored.

[TPS_MANI_03508]{DRAFT} Definition of an AliveSupervision for a SupervisionCheckpoint [An `AliveSupervision` definition provides attributes to configure the supervision of the referenced `SupervisionCheckpoint`.

- `aliveReferenceCycle` defines the time base used to monitor the reporting of this specific `SupervisionCheckpoint`
- `expectedAliveIndications` defines the number of indications which shall be observed during the time period defined by `aliveReferenceCycle`
- `minMargin` and `maxMargin` define the acceptable deviation from the `expectedAliveIndications` within the time period defined by `aliveReferenceCycle`

] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[TPS_MANI_03575]{DRAFT} Definition of no minimum alive supervision [If the value `AliveSupervision.minMargin` equals 0, this defines that no minimum alive supervision shall be performed.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[TPS_MANI_03576]{DRAFT} Definition of no maximum alive supervision [If the value `AliveSupervision.maxMargin` equals INF, this defines that no maximum alive supervision shall be performed.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[constr_3539]{DRAFT} Only one AliveSupervision per SupervisionCheckpoint [A `SupervisionCheckpoint` shall only be referenced up to once by an `AliveSupervision` in the role `checkpoint` in the context of an identical `SupervisionMode`.] ()

[TPS_MANI_03515]{DRAFT} Failure tolerance for AliveSupervision [The attribute `AliveSupervision.failedReferenceCyclesTolerance` defines the acceptable amount of `AliveSupervision.aliveReferenceCycles` with incorrect/failed `AliveSupervision`.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

Class	AliveSupervision			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Defines an <code>AliveSupervision</code> for one checkpoint.			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>PhmSupervision</code> , <code>Referrable</code>			
Aggregated by	<code>GlobalSupervision.aliveSupervision</code>			
Attribute	Type	Mult.	Kind	Note
<code>aliveReferenceCycle</code>	<code>TimeValue</code>	0..1	attr	Time period at which the Alive Supervision mechanism compares the amount of received Alive Indications for the <code>SupervisionCheckpoint</code> against the <code>expectedAliveIndications</code> .





Class	AliveSupervision			
checkpoint	SupervisionCheckpoint	0..1	ref	Reference to a checkpoint in the context of Alive Supervision.
expectedAliveIndications	PositiveInteger	0..1	attr	Defines the amount of expected Alive Indications of the SupervisionCheckpoint within the aliveReferenceCycle.
failedReferenceCyclesTolerance	PositiveInteger	0..1	attr	This attribute defines the acceptable amount of alive ReferenceCycles with incorrect/failed AliveSupervision.
maxMargin	PositiveInteger	0..1	attr	Defines the amount of Alive Indications of the Supervision Checkpoint that are acceptable to be additional to the expectedAliveIndications within the aliveReferenceCycle.
minMargin	PositiveInteger	0..1	attr	Defines the amount of Alive Indications of the Supervision Checkpoint that are acceptable to be missing to the expectedAliveIndications within the aliveReferenceCycle.
terminatingCheckpoint	SupervisionCheckpoint	0..1	ref	Reference to the SupervisionCheckpoint which is defined as the terminating checkpoint of this AliveSupervision.
terminatingCheckpointTimeoutUntilTermination	TimeValue	0..1	attr	Defines the time a process shall terminate after it has announced its start of termination by reporting terminatingCheckpoint.

Table 10.26: AliveSupervision

[constr_3633]{DRAFT} Mandatory attributes of [AliveSupervision](#) [The following attributes of [AliveSupervision](#) shall be defined at the time when the integration into a [SoftwareCluster](#) is finished:

- [aliveReferenceCycle](#)
- [checkpoint](#)
- [expectedAliveIndications](#)
- [failedReferenceCyclesTolerance](#)
- [minMargin](#)
- [maxMargin](#)

]()

10.3.3.5.1 [AliveSupervision](#) of self-terminating processes

If a [Process](#) is defined to be self-terminating (according to [TPS_MANI_01334]) and that [Process](#) has an [AliveSupervision](#) defined, then it is essential for that [Process](#) to indicate to the Phm when that [Process](#) is about to self terminate. The indication is done using a dedicated [SupervisionCheckpoint](#) and is associated with the [AliveSupervision](#). In this case the Phm can stop the [AliveSupervision](#) in a defined way when the application reports that [AliveSupervision.terminatingCheckpoint](#) has been reached.

[constr_3709]{DRAFT} [AliveSupervision.terminatingCheckpoint](#) required for self terminating [Processes](#) [Only if a [Process](#)

- refers to a `StartupConfig` (via `stateDependentStartupConfig`), and that `StartupConfig` has the attribute `StartupConfig.terminationBehavior` set to the value `TerminationBehaviorEnum.processIsSelfTerminating`, and
- the `StateDependentStartupConfig.functionGroupState` is identical to the respective `GlobalSupervision.supervisionMode.modeCondition.stateReference.functionGroupState` and
- there exists an `AliveSupervision` which refers to a `SupervisionCheckpoint` in the role `checkpoint`, and that `SupervisionCheckpoint` refers to that `Process`, then

there shall exist an `AliveSupervision.terminatingCheckpoint` reference from the `AliveSupervision` **at the time when the creation of the manifest is finished.**]()

That is, if an `AliveSupervision` is defined for a `Process` in a `SupervisionMode` that corresponds to a `Function Group State` in which the `Process` is configured to be self-terminating, then and only then `AliveSupervision.terminatingCheckpoint` shall be defined.

[constr_3710]{DRAFT} `Process` referenced by `AliveSupervision.terminatingCheckpoint` [The `SupervisionCheckpoint` that is referenced in the role `AliveSupervision.terminatingCheckpoint` shall refer to the same `Process` as the `SupervisionCheckpoint` that is referenced by the `AliveSupervision.checkpoint` **at the time when the creation of the manifest is finished.**]()

[constr_3711]{DRAFT} `AliveSupervision.terminatingCheckpointTimeoutUntilTermination` [If an `AliveSupervision` has the reference `AliveSupervision.terminatingCheckpoint` defined, then the attribute `AliveSupervision.terminatingCheckpointTimeoutUntilTermination` shall be defined **at the time when the creation of the manifest is finished.**]()

10.3.3.6 `CheckpointTransition` definition

For the definition of further supervision strategies the need to first define possible `CheckpointTransitions` between `SupervisionCheckpoints` arises. Since the application software design does not provide any transition definition between checkpoints, it is essential to define possible `CheckpointTransitions`.

The definition of `CheckpointTransitions` is done in the scope of the `GlobalSupervision` and can be used by the `LogicalSupervision` and `DeadlineSupervision` of the same `GlobalSupervision`.

[TPS_MANI_03509]{DRAFT} **Definition of a CheckpointTransition** [A CheckpointTransition defines one possible transition from the source SupervisionCheckpoint to the target SupervisionCheckpoint.] (RS_MANI_00023, RS_MANI_00032)

[constr_3634]{DRAFT} **Multiplicity of CheckpointTransition.source and CheckpointTransition.target** [Each CheckpointTransition shall define exactly one source reference and one target reference at the time when the integration into a SoftwareCluster is finished.] ()

Class	CheckpointTransition			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Defines one transition between two checkpoints.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	GlobalSupervision.transition			
Attribute	Type	Mult.	Kind	Note
source	SupervisionCheckpoint	0..1	ref	Reference to the source checkpoint for this transition.
target	SupervisionCheckpoint	0..1	ref	Reference to the target checkpoint for this transition.

Table 10.27: CheckpointTransition

10.3.3.7 LogicalSupervision definition

The LogicalSupervision defines a supervision graph of allowed CheckpointTransitions which is monitored by the Platform Health Management without any timing considerations, just the order of reported checkpoints is considered for the monitoring.

[constr_3540]{DRAFT} **SupervisionCheckpoint in supervision graph** [Each SupervisionCheckpoint shall only be part of one supervision graph in the context of an identical SupervisionMode.] ()

When a SupervisionCheckpoint belonging to the supervision graph is reported to the Platform Health Management where there is no CheckpointTransition defined from the last reported SupervisionCheckpoint as source to the current reported SupervisionCheckpoint as target, this situation violates the LogicalSupervision.

[TPS_MANI_03510]{DRAFT} **Definition of LogicalSupervision** [A LogicalSupervision defines relations between SupervisionCheckpoints which form a directed graph from one or more initialCheckpoint SupervisionCheckpoints through a set of CheckpointTransitions defined by collection of transitions to one or more finalCheckpoint SupervisionCheckpoints.] (RS_MANI_00023, RS_MANI_00032)

Class	LogicalSupervision			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Defines a LogicalSupervision graph consisting of transitions, initial- and final checkpoints.			
Base	ARObject, Identifiable , MultilanguageReferrable , PhmSupervision , Referrable			
Aggregated by	GlobalSupervision . LogicalSupervision			
Attribute	Type	Mult.	Kind	Note
finalCheckpoint	SupervisionCheckpoint	*	ref	Reference to the final Checkpoint(s) for this Logical Supervision. Tags: xml.sequenceOffset=20
initialCheckpoint	SupervisionCheckpoint	*	ref	Reference to the initial Checkpoint(s) for this Logical Supervision. Tags: xml.sequenceOffset=10
transition	CheckpointTransition	*	ref	Reference to the transitions for this LogicalSupervision. Tags: xml.sequenceOffset=30

Table 10.28: LogicalSupervision

[constr_1736]{DRAFT} Multiplicity of reference [LogicalSupervision.initialCheckpoint](#) [At the time of deployment of a [LogicalSupervision](#), at least one reference to meta-class [SupervisionCheckpoint](#) in the role [initialCheckpoint](#) shall exist.]()

[constr_1737]{DRAFT} Multiplicity of reference [LogicalSupervision.finalCheckpoint](#) [At the time of deployment of a [LogicalSupervision](#), at least one reference to meta-class [SupervisionCheckpoint](#) in the role [finalCheckpoint](#) shall exist.]()

[constr_1740]{DRAFT} Multiplicity of reference [LogicalSupervision.transition](#) [At the time of deployment of a [LogicalSupervision](#), at least one reference to meta-class [CheckpointTransition](#) in the role [LogicalSupervision.transition](#) shall exist.]()

10.3.3.8 [DeadlineSupervision](#) definition

The [DeadlineSupervision](#) defines timing attributes for one specific [CheckpointTransition](#).

[TPS_MANI_03511]{DRAFT} Definition of [DeadlineSupervision](#) [A [DeadlineSupervision](#) defines timing attributes which are monitored by the Platform Health Management for one specific [CheckpointTransition](#).]([RS_MANI_00023](#), [RS_MANI_00032](#))

[constr_3635]{DRAFT} Mandatory attributes of [DeadlineSupervision](#) [The following attributes of [DeadlineSupervision](#) shall be defined **at the time when the integration into a [SoftwareCluster](#) is finished**:

- [transition](#)
- [minDeadline](#)

- [maxDeadline](#)

]()

[TPS_MANI_03573]{DRAFT} Definition of no minimum deadline supervision [If the value [DeadlineSupervision.minDeadline](#) equals 0, this defines that no minimum deadline supervision shall be performed.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[TPS_MANI_03574]{DRAFT} Definition of no maximum deadline supervision [If the value [DeadlineSupervision.maxDeadline](#) equals INF, this defines that no maximum deadline supervision shall be performed.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

Class	DeadlineSupervision			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Defines an DeadlineSupervision for one transition.			
Base	ARObject , Identifiable , MultilanguageReferrable , PhmSupervision , Referrable			
Aggregated by	GlobalSupervision.deadlineSupervision			
Attribute	Type	Mult.	Kind	Note
maxDeadline	TimeValue	0..1	attr	Defines the longest time span before which the deadline is considered to be met for transition.
minDeadline	TimeValue	0..1	attr	Defines the shortest time span after which the deadline is considered to be met for transition.
transition	CheckpointTransition	0..1	ref	Reference to the transition in the context of a Deadline Supervision.

Table 10.29: DeadlineSupervision

10.3.3.9 NoCheckpointSupervision definition

The [NoCheckpointSupervision](#) is used to define a set of [SupervisionCheckpoints](#) for which no Alive, Deadline and Logical supervision shall be performed. It is a means to define a complete coverage of the configuration with respect to the possibly reported [SupervisionCheckpoints](#). If a set of [SupervisionCheckpoints](#) shall not be considered by the Phm for Supervision (Alive, Deadline and Logical) evaluation, then these [SupervisionCheckpoints](#) can be referenced from the [NoCheckpointSupervision](#) in the role [NoCheckpointSupervision.checkpoint](#).

[TPS_MANI_03670]{DRAFT} Definition of NoCheckpointSupervision [A [NoCheckpointSupervision](#) defines explicitly that no supervision (Alive, Deadline and Logical) shall be applied to the [SupervisionCheckpoints](#) which are referenced in the role [NoCheckpointSupervision.checkpoint](#).] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[constr_3712]{DRAFT} Exclusive usage of NoCheckpointSupervision [If a [SupervisionCheckpoint](#) is referenced by a [NoCheckpointSupervision](#) in the role [checkpoint](#), then that [SupervisionCheckpoint](#) shall not be referenced by any other checkpoint supervision ([AliveSupervision](#), [DeadlineSupervision](#) (via

CheckpointTransition), LogicalSupervision (also via or CheckpointTransition)) in the scope of one SupervisionMode.]()

Class	NoCheckpointSupervision			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Defines explicitly that NO supervision shall be applied for a set of SupervisionCheckpoints.			
Base	ARObject, Identifiable, MultilanguageReferrable, PhmSupervision, Referrable			
Aggregated by	GlobalSupervision.noCheckpointSupervision			
Attribute	Type	Mult.	Kind	Note
checkpoint	SupervisionCheckpoint	*	ref	Reference to the set of SupervisionCheckpoints which shall not be considered for any kind of supervision.

Table 10.30: NoCheckpointSupervision

10.3.4 Health channel deployment

The HealthChannel is used as an abstraction to the Platform Health Management input for the RecoveryNotification.

[constr_3730]{DRAFT} Upper multiplicity of reference in the role HealthChannel.recoveryNotification [In the context of HealthChannel, the reference in the role recoveryNotification shall exist at most once at the time when the creation of the manifest is finished.]()

The specialized use-cases for HealthChannels are described in the following sections. A HealthChannel can either represent

- the status of a GlobalSupervision using the HealthChannelSupervision or
- the status of a reported PhmHealthChannelInterface using the HealthChannelExternalStatus

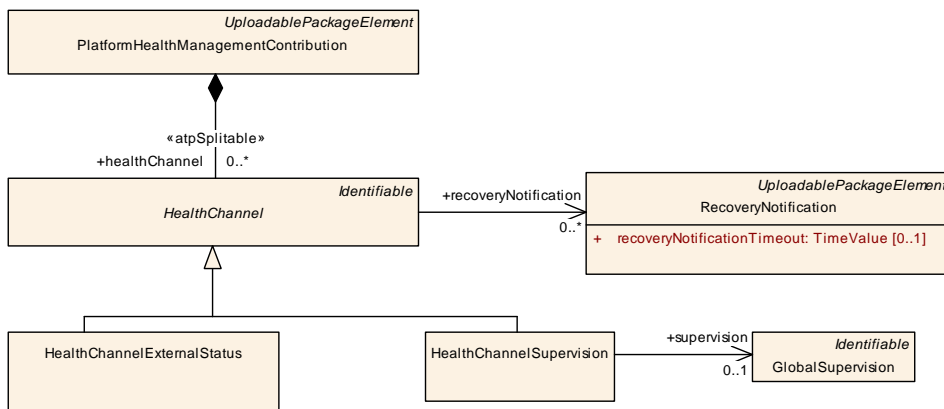


Figure 10.15: Modeling of HealthChannel

Class	HealthChannel (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element defines the source of a health channel.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Subclasses	HealthChannelExternalStatus , HealthChannelSupervision			
Aggregated by	PlatformHealthManagementContribution.healthChannel			
Attribute	Type	Mult.	Kind	Note
recoveryNotification	RecoveryNotification	*	ref	Defines the RecoveryNotification for this HealthChannel.

Table 10.31: HealthChannel

[TPS_MANI_03672]{DRAFT} **Definition of [RecoveryNotification](#) for an [HealthChannel](#)** [The reference [HealthChannel.recoveryNotification](#) defines which [RecoveryNotification](#) shall be triggered if the [HealthChannel](#) is violated.] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[TPS_MANI_03673]{DRAFT} **[RecoveryNotification](#) referenced by several [HealthChannel.recoveryNotifications](#)** [One [RecoveryNotification](#) may be referenced by several [HealthChannel.recoveryNotifications](#) defining that the violation of any of the referencing [HealthChannels](#) will trigger that [RecoveryNotification](#).] ([RS_MANI_00023](#), [RS_MANI_00032](#))

[constr_3719]{DRAFT} **[RecoveryNotification](#) referenced either by [HealthChannelExternalStatus](#) or [HealthChannelSupervision](#)** [A [RecoveryNotification](#) shall either be referenced from up to one [HealthChannelExternalStatus](#) element or from one or more [HealthChannelSupervision](#) elements **at the time when the creation of the manifest is finished**.] ()

[constr_3719] exists because the notification signature differs depending on whether the notification is caused by a [HealthChannelExternalStatus](#) or [HealthChannelSupervision](#). The restriction of only one [HealthChannelExternalStatus](#) reference exists because the notification uses the statusId of the [HealthChannelExternalStatus](#) as argument.

10.3.4.1 Supervision health channel deployment

The [HealthChannelSupervision](#) is used to take the status of a [GlobalSupervision](#) trigger the [RecoveryNotification](#) in case a violation is detected by the Phm.

[TPS_MANI_03516]{DRAFT} **Status for [HealthChannelSupervision](#)** [The status of the [GlobalSupervision](#) which is referenced in the role [supervision](#) is taken as the trigger for the [RecoveryNotification](#).] ([RS_MANI_00023](#), [RS_MANI_00032](#))

Class	HealthChannelSupervision			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element defines a health channel representing the status of a PhmSupervision.			
Base	ARObject, HealthChannel , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	PlatformHealthManagementContribution.healthChannel			
Attribute	Type	Mult.	Kind	Note
supervision	GlobalSupervision	0..1	ref	Reference to the GlobalSupervision as source for the health channel.

Table 10.32: HealthChannelSupervision

10.3.4.2 External health channel deployment

The [HealthChannelExternalStatus](#) is used to define a list of [HealthChannelExternalReportedStatus](#) in the role [healthChannel](#). If for this [HealthChannelExternalStatus](#) and the referenced [Process](#) a status is reported which is part of the list in [healthChannel](#) then this [HealthChannelExternalStatus](#) is considered violated and a notification to the respective [RecoveryNotification](#) is performed.

[TPS_MANI_03545]{DRAFT} Existence of [HealthChannelExternalStatus](#) [For each [RPortPrototype](#) typed by a [PhmHealthChannelInterface](#) there may be a [HealthChannelExternalStatus](#) defined.]([RS_MANI_00023](#), [RS_MANI_00032](#))

The attribute [HealthChannelExternalReportedStatus.statusId](#) replicates the value of the referenced [PhmHealthChannelStatus.statusId](#). During deployment the [PhmHealthChannelInterface](#) and its content is no longer available and therefore needs to be made available to the Phm.

[TPS_MANI_03625]{DRAFT} Consistency of [HealthChannelExternalReportedStatus.statusId](#) and [PhmHealthChannelStatus.statusId](#) [The value of [HealthChannelExternalReportedStatus.statusId](#) shall be identical to the value of [PhmHealthChannelStatus.statusId](#) which is referenced in [HealthChannelExternalReportedStatus.status](#).]([RS_MANI_00023](#), [RS_MANI_00032](#))

[TPS_MANI_03546]{DRAFT} Definition of reported health status [RPortPrototype](#) [The [RPortPrototype](#) typed by a [PhmHealthChannelInterface](#) is used to report the status of a health channel by the application software. This specific [RPortPrototype](#) is defined as the [targetRPortPrototype](#) of the instance reference [HealthChannelExternalStatus.healthChannel](#).]([RS_MANI_00023](#), [RS_MANI_00032](#))

[TPS_MANI_03517]{DRAFT} Evaluation of [HealthChannelExternalStatus](#) [The reported value of the [HealthChannelExternalStatus](#) according to [\[TPS_MANI_03546\]](#) will be compared to the list of statuses provided in [notifiedStatus](#). If the reported status value matches one of the listed [statusIds](#) then this

HealthChannelExternalStatus is considered violated and the respective RecoveryNotification is issued.](RS_MANI_00023, RS_MANI_00032)

[TPS_MANI_03553]{DRAFT} **Applicability of health channel to a specific Process** [The reference HealthChannelExternalStatus.process defines to which specific Process this HealthChannelExternalStatus definition shall be applied to.](RS_MANI_00023, RS_MANI_00032)

This means that only if a PhmHealthChannelStatus is reported from the context of this Process it is considered to be this HealthChannelExternalStatus.

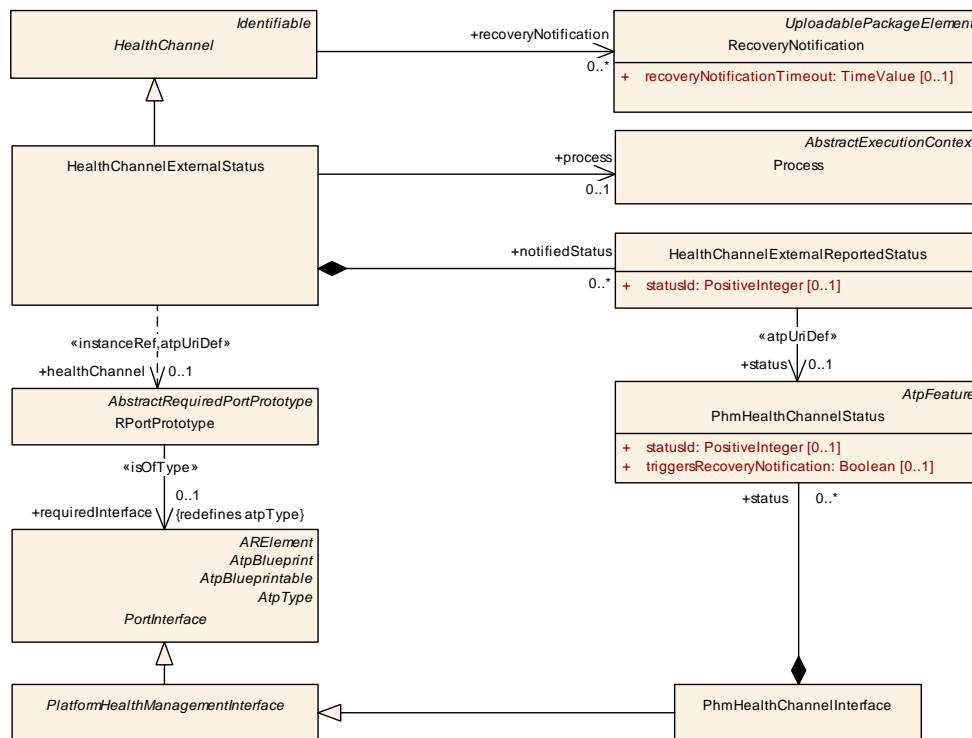


Figure 10.16: Modeling of HealthChannelExternalStatus

Class	HealthChannelExternalStatus			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element defines a health channel representing the status of an external health channel.			
Base	ARObject, HealthChannel, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	PlatformHealthManagementContribution.healthChannel			
Attribute	Type	Mult.	Kind	Note
healthChannel	RPortPrototype	0..1	iref	Refers to the HealthChannel. Stereotypes: atpUriDefInstanceRef implemented by:RPortPrototypeInExecutableInstanceRef
notifiedStatus	HealthChannelExternalReportedStatus	*	aggr	This is a list of statuses which shall trigger the Recovery Notification of this HealthChannelExternalStatus.
process	Process	0..1	ref	Defines the Process this Health Channel shall be monitored.

Table 10.33: HealthChannelExternalStatus

Class	HealthChannelExternalReportedStatus			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This element defines a health channel representing the status of an external health channel.			
Base	ARObject			
Aggregated by	HealthChannelExternalStatus.notifiedStatus			
Attribute	Type	Mult.	Kind	Note
status	PhmHealthChannel Status	0..1	ref	Reference to one status of a PhmHealthChannel. Stereotypes: atpUriDef
statusId	PositiveInteger	0..1	attr	Defines the numeric value which is used to identify the reporting of this HealthChannelExternalReportedStatus to the Phm.

Table 10.34: HealthChannelExternalReportedStatus

10.3.5 Recovery Notification

If Phm detects a Supervision violation or Health Channel violation then the associated [RecoveryNotification](#) at the [HealthChannel](#) is activated. This general setup is illustrated in figure 3.50. Via the [RecoveryNotificationToPPortPrototypeMapping](#) this [RecoveryNotification](#) is mapped to a dedicated [PPortPrototype](#) in the context of a dedicated [Process](#) implementing the State Management functionality.

[constr_3612]{DRAFT} Multiplicity of references [recoveryNotification](#), [recoveryAction](#), and [process](#) at [RecoveryNotificationToPPortPrototypeMapping](#) [The references [recoveryNotification](#), [recoveryAction](#), and [process](#) shall be defined for each [RecoveryNotificationToPPortPrototypeMapping](#) at the time when manifest creation is finished.]()

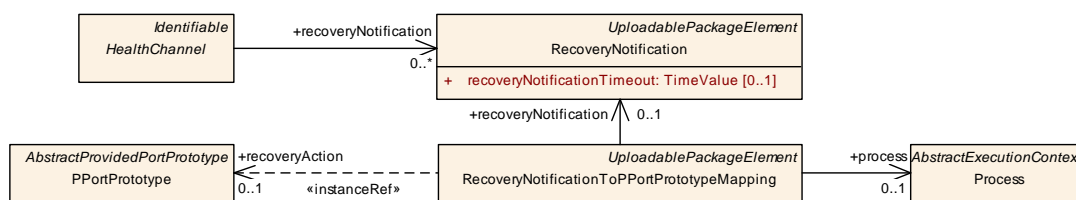


Figure 10.17: Modeling of [RecoveryNotification](#)

[constr_3613]{DRAFT} Reference to a [PhmSupervisionRecoveryNotificationInterface](#) in the context of a [HealthChannelSupervision](#) [If the [RecoveryNotification](#) is aggregated by a [HealthChannelSupervision](#) then the [RecoveryNotificationToPPortPrototypeMapping](#) shall refer to a [PPortPrototype](#) in the role [recoveryAction](#) typed by [PhmSupervisionRecoveryNotificationInterface](#).]()

[constr_3614]{DRAFT} Reference to a [PhmHealthChannelRecoveryNotificationInterface](#) in the context of a [HealthChannelExternalStatus](#) [If the [RecoveryNotification](#) is aggregated by a [HealthChannelExternalStatus](#) then the [RecoveryNotificationToPPortPrototypeMapping](#) shall refer to a

`PPortPrototype` in the role `recoveryAction` typed by `PhmHealthChannelRecoveryNotificationInterface`.]()

Class	RecoveryNotification			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This meta-class represents a PHM action that can trigger a recovery operation inside a piece of State Management software. Tags: atp.recommendedPackage=RecoveryNotifications			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
recovery Notification Timeout	TimeValue	0..1	attr	The maximum acceptable amount of time (in seconds), Platform Health Management waits for an acknowledgement by State Management after sending the notification.

Table 10.35: RecoveryNotification

Class	RecoveryNotificationToPPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	This meta-class represents the ability to associate a RecoveryNotification to a PPortPrototype while also being able to identify the respective Process in which the actual recovery executes. Tags: atp.recommendedPackage=RecoveryNotificationMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
process	Process	0..1	ref	Reference to the process which represents the State Management instance that the recovery notification shall be applied to.
recoveryAction	PPortPrototype	0..1	iref	This reference identifies the PortPrototype to be addressed as part of a PHM recovery. InstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
recovery Notification	RecoveryNotification	0..1	ref	This reference identifies the applicable Recovery Notification to be mapped.

Table 10.36: RecoveryNotificationToPPortPrototypeMapping

10.4 Time Synchronization Deployment

10.4.1 Overview

This chapter explains the configuration of the Time Synchronization functional cluster.

An adaptive AUTOSAR application can utilize several (synchronized) Time-Base Resources which are provided by the Time Synchronization functional cluster [14].

The intended interaction of an adaptive AUTOSAR application with Time Synchronization is described in chapter 3.9.

Since an adaptive Machine is usually collaborating with other Machines (adaptive) and ECUs (classic), special focus has been put on the vehicle wide definition of synchronized time.

For a detailed specification please refer to the *Global Time Synchronization* chapter in the *System Template* [19].

Figure 10.18 provides an example system view on time domains and their transportation over diverse networks. In the scope of the *AUTOSAR adaptive platform* the focus is put on the Ethernet interaction with the rest of the system.

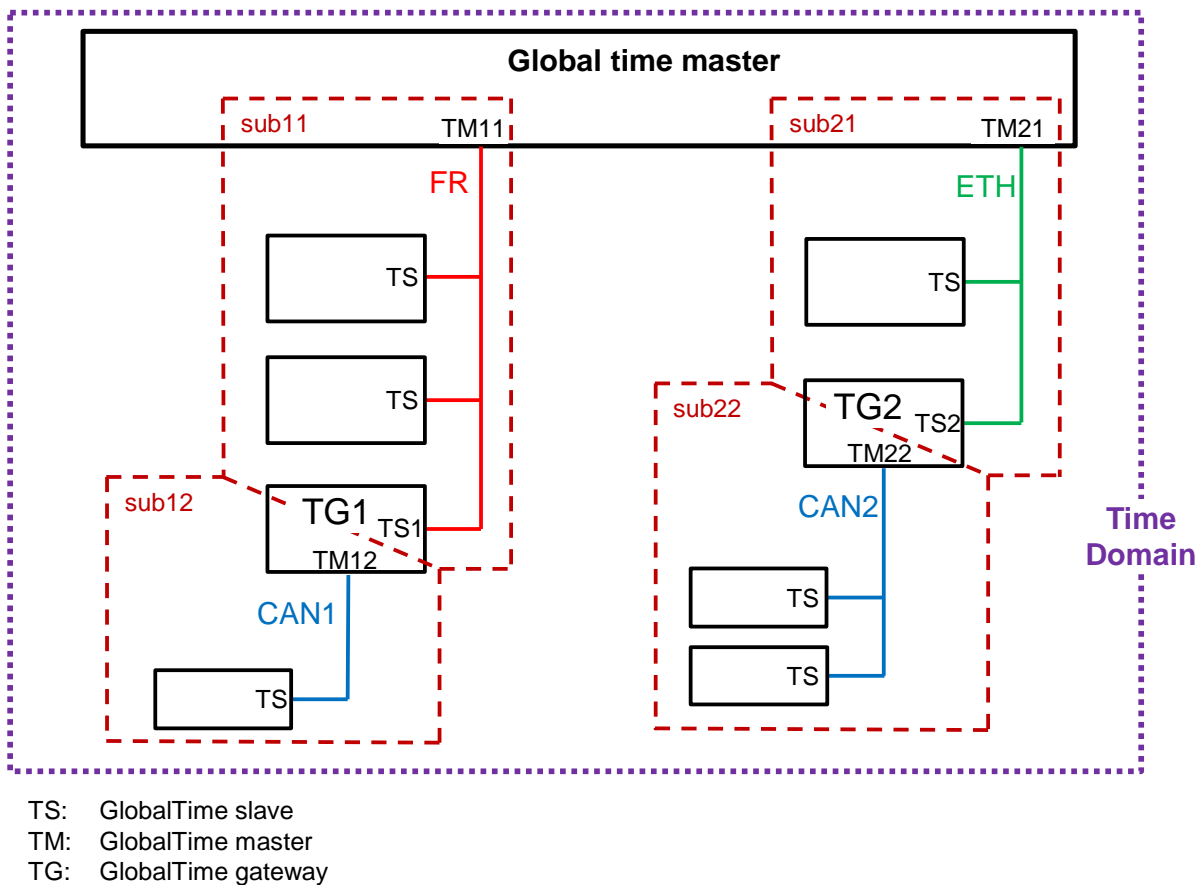


Figure 10.18: Example setup of Synchronized Global Time in AUTOSAR

10.4.2 Time Synchronization functional cluster configuration

The representation of the Time Synchronization functional cluster [14] within one specific Machine is defined by the *TimeSyncModuleInstantiation*. The Machine has the ability to define a set of *moduleInstantiations*, where a specialization can be the *TimeSyncModuleInstantiation*.

Class	TimeSyncModuleInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::TimeSync			
Note	This meta-class defines the attributes for the Time Synchronization configuration on a specific machine.			
Base	ARObject, AdaptiveModuleInstantiation , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , NonOsModuleInstantiation , Referrable			
Aggregated by	AtpClassifier.atpFeature , Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
timeBase	TimeBaseResource	*	aggr	This aggregation defines the configured Time Bases for Time Synchronization.

Table 10.37: TimeSyncModuleInstantiation

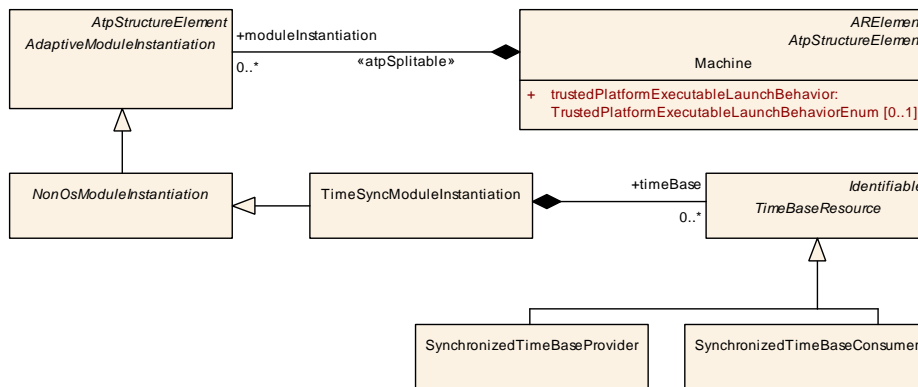


Figure 10.19: Modeling of TimeSyncModuleInstantiation

10.4.3 Time Base

The [TimeSyncModuleInstantiation](#) represents the actual instance of the Time Synchronization functional cluster executed on a specific [Machine](#). In the scope of the [TimeSyncModuleInstantiation](#) the Time-Base Resources are defined.

[TPS_MANI_03539]{DRAFT} Definition of Time-Base Resources [The meta-class [TimeSyncModuleInstantiation](#) has the ability to define a set of Time-Base Resources of kind [TimeBaseResource](#) in the role `timeBase`.] ([RS_MANI_00040](#))

There are several sub types of [TimeBaseResource](#) which will be explained in the following sections.

Class	TimeBaseResource (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::TimeSync			
Note	This meta-class represents the attributes of one Time Base Resource for Time Synchronization.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	SynchronizedTimeBaseConsumer , SynchronizedTimeBaseProvider			
Aggregated by	TimeSyncModuleInstantiation.timeBase			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.38: TimeBaseResource

10.4.3.1 Synchronized time base

When configuring a synchronized time base many configuration aspects are already provided by the definition of the [GlobalTimeDomain](#) and are specified in the *System Template* [19] and associated to [MachineDesign](#).

As for the configuration of the [TimeSyncModuleInstantiation](#) the usage of the [SynchronizedTimeBaseProvider](#) respectively [SynchronizedTimeBaseConsumer](#) defines the interaction with the [GlobalTimeDomain](#).

[TPS_MANI_03541]{DRAFT} Definition of [SynchronizedTimeBaseConsumer](#)
[The meta-class [SynchronizedTimeBaseConsumer](#) defines a Time Base which is synchronized with a time coming from the network. With the reference [SynchronizedTimeBaseConsumer.networkTimeConsumer](#) to a [GlobalTimeSlave](#) the relation to the system model is established.] ([RS_MANI_00040](#))

[TPS_MANI_03542]{DRAFT} Definition of [SynchronizedTimeBaseProvider](#)
[The meta-class [SynchronizedTimeBaseProvider](#) defines a Time Base which is propagated to a time on the network. With the reference [SynchronizedTimeBaseProvider.networkTimeProvider](#) to a [GlobalTimeMaster](#) the relation to the system model is established.] ([RS_MANI_00040](#))

Some aspects of the Synchronized Time Base for the *provider* role are not available in the system model, those are provided with the [TimeSyncCorrection](#).

[TPS_MANI_03543]{DRAFT} Definition of time sync correction attributes [The meta-class [TimeSyncCorrection](#) defines the attributes required to specify the time sync correction behavior of a [SynchronizedTimeBaseProvider](#). The [SynchronizedTimeBaseProvider](#) aggregates the [TimeSyncCorrection](#) in the role [timeSyncCorrection](#).] ([RS_MANI_00040](#))

The synchronized global time feature also supports the definition of *offset* time domains.

[TPS_MANI_03547]{DRAFT} Definition of *offset* time domains [A [GlobalTimeDomain](#) which has a [offsetTimeDomain](#) reference defined is considered an *offset* time domain. The reference source is the *offset* time domain. The reference *target* is the synchronized time domain.] ([RS_MANI_00040](#))

The *offset* time domain is applicable to [GlobalTimeMaster](#) (therefore also [SynchronizedTimeBaseProvider](#)) and [GlobalTimeSlave](#) (therefore also [SynchronizedTimeBaseConsumer](#)).

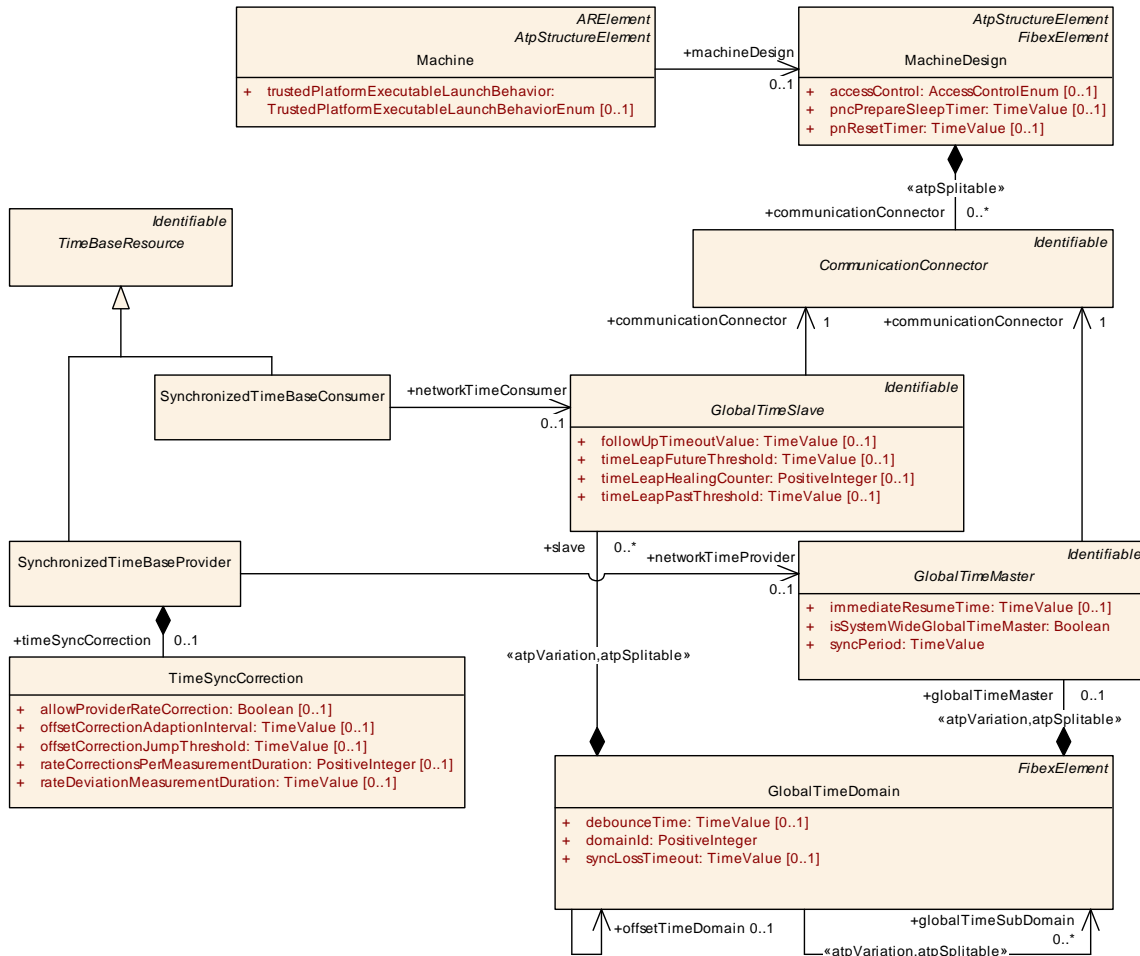


Figure 10.20: Modeling of synchronized time bases

Class	SynchronizedTimeBaseConsumer			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::TimeSync			
Note	This meta-class represents a Synchronized Time Base Consumer.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i> , <i>TimeBaseResource</i>			
Aggregated by	TimeSyncModuleInstantiation.timeBase			
Attribute	Type	Mult.	Kind	Note
networkTime Consumer	GlobalTimeSlave	0..1	ref	This reference defines the GlobalTime Consumer which is synchronized with this Time Base.

Table 10.39: SynchronizedTimeBaseConsumer

[constr_10184]{DRAFT} Multiplicity of the reference in the role *SynchronizedTimeBaseConsumer.networkTimeConsumer* [For each *SynchronizedTimeBaseConsumer*, the reference in the role *networkTimeConsumer* shall exist at the time when the creation of the manifest is finished.]()

Class	SynchronizedTimeBaseProvider			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::TimeSync			
Note	This meta-class represents a Synchronized Time Base Provider.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable , TimeBaseResource			
Aggregated by	TimeSyncModuleInstantiation.timeBase			
Attribute	Type	Mult.	Kind	Note
networkTime Provider	GlobalTimeMaster	0..1	ref	This reference defines the GlobalTime Provider which is synchronized with this Time Base.
timeSync Correction	TimeSyncCorrection	0..1	aggr	This aggregation defines the attributes used for the correction of time synchronization.

Table 10.40: SynchronizedTimeBaseProvider

[constr_10185]{DRAFT} Multiplicity of the reference in the role [SynchronizedTimeBaseProvider.networkTimeProvider](#) [For each [SynchronizedTimeBaseProvider](#), the reference in the role [networkTimeProvider](#) shall exist at the time when the creation of the manifest is finished.]()

Class	TimeSyncCorrection			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::TimeSync			
Note	This meta-class represents the attributes used for the correction of time synchronization.			
Base	ARObject			
Aggregated by	SynchronizedTimeBaseProvider.timeSyncCorrection			
Attribute	Type	Mult.	Kind	Note
allowProvider RateCorrection	Boolean	0..1	attr	Defines whether the rate correction value of a Time Base can be set by means of the method <code>setRateCorrection()</code> . false: rate correction cannot be set by method <code>setRateCorrection()</code> . true: rate correction can be set by method <code>setRateCorrection()</code> .
offsetCorrection AdaptionInterval	TimeValue	0..1	attr	Defines the interval during which the adaptive rate correction cancels out the rate and time deviation. Unit: seconds.
offsetCorrection JumpThreshold	TimeValue	0..1	attr	Threshold for the correction method. Deviations below this value will be corrected by a linear reduction over a defined timespan. Values equal and greater than this value will be corrected by immediately setting the correct time and rate in form of a jump. Unit: seconds.
rateCorrections Per Measurement Duration	PositiveInteger	0..1	attr	Number of simultaneous rate measurements to determine the current rate deviation.
rateDeviation Measurement Duration	TimeValue	0..1	attr	Time span used to calculate the rate deviation. Unit: seconds.

Table 10.41: TimeSyncCorrection

10.4.3.2 Persistent Time Base value storage

The Time Synchronization functional cluster allows to define a storage for a [SynchronizedTimeBaseProvider](#) time base. During shutdown the value of that specific

time base is stored in a `PersistencyDeploymentElement` (either `PersistencyKeyValuePair` or `PersistencyFile`) and during startup the value is read from persistency and restored at the time base.

[TPS_MANI_03632]{DRAFT} Semantics of TimeBaseProviderToPersistencyMapping [The `TimeBaseProviderToPersistencyMapping` defines that the referenced `SynchronizedTimeBaseProvider` (`TimeBaseProviderToPersistencyMapping.timeBaseProvider`) time value shall be stored to persistency during shutdown and restored from persistency during startup (`TimeBaseProviderToPersistencyMapping.persistencyDeploymentElement`).] (*RS_MANI_00040*)

It is also possible to define a cycle in which the time base value shall be stored periodically using the attribute `TimeBaseProviderToPersistencyMapping.cyclicBackupInterval`.

[TPS_MANI_03671]{DRAFT} Periodic storage of time base value [The attribute `TimeBaseProviderToPersistencyMapping.cyclicBackupInterval` defines an interval in which the time base value shall be stored periodically to the `TimeBaseProviderToPersistencyMapping.persistencyDeploymentElement`.] (*RS_MANI_00040*)

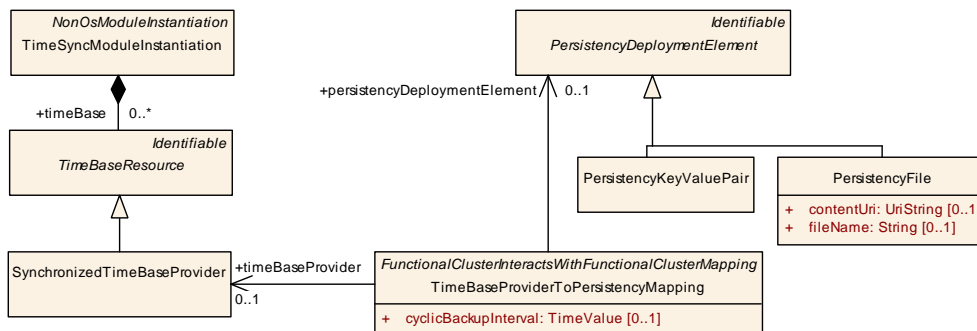


Figure 10.21: Modeling of TimeBaseProviderToPersistencyMapping

Class	TimeBaseProviderToPersistencyMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::TimeSync			
Note	This meta-class represents the ability to define a mapping between a <code>TimeBaseProvider</code> and a <code>PersistencyDeploymentElement</code> for the purpose of storing and retrieving the time value. Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
cyclicBackupInterval	TimeValue	0..1	attr	Time interval in seconds to store the time base value periodically to persistence.
persistencyDeploymentElement	PersistencyDeploymentElement	0..1	ref	This reference represents the <code>PersistencyDeploymentElement</code> where the time value shall be stored in and retrieved from.
timeBaseProvider	SynchronizedTimeBaseProvider	0..1	ref	This reference represents the mapped <code>TimeBaseProvider</code> .

Table 10.42: TimeBaseProviderToPersistencyMapping

[constr_3619]{DRAFT} **Mandatory references of TimeBaseProviderToPersistenceMapping** [The references `TimeBaseProviderToPersistenceMapping.persistenceDeploymentElement` and `TimeBaseProviderToPersistenceMapping.timeBaseProvider` shall exist at the time when manifest creation is finished.]()

10.4.3.3 Ethernet synchronized time

As the *AUTOSAR adaptive platform* supports Ethernet as communication network also the time synchronization using Ethernet is supported.

In order to configure the behavior of the Ethernet time synchronization the specific sub-classes are used as shown in figure 10.22.

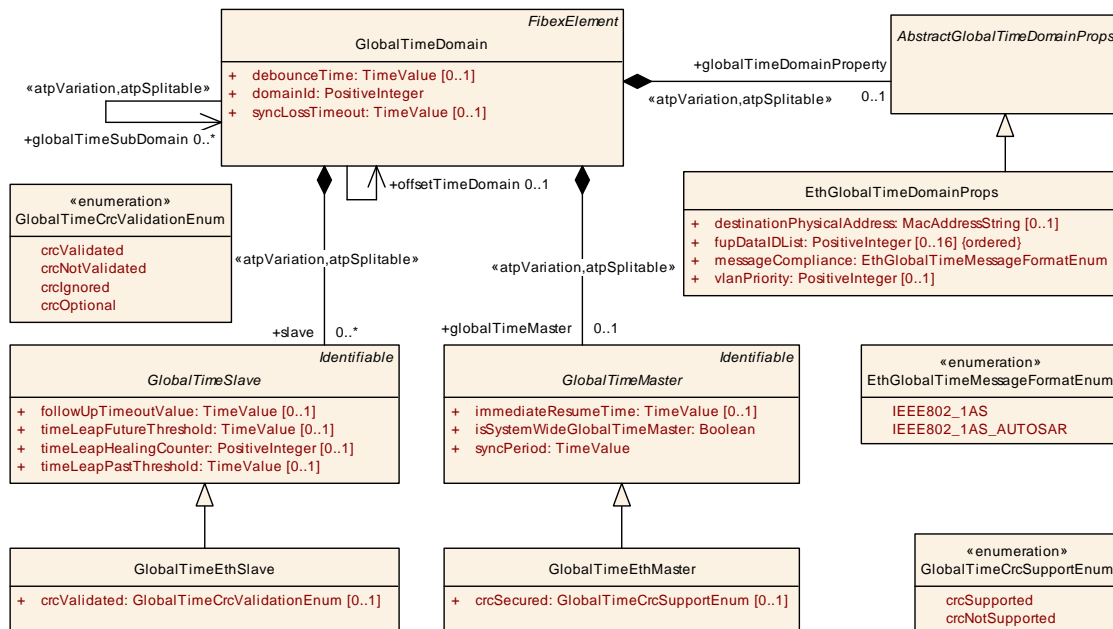


Figure 10.22: Modeling of Ethernet synchronized time

Class	EthGlobalTimeDomainProps			
Package	M2::AUTOSARTemplates::SystemTemplate::GlobalTime::ETH			
Note	Enables the definition of Ethernet Global Time specific properties.			
Base	ARObject, AbstractGlobalTimeDomainProps			
Aggregated by	GlobalTimeDomain.globalTimeDomainProperty			
Attribute	Type	Mult.	Kind	Note
crcFlags	EthTSynCrcFlags	0..1	aggr	Defines the fields of the message which shall be taken into account for CRC calculation and verification.
destination Physical Address	MacAddressString	0..1	attr	Defines the MAC multicast address the Ethernet time sync messages are communicated on.
fupDataIDList (ordered)	PositiveInteger	0..16	attr	The DataIDList for FUP messages to calculate CRC.





Class	EthGlobalTimeDomainProps			
managedCouplingPort	EthGlobalTimeManagedCouplingPort	*	aggr	Collection of CouplingPorts which are managed in the scope of this Ethernet GlobalTimeDomain.
messageCompliance	EthGlobalTimeMessageFormatEnum	1	attr	Defines the compliance of the Ethernet time sync messages to specific standards.
vlanPriority	PositiveInteger	0..1	attr	Defines which VLAN priority shall be assigned to a time sync message in case the message is sent using a VLAN tag.

Table 10.43: EthGlobalTimeDomainProps

Class	GlobalTimeEthSlave			
Package	M2::AUTOSARTemplates::SystemTemplate::GlobalTime::ETH			
Note	This represents the specialization of the GlobalTimeSlave for Ethernet communication.			
Base	ARObject, GlobalTimeSlave, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	GlobalTimeDomain.slave			
Attribute	Type	Mult.	Kind	Note
crcValidated	GlobalTimeCrcValidationEnum	0..1	attr	Definition of whether or not validation of the CRC is supported.

Table 10.44: GlobalTimeEthSlave

Class	GlobalTimeEthMaster			
Package	M2::AUTOSARTemplates::SystemTemplate::GlobalTime::ETH			
Note	This represents the specialization of the GlobalTimeMaster for Ethernet communication.			
Base	ARObject, GlobalTimeMaster, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	GlobalTimeDomain.globalTimeMaster			
Attribute	Type	Mult.	Kind	Note
crcSecured	GlobalTimeCrcSupportEnum	0..1	attr	Definition of whether or not CRC is supported. This is only relevant for selected bus systems.
subTlvConfig	EthTSynSubTlvConfig	0..1	aggr	Defines the subTLV fields which shall be included in the time sync message.

Table 10.45: GlobalTimeEthMaster

10.4.4 Time Base to Port Prototype mapping

The [TimeBaseResource](#) definition of chapter 10.4.3 and the [RPortPrototype](#) typed by a sub-class of [AbstractSynchronizedTimeBaseInterface](#) of chapter 3.9 have to be mapped to each other in order to define the binding of application software to the platform foundation software implementing the time synchronization.

[TPS_MANI_03548]{DRAFT} Definition of TimeSyncPortPrototypeToTimeBaseMapping [A [TimeSyncPortPrototypeToTimeBaseMapping](#) is used to define a mapping between a [TimeBaseResource](#) and a [RPortPrototype](#) typed by a sub-class of [AbstractSynchronizedTimeBaseInterface](#) in the context of a [Process](#).] ([RS_MANI_00040](#))

The `TimeSyncPortPrototypeToTimeBaseMapping` takes the `Process` into account so that every instantiation of an `Executable` (and the resulting instantiation of all the `RPortPrototypes` typed by a sub-class of `AbstractSynchronizedTimeBaseInterface`) can be mapped individually to `TimeBaseResources`.

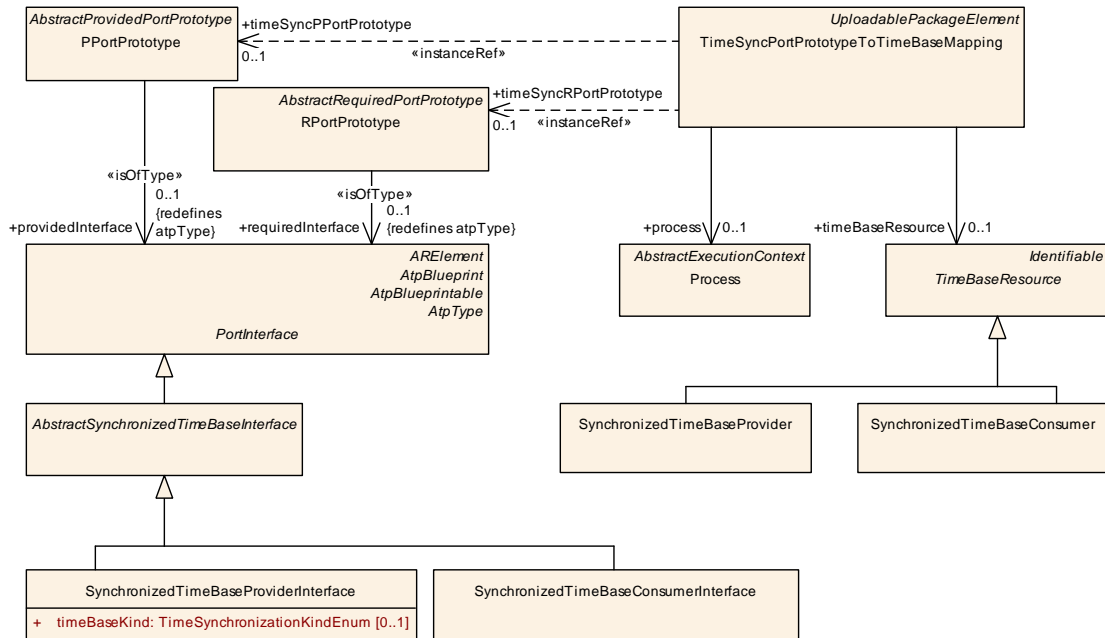


Figure 10.23: Modeling of `TimeSyncPortPrototypeToTimeBaseMapping`

Class	TimeSyncPortPrototypeToTimeBaseMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::TimeSync			
Note	This meta-class provides the ability to map a PortPrototype typed by a AbstractSynchronizedTimeBase Interface to a TimeBaseResource in the context of a Process. Tags: atp.recommendedPackage=TimeSyncPortPrototypeToTimeBaseMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
process	Process	0..1	ref	Reference to the context Process this mapping applies to.
timeBase Resource	TimeBaseResource	0..1	ref	Reference to the mapped TimeBaseResource.
timeSyncPPort Prototype	PPortPrototype	0..1	iref	Instance reference to the mapped PPortPrototype typed by a AbstractSynchronizedTimeBaseInterface. InstanceRef implemented by: PPortPrototypeInExecutableInstanceRef
timeSyncRPort Prototype	RPortPrototype	0..1	iref	Instance reference to the mapped RPortPrototype typed by a AbstractSynchronizedTimeBaseInterface. InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 10.46: TimeSyncPortPrototypeToTimeBaseMapping

The example shown in figure 10.24 illustrates the mapping of `RPortPrototypes` typed by one of the sub-classes of `AbstractSynchronizedTimeBaseInterface` to actually configured `TimeBaseResources` at the Time Sync Management.

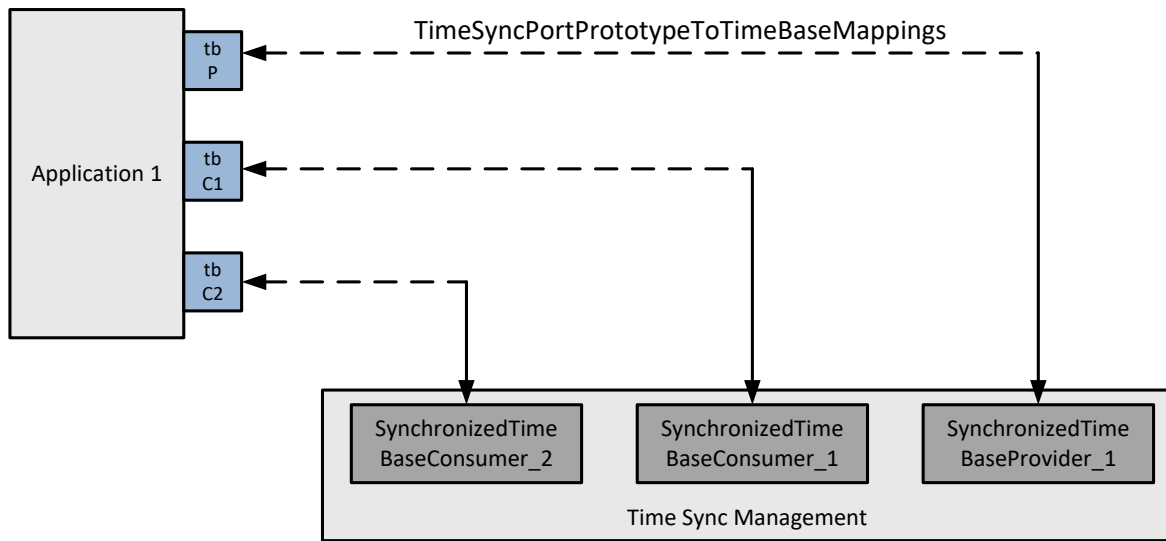


Figure 10.24: Example PortPrototype to TimeBase mapping

10.5 DoIP configuration

[TPS_MANI_03164]{DRAFT} **Machine-specific configuration settings for DoIP**
 [The *Machine*-specific configuration settings for DoIP are collected in *DoIpInstantiation*.] (*RS_MANI_00023*)

Class	DoIpInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModuleImplementation			
Note	This meta-class defines the attributes for the DoIP configuration on a specific machine.			
Base	<i>ARObject</i> , <i>AdaptiveModuleInstantiation</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>NonOsModuleInstantiation</i> , <i>Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i> , <i>Machine.moduleInstantiation</i>			
Attribute	Type	Mult.	Kind	Note
eid	PositiveUnlimitedInteger	0..1	attr	Configured EID (Entity ID) used for VehicleIdentification Request.
entityStatusMaxByteFieldUse	Boolean	0..1	attr	This attribute is used to distinguish the optional support of the Max data size element of a diagnostic entity status response.
gid	PositiveUnlimitedInteger	0..1	attr	Configured GID (Group ID) used for VehicleIdentification Request. If configured, take this value (and set "Further action required" byte to 0x00="No further action required"), if not configured use ServiceInterface DoIPGroupIdentification to retrieve GID and 'further action required' values.
gidInvalidityPattern	PositiveInteger	0..1	attr	Specifies the Byte pattern that is used for response messages if no valid GID could be retrieved. Only the value '0' or '255' is allowed.





Class	DoIpInstantiation			
logicalAddress	PositiveInteger	0..1	attr	Describes the logical address of the DoIP entity, which is used for VehicleAnnouncement and RoutingActivation responses.
maxRequest Bytes	PositiveInteger	0..1	attr	Specifies the maximum allowed bytes of a DoIP message request without the DoIP header.
network Interface	DoIpNetwork Configuration	*	aggr	Network interface specific DoIP properties.
request Configuration	DoIpRequest Configuration	*	aggr	Request configuration that is used to determine whether an incoming DiagnosticMessage request needs to be interpreted as PHYSICAL or FUNCTIONAL. Any request with target address not within the configured target address range will be rejected.
vinInvalidity Pattern	PositiveInteger	0..1	attr	Specifies the Byte pattern that is used for response messages if no valid VIN could be retrieved. Only the value '0' or '255' is allowed.

Table 10.47: DoIpInstantiation

[constr_10186]{DRAFT} Multiplicity of attribute [DoIpInstantiation.entityStatusMaxByteFieldUse](#) [For each [DoIpInstantiation](#), the attribute [entityStatusMaxByteFieldUse](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10187]{DRAFT} Multiplicity of attribute [DoIpInstantiation.gidInvalidityPattern](#) [For each [DoIpInstantiation](#), the attribute [gidInvalidityPattern](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10188]{DRAFT} Multiplicity of attribute [DoIpInstantiation.logicalAddress](#) [For each [DoIpInstantiation](#), the attribute [logicalAddress](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10189]{DRAFT} Multiplicity of attribute [DoIpInstantiation.maxRequestBytes](#) [For each [DoIpInstantiation](#), the attribute [maxRequestBytes](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10190]{DRAFT} Multiplicity of attribute [DoIpInstantiation.vinInvalidityPattern](#) [For each [DoIpInstantiation](#), the attribute [vinInvalidityPattern](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_3425]{DRAFT} Restriction of [DoIpInstantiations](#) on a [Machine](#) [Each [Machine](#) shall aggregate at most one [DoIpInstantiation](#) in the role [moduleInstantiation](#).]()

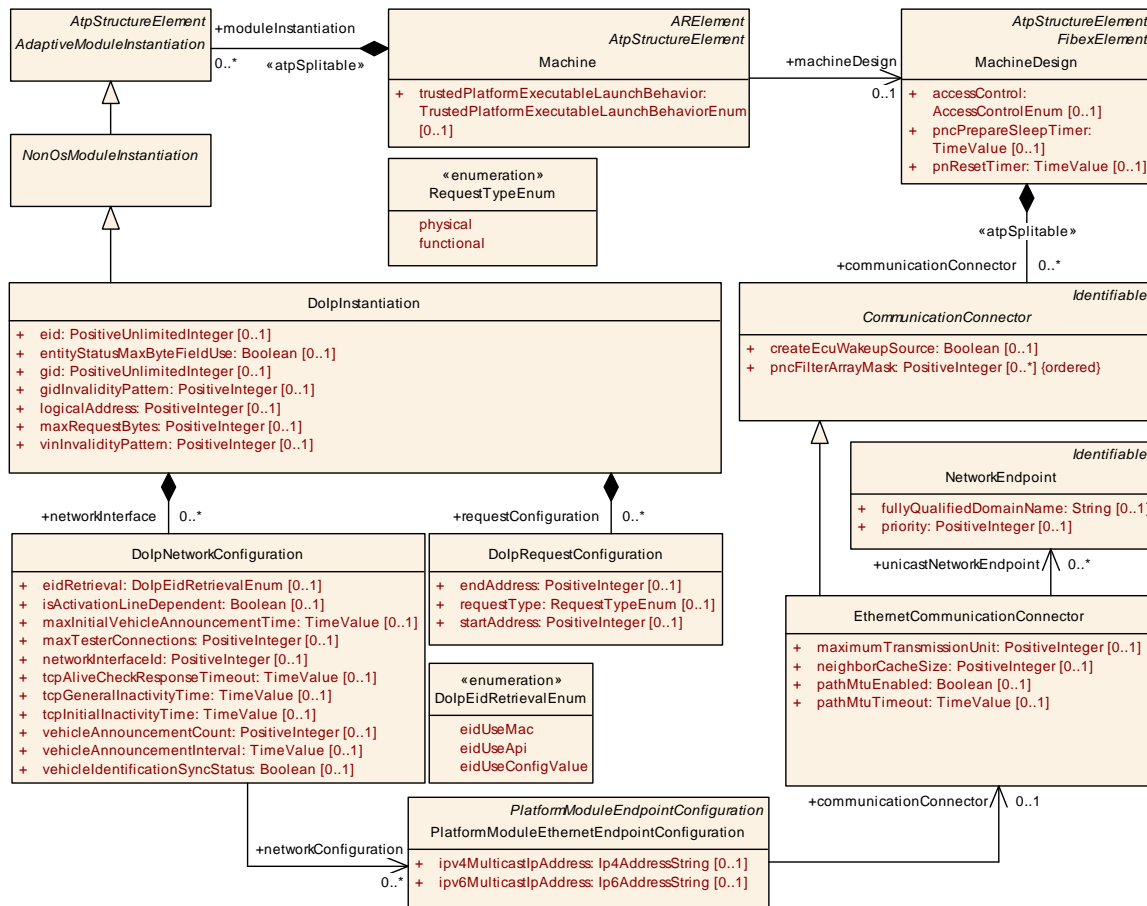


Figure 10.25: DoIP configuration

[constr_3495]{DRAFT} Supported value range for attribute DoIpInstantiation.eid [The supported value range of attribute DoIpInstantiation.eid is limited to the interval [0..281474976710655].] ()

[constr_3496]{DRAFT} Supported value range for attribute DoIpInstantiation.gid [The supported value range of attribute DoIpInstantiation.gid is limited to the interval [0..281474976710655].] ()

[constr_3497]{DRAFT} Supported value range for attribute DoIpInstantiation.maxRequestBytes [The supported value range of attribute DoIpInstantiation.maxRequestBytes is limited to the interval [0..4294967295].] ()

[constr_3498]{DRAFT} Supported value range for attribute DoIpInstantiation.logicalAddress [The supported value range of attribute DoIpInstantiation.logicalAddress is limited to the interval [0..65535].] ()

[TPS_MANI_03165]{DRAFT} Network Interface configuration for DoIP [The DoIpNetworkConfiguration contains all configuration settings that are specific for a configured network connection. The network connection is configured with the PlatformModuleEthernetEndpointConfiguration that is referenced by the DoIpNetworkConfiguration in the role networkConfiguration.]

The `tcpPort` and `udpPort` references to the `ApApplicationEndpoint` are used to configure the Transport Protocol (Udp or Tcp) and the used Port number. The IP Address is configured in the `NetworkEndpoint` that is referenced by the `Platform-ModuleEthernetEndpointConfiguration` via the `EthernetCommunication-Connector.`] (*RS_MANI_00023*)

Class		DoIpNetworkConfiguration			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation				
Note	This element collects DoIP properties that are network interface specific.				
Base	<i>ARObject</i>				
Aggregated by	DoIpInstantiation.networkInterface				
Attribute	Type	Mult.	Kind	Note	
eidRetrieval	DoIpEidRetrievalEnum	0..1	attr	This attribute defines how DoIp Entity Identification is retrieved.	
isActivationLine Dependent	Boolean	0..1	attr	This attribute defines whether the network interface <ul style="list-style-type: none"> is started "on-demand" when an activation line is sensed or is always available. 	
maxInitial Vehicle Announcement Time	TimeValue	0..1	attr	Upper bound for the time to wait in [s] for sending first vehicle announcement message after IP address assignment. Represents parameter A_DoIP_Announce_Wait of ISO 13400-2:2012. The value of this timing shall be determined randomly in the closed interval [0..max InitialVehicleAnnouncementTime].	
maxTester Connections	PositiveInteger	0..1	attr	Maximum amount of tester connections that shall be maintained at one time before alive check is performed.	
network Configuration	PlatformModule EthernetEndpoint Configuration	*	ref	Network configuration (Protocol, Port, IP Address) for transmission of DoIP messages on a specific VLAN.	
network InterfaceId	PositiveInteger	0..1	attr	This attribute defines the identifier for the DoIPInterface.	
tcpAliveCheck Response Timeout	TimeValue	0..1	attr	Timeout in [s] for waiting for a response to an Alive Check request before the connection is considered to be disconnected. Represents parameter T_TCP_AliveCheck of ISO 13400-2:2012.	
tcpGeneral InactivityTime	TimeValue	0..1	attr	Timeout in [s] for maximum inactivity of a TCP socket connection before the DoIP module will close the according socket connection. Represents parameter T_TCP_General_Inactivity of ISO 13400-2:2012.	
tcpInitial InactivityTime	TimeValue	0..1	attr	Timeout in [s] used for initial inactivity of a connected TCP socket connection directly after socket connection. Represents parameter T_TCP_Initial_Inactivity of ISO 13400-2:2012.	
vehicle Announcement Count	PositiveInteger	0..1	attr	Number of vehicle announcement messages on IP address assignment. Represents parameter A_DoIP_Announce_Num of ISO 13400-2:2012.	
vehicle Announcement Interval	TimeValue	0..1	attr	Time to wait in [s] for sending subsequent vehicle announcement messages. Represents parameter A_DoIP_Announce_Interval of ISO 13400-2:2012.	
vehicle Identification SyncStatus	Boolean	0..1	attr	Defines if the optional VIN/GID synchronization status is used additionally in the vehicle identification/ announcement.	

Table 10.48: DoIpNetworkConfiguration

[constr_10191]{DRAFT} Multiplicity of attribute DoIpNetworkConfiguration.isActivationLineDependent [For each DoIpNetworkConfiguration, the attribute isActivationLineDependent shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10192]{DRAFT} Multiplicity of attribute DoIpNetworkConfiguration.maxInitialVehicleAnnouncementTime [For each DoIpNetworkConfiguration, the attribute maxInitialVehicleAnnouncementTime shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10193]{DRAFT} Multiplicity of attribute DoIpNetworkConfiguration.maxTesterConnections [For each DoIpNetworkConfiguration, the attribute maxTesterConnections shall exist **at the time when the creation of the manifest is finished.**]()

[constr_3734]{DRAFT} Upper multiplicity of reference in the role DoIpNetworkConfiguration.networkConfiguration [In the context of DoIpNetworkConfiguration, the reference in the role networkConfiguration shall exist at most once **at the time when the creation of the manifest is finished.**]()

[constr_10194]{DRAFT} Multiplicity of attribute DoIpNetworkConfiguration.networkInterfaceId [For each DoIpNetworkConfiguration, the attribute networkInterfaceId shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10195]{DRAFT} Multiplicity of attribute DoIpNetworkConfiguration.vehicleIdentificationSyncStatus [For each DoIpNetworkConfiguration, the attribute vehicleIdentificationSyncStatus shall exist **at the time when the creation of the manifest is finished.**]()

Class	PlatformModuleEthernetEndpointConfiguration			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModuleImplementation			
Note	This meta-class defines the attributes for the configuration of a port, protocol type and IP address of the communication on a VLAN. Tags: atp.recommendedPackage=PlatformModuleEndpointConfigurations			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PlatformModuleEndpointConfiguration , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
communicationConnector	EthernetCommunicationConnector	0..1	ref	Reference to the CommunicationConnector (VLAN) for which the network configuration is defined.
ipv4MulticastIpAddress	Ip4AddressString	0..1	attr	Multicast IPv4 Address to which the message will be transmitted.
ipv6MulticastIpAddress	Ip6AddressString	0..1	attr	Multicast IPv6 Address to which the message will be transmitted.
tcpPort	ApApplicationEndpoint	0..1	ref	This reference allows to configure a tcp port number.
udpPort	ApApplicationEndpoint	0..1	ref	This reference allows to configure a udp port number.

Table 10.49: PlatformModuleEthernetEndpointConfiguration

Please note that it is possible to define several `networkInterfaces` in a `DoIpInstantiation`. For each network connection individual configuration settings can be set with the attributes that are defined in the `DoIpNetworkConfiguration` element, e.g. it is possible to configure the vehicle announcement for different network connections differently.

[TPS_MANI_03294]{DRAFT} Semantics of `DoIpNetworkConfiguration.eidRetrieval` [If `DoIpNetworkConfiguration.eidRetrieval` is set to:

- `eidUseConfigValue`, then take the value from `DoIpInstantiation.eid`
- `eidUseApi`, then `DoIpInstantiation.eid` shall be ignored and the API `DiagnosticDoIPEntityIdentification` shall be used to retrieve the `eid`
- `eidUseMac`, then `DoIpInstantiation.eid` shall be ignored and the MAC shall be taken as as the `eid`

](*RS_MANI_00023*)

[constr_5343]{DRAFT} Usage of `DoIpNetworkConfiguration.eidRetrieval` [If `DoIpNetworkConfiguration.eidRetrieval` is set to `eidUseConfigValue` then `DoIpInstantiation.eid` shall exist and a value shall be assigned to it **at the time when the creation of the manifest is finished.**](*RS_MANI_00023*)

[TPS_MANI_03218]{DRAFT} Default value for the attribute `tcpInitialInactivityTime` of meta-class `DoIpNetworkConfiguration` [If no value for the attribute `DoIpNetworkConfiguration.tcpInitialInactivityTime` is defined then the default value of 2 seconds shall be assumed.](*RS_MANI_00023*)

[TPS_MANI_03219]{DRAFT} Default value for the attribute `tcpGeneralInactivityTime` of meta-class `DoIpNetworkConfiguration` [If no value for the attribute `DoIpNetworkConfiguration.tcpGeneralInactivityTime` is defined then the default value of 300 seconds shall be assumed.](*RS_MANI_00023*)

[TPS_MANI_03220]{DRAFT} Default value for the attribute `vehicleAnnouncementCount` of meta-class `DoIpNetworkConfiguration` [If no value for the attribute `DoIpNetworkConfiguration.vehicleAnnouncementCount` is defined then the default value of 3 shall be assumed.](*RS_MANI_00023*)

[TPS_MANI_03221]{DRAFT} Default value for the attribute `vehicleAnnouncementInterval` of meta-class `DoIpNetworkConfiguration` [If no value for the attribute `DoIpNetworkConfiguration.vehicleAnnouncementInterval` is defined then the default value of 0,5 seconds shall be assumed.](*RS_MANI_00023*)

[TPS_MANI_03222]{DRAFT} Default value for the attribute `tcpAliveCheckResponseTimeout` of meta-class `DoIpNetworkConfiguration` [If no value for the attribute `DoIpNetworkConfiguration.tcpAliveCheckResponseTimeout` is defined then the default value of 0,5 seconds shall be assumed.](*RS_MANI_00023*)

During vehicle discovery the DoIP module responds by informing the tester about its own address, configured as the `logicalAddress`. The tester will approach the ECU

under this UDS target address, thus the ECU should have a `SoftwareCluster` that is configured to respond to this UDS target address.

The list of available target addresses may or may not be obtainable from the `SoftwareCluster` with the `logicalAddress`.

In some cases, this `SoftwareCluster` may have the ability to inform the tester which other existing physical and/or logical addresses are available.

Class	DoIpRequestConfiguration			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation			
Note	This meta-class specifies a range of target addresses and its interpretation as either physical or functional request.			
Base	ARObject			
Aggregated by	DoIpInstantiation.requestConfiguration			
Attribute	Type	Mult.	Kind	Note
endAddress	PositiveInteger	0..1	attr	End address for range of target-addresses (including this address).
requestType	RequestTypeEnum	0..1	attr	Determines the type of request.
startAddress	PositiveInteger	0..1	attr	Start address for range of target-addresses (including this address).

Table 10.50: DoIpRequestConfiguration

[constr_10197]{DRAFT} Multiplicity of attribute DoIpRequestConfiguration.endAddress [For each `DoIpRequestConfiguration`, the attribute `endAddress` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10198]{DRAFT} Multiplicity of attribute DoIpRequestConfiguration.requestType [For each `DoIpRequestConfiguration`, the attribute `requestType` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10199]{DRAFT} Multiplicity of attribute DoIpRequestConfiguration.startAddress [For each `DoIpRequestConfiguration`, the attribute `startAddress` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_3492]{DRAFT} DoIpInstantiation.logicalAddress shall be defined as member in the DoIpRequestConfiguration [The `DoIpInstantiation.logicalAddress` shall be a member of the intervals of available physical addresses configured for the `DoIpInstantiation` in the `requestConfiguration`.]()

On top of that, there is the expectation that the configured `diagnosticDeploymentProps.diagnosticAddresses` of `SoftwareClusters` deployed to the `Machine` fit to the intervals defined in the context of the `DoIpInstantiation` in the `requestConfiguration`.

Please note that the `DoIpRequestConfiguration` corresponds to Table 39 that is defined in ISO-13400-2 [22].

[constr_3499]{DRAFT} Supported value range for attribute `DoIpRequestConfiguration.startAddress` [The supported value range of attribute `DoIpRequestConfiguration.startAddress` is limited to the interval [0..65535].]

()

[constr_5000]{DRAFT} Supported value range for attribute `DoIpRequestConfiguration.endAddress` [The supported value range of attribute `DoIpRequestConfiguration.endAddress` is limited to the interval [0..65535].]

[constr_3414]{DRAFT} Allowed usage of `PlatformModuleEthernetEndpointConfiguration` attributes that are allowed to be used to configure the network communication in the different platform modules [

	Element	
	Usage in <code>DoIpInstantiation</code>	Usage in <code>DltLogSink</code>
<code>PlatformModuleEthernetEndpointConfiguration</code> attributes		
<code>tcpPort</code>	Optional	Optional
<code>udpPort</code>	Optional	Optional
<code>ipv4MulticastIpAddress</code>	N/A	N/A
<code>ipv6MulticastIpAddress</code>	N/A	N/A
<code>communicationConnector</code>	Mandatory	Mandatory

]()

10.6 Log and Trace module configuration

The Log and Trace functionality in AUTOSAR supports the monitoring of applications and provides means to forward logging information onto the communication bus, the console, or to the file system.

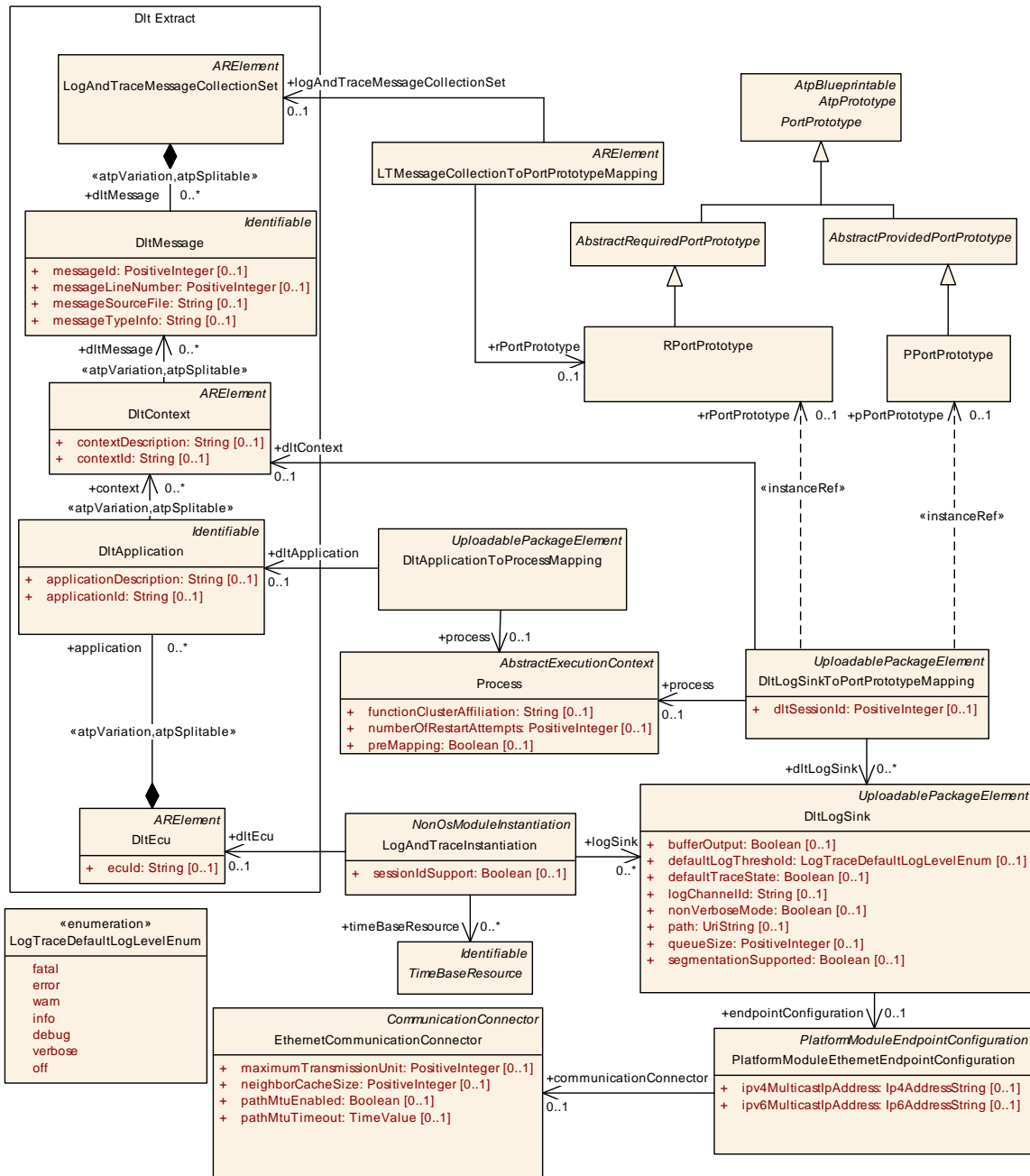


Figure 10.26: Log and Trace module configuration

The logging information is put into a standardized delivery and presentation format that is described in more detail in the Log and Trace Protocol specification [23]. The format contains meta-data that identifies for example the application that produces the logging information.

This chapter describes settings that are available in the Machine Manifest to configure the logging framework and defines the relation between the application design and the deployment model.

Please note that the modeling elements described in this chapter are using elements from the Log And Trace Extract Template that defines a AUTOSAR platform independent format for description of log and trace messages and the source that produces these log and trace messages.

10.6.1 Log and trace deployment

[TPS_MANI_03162]{DRAFT} **Machine-specific configuration settings for the Log and Trace functional cluster** [The *Machine*-specific configuration settings for the Log and Trace functional cluster are collected in *LogAndTraceInstantiation*.] (*RS_MANI_00023*)

[TPS_MANI_03282]{DRAFT} **Assignment of a Dlt Ecu Identifier to a LogAndTraceInstantiation** [The *Machine* is represented in the Log And Trace Extract by the *DltEcu* that is referenced from the *LogAndTraceInstantiation* in the role *dltEcu*. The referenced *DltEcu* defines the *ecuId* that is transported in the standard header of the log and trace message.] (*RS_MANI_00023*)

Class	LogAndTraceInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace			
Note	This meta-class defines the attributes for the Log&Trace configuration on a specific machine.			
Base	ARObject, AdaptiveModuleInstantiation, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, NonOsModuleInstantiation, Referrable			
Aggregated by	AtpClassifier.atpFeature, Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
dltEcu	DltEcu	0..1	ref	Reference to the Ecu representation in the Log And Trace Extract.
logSink	DltLogSink	*	ref	Reference to output sinks for log or trace messages that are produced on the Machine.
sessionIdSupport	Boolean	0..1	attr	This attribute defines whether the sessionId is used or not.
timeBaseResource	TimeBaseResource	*	ref	This reference is used to describe to which time base the Log and Trace module has access. From the Time Base Resource the Log and Trace module gets the needed information to generate the time stamp.

Table 10.51: LogAndTraceInstantiation

[constr_5275]{DRAFT} **Existence of LogAndTraceInstantiation.dltEcu** [For each *LogAndTraceInstantiation* the reference to *DltEcu* in the role *dltEcu* shall exist at the time when the creation of the manifest is finished.]()

[constr_5276]{DRAFT} **Existence of LogAndTraceInstantiation.logSink** [Each *LogAndTraceInstantiation* shall reference at least one *DltLogSink* in the role *logSink* at the time when the creation of the manifest is finished.]()

[constr_3729]{DRAFT} **Upper multiplicity of reference in the role LogAndTraceInstantiation.timeBaseResource** [In the context of *LogAndTraceInstantiation*, the reference in the role *timeBaseResource* shall exist at most once **at the time when the creation of the manifest is finished.**]()

[TPS_MANI_03274]{DRAFT} **Configuration of log and trace sinks** [The output sinks for log or trace messages that are produced on the *Machine* are defined by *DltLogSinks* that are referenced in the role *logSink* from the *LogAndTraceInstantiation*.] (*RS_MANI_00023*)

Class	DltLogSink			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace			
Note	The meta-class defines the output sink for DltLogMessages Tags: atp.recommendedPackage=DltLogSinks			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
bufferOutput	Boolean	0..1	attr	This attribute defines whether a buffer is used in case that the output sink is the console.
defaultLogThreshold	LogTraceDefaultLogLevelEnum	0..1	attr	This attribute allows to set a log level Threshold for Log Level filtering.
defaultTraceState	Boolean	0..1	attr	This attributes defines the default trace status.
endpointConfiguration	PlatformModuleEthernetEndpointConfiguration	0..1	ref	Network configuration (Protocol, Port, IP Address) for transmission of dlt messages on a specific VLAN.
logChannelId	String	0..1	attr	This attribute identifies the LogChannel for usage within the Log And Trace protocol.
nonVerboseMode	Boolean	0..1	attr	This attribute defines whether this DltLogSink supports non-Verbose Dlt messages. If disabled only verbose mode messages shall be used.
path	UriString	0..1	attr	This attribute defines the path to the file that is used as output sink.
queueSize	PositiveInteger	0..1	attr	Length of the queue (in which messages can be stored before processing) in the unit "Log message".
segmentationSupported	Boolean	0..1	attr	If enabled, segmentation will be used for DLT messages that are larger than EthernetCommunicationConnector.maximumTransmissionUnit referenced via DltLogSink.endpointConfiguration.

Table 10.52: DltLogSink

Enumeration	LogTraceDefaultLogLevelEnum
Package	M2::AUTOSARTemplates::SystemTemplate::Dlt
Note	This enum defines available log&trace log levels that may be used to define the severity level of a log message.
Aggregated by	DltLogChannel.logTraceDefaultLogThreshold, DltLogSink.defaultLogThreshold
Literal	Description
debug	Detailed information for programmers Tags: atp.EnumerationLiteralIndex=4
error	Error with impact to correct functionality Tags: atp.EnumerationLiteralIndex=1
fatal	Fatal error Tags: atp.EnumerationLiteralIndex=0





Enumeration	LogTraceDefaultLogLevelEnum
info	High level information Tags: atp.EnumerationLiteralIndex=3
off	logging is turned off Tags: atp.EnumerationLiteralIndex=6
verbose	Verbose debug message Tags: atp.EnumerationLiteralIndex=5
warn	Warning if correct behavior cannot be ensured Tags: atp.EnumerationLiteralIndex=2

Table 10.53: LogTraceDefaultLogLevelEnum

[TPS_MANI_03283]{DRAFT} **Standardized values for attribute `DltLogSink.category`** [AUTOSAR reserves the following values for attribute `DltLogSink.category`:

- `DLT_LOGSINK_REMOTE`
- `DLT_LOGSINK_DLT`
- `DLT_LOGSINK_FILE`
- `DLT_LOGSINK_CONSOLE`

]([RS_MANI_00023](#))

[TPS_MANI_02384]{DRAFT} **`DltLogSink` with category `DLT_LOGSINK_REMOTE`** [`DltLogSink` with category `DLT_LOGSINK_REMOTE` provides means to forward logging information to a Dlt log channel defined by `logChannelId`.]([RS_MANI_00023](#))

[TPS_MANI_02385]{DRAFT} **`DltLogSink` with category `DLT_LOGSINK_DLT`** [`DltLogSink` with category `DLT_LOGSINK_DLT` provides means to forward logging information onto on a specific VLAN configured by `endpointConfiguration` via a Dlt log channel defined by `logChannelId`.]([RS_MANI_00023](#))

[TPS_MANI_02386]{DRAFT} **`DltLogSink` with category `DLT_LOGSINK_FILE`** [`DltLogSink` with category `DLT_LOGSINK_FILE` provides means to forward logging information to a file in `path` of a file system.]([RS_MANI_00023](#))

[TPS_MANI_02387]{DRAFT} **`DltLogSink` with category `DLT_LOGSINK_CONSOLE`** [`DltLogSink` with category `DLT_LOGSINK_CONSOLE` provides means to forward logging information to the console.]([RS_MANI_00023](#))

[TPS_MANI_03163]{DRAFT} **Network configuration for Log and Trace messages** [The output channel on Ethernet for Log and Trace messages is configured with the `PlatformModuleEthernetEndpointConfiguration` that is referenced by the `DltLogSink` in the role `endpointConfiguration`. The attributes `tcpPort` and `udpPort` are used to configure the Transport Protocol (Udp or Tcp) and the used Port number. The IP Address is configured in the `NetworkEndpoint` that is referenced

by the PlatformModuleEthernetEndpointConfiguration via the EthernetCommunicationConnector.](RS_MANI_00023)

[constr_5277]{DRAFT} applicable DltLogSink categorys vs. DltLogSink attributes [

Category	Applicable to ...					
	DltLogSink.logChannelId	DltLogSink.endpointConfiguration	DltLogSink.path	DltLogSink.bufferOutput	DltLogSink.nonVerboseMode	DltLogSink.segmentationSupported
DLT_LOGSINK_REMOTE	x					
DLT_LOGSINK_DLT	x	x			x	x
DLT_LOGSINK_FILE			x			
DLT_LOGSINK_CONSOLE				x		

]()

[constr_5278]{DRAFT} DltLogSink with category DLT_LOGSINK_REMOTE is only allowed to be referenced by DltLogSinkToPortPrototypeMapping [DltLogSink with category DLT_LOGSINK_REMOTE shall not be referenced by LogAndTraceInstantiation in the role logSink.]()

[constr_5279]{DRAFT} DltLogSink with category DLT_LOGSINK_DLT is only allowed to be referenced by LogAndTraceInstantiation [DltLogSink with category DLT_LOGSINK_DLT shall not be referenced by DltLogSinkToPortPrototypeMapping in the role dltLogSink.]()

[constr_5281]{DRAFT} Existence of DltLogSink.defaultTraceState [For each DltLogSink, attribute defaultTraceState shall exist at the time when the creation of the manifest is finished.]()

10.6.2 Relation between design and deployment

The relation between the DltLogSink and applications that are monitored and are producing the logging information is created with the DltLogSinkToPortPrototypeMapping.

[TPS_MANI_02388]{DRAFT} Semantics of DltLogSinkToPortPrototypeMapping [Meta-class DltLogSinkToPortPrototypeMapping has the ability to map

a specific [PortPrototype](#) referenced in the role [rPortPrototype](#) or [pPortPrototype](#) to a [DltLogSink](#) referenced in the role [dltLogSink](#). The [dltContext](#) reference to the [DltContext](#) that is defined in the Log And Trace Extract defines the relationship to [DltMessages](#) that the application produces.

The mapping also comprises a reference to meta-class [Process](#) in order to accommodate for the fact that identical combinations of [DltLogSink](#) and [PortPrototype](#) may or may not apply for a given [Process](#) that represents the enclosing [Executable](#) at runtime.]([RS_MANI_00023](#))

[constr_5282]{DRAFT} Existence of [DltLogSinkToPortPrototypeMapping](#).[process](#) [Each [DltLogSinkToPortPrototypeMapping](#) shall reference a [Process](#) in the role [process](#) **at the time when the creation of the manifest is finished.**]([\(\)](#))

[constr_5283]{DRAFT} Existence of [DltLogSinkToPortPrototypeMapping](#).[dltLogSink](#) [Each [DltLogSinkToPortPrototypeMapping](#) shall reference at least one [DltLogSink](#) in the role [dltLogSink](#) **at the time when the creation of the manifest is finished.**]([\(\)](#))

[constr_5284]{DRAFT} Existence of [DltLogSinkToPortPrototypeMapping](#).[dltContext](#) [Each [DltLogSinkToPortPrototypeMapping](#) shall reference a [DltContext](#) in the role [dltContext](#) **at the time when the creation of the manifest is finished.**]([\(\)](#))

[constr_5285]{DRAFT} Existence of [PortPrototype](#) references in [DltLogSinkToPortPrototypeMapping](#) [Each [DltLogSinkToPortPrototypeMapping](#) shall reference exactly one [PortPrototype](#) in the role [rPortPrototype](#) or [pPortPrototype](#) **at the time when the creation of the manifest is finished.**]([\(\)](#))

Class	DltLogSinkToPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace			
Note	This meta-class maps a PortPrototype to an output sink of a log and trace message. Tags: atp.recommendedPackage=DltLogSinkToPortPrototypeMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackageElement			
Attribute	Type	Mult.	Kind	Note
dltContext	DltContext	0..1	ref	Assignment of the DltContext that groups log and trace messages that will be transmitted to the DltLogSink .
dltLogSink	DltLogSink	*	ref	Reference to the output sink to which the log or trace message will be transmitted,
dltSessionId	PositiveInteger	0..1	attr	This attribute allows distinguishing log/trace messages from different instances of the same SW-C.
pPortPrototype	PPortPrototype	0..1	iref	Reference to PPortPrototype that is mapped to the DltLogSink . InstanceRef implemented by: PPortPrototypeInExecutableInstanceRef





Class	DltLogSinkToPortPrototypeMapping			
process	Process	0..1	ref	This reference represents the process required as context for the mapping.
rPortPrototype	RPortPrototype	0..1	iref	Reference to RPortPrototype that is mapped to a DltLog Sink InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 10.54: DltLogSinkToPortPrototypeMapping

[constr_5286]{DRAFT} Restriction applicable for [DltLogSinkToPortPrototypeMapping.rPortPrototype](#) [The reference [DltLogSinkToPortPrototypeMapping.rPortPrototype](#) shall only be used for a [RPortPrototype](#) typed by a [LogAndTraceInterface](#) or by a [ServiceInterface](#).]()

[constr_5287]{DRAFT} Restriction applicable for [DltLogSinkToPortPrototypeMapping.pPortPrototype](#) [The reference [DltLogSinkToPortPrototypeMapping.pPortPrototype](#) shall only be used for a [PPortPrototype](#) typed by a [ServiceInterface](#).]()

With the possibility to map a [DltLogSink](#) to a [PortPrototype](#) typed by a [ServiceInterface](#) it is possible to describe the ara::com communication that is monitored by Log And Trace.

[TPS_MANI_03286]{DRAFT} Assignment of [DltApplication](#) to a [Process](#) [Meta-class [DltApplicationToProcessMapping](#) has the ability to map a specific [DltApplication](#) that defines the [applicationId](#) used in the Log And Trace Protocol to a [Process](#).]([RS_MANI_00023](#))

[constr_5292]{DRAFT} Assigned [dltSessionId](#) shall be consistent for the same [PortPrototype](#) [If several [DltLogSinkToPortPrototypeMappings](#) are referencing the same [PortPrototype](#) in the role [rPortPrototype](#) or [pPortPrototype](#) then the value for the [dltSessionId](#) in all these [DltLogSinkToPortPrototypeMappings](#) shall be the same.]()

Class	DltApplicationToProcessMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace			
Note	This element assigns a DltApplicationId to a Process . Tags: atp.recommendedPackage=DltApplicationToProcessMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dltApplication	DltApplication	0..1	ref	Reference to a DltApplication that defines the application Id
process	Process	0..1	ref	Reference to the process that is assigned to a Log And Trace applicationId.

Table 10.55: DltApplicationToProcessMapping

[constr_5288]{DRAFT} **Existence of `process` reference in `DltApplicationToProcessMapping`** [Each `DltApplicationToProcessMapping` shall reference a `Process` in the role `process` at the time when the creation of the manifest is finished.]()

[constr_5289]{DRAFT} **Existence of `dltApplication` reference in `DltApplicationToProcessMapping`** [Each `DltApplicationToProcessMapping` shall reference a `DltApplication` in the role `dltApplication` at the time when the creation of the manifest is finished.]()

10.7 Network Management configuration

10.7.1 UDP Network Management

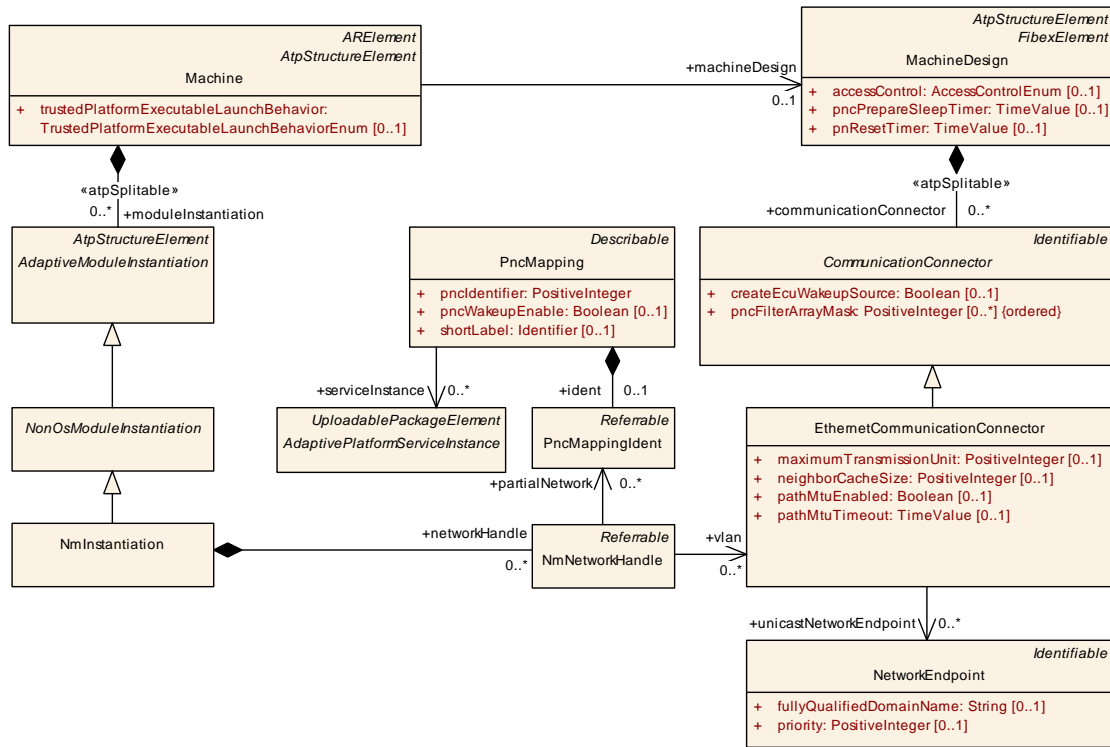
[TPS_MANI_03166]{DRAFT} **Machine-specific configuration settings for NM module** [The `Machine`-specific configuration settings for Nm are collected in `NmInstantiation`.] (*RS_MANI_00023*)

[TPS_MANI_03226]{DRAFT} **Collection of `partialNetworks` and `VLANs` in `NmNetworkHandle`** [The `NmNetworkHandle` element is used to describe a collection of `partialNetworks` and `vlangs` that can be controlled collectively by the State Management.] (*RS_MANI_00023*)

The `UdpNmCluster` with all included `UdpNmNodes` is described in the `System` design model. With the reference `NmNode.machine` the relation between the `System` design model and the `NmInstantiation` on a `Machine` is established.

Typically, the `System` design model is provided by an OEM that defines the network configuration and provides all configuration settings that are relevant for a network management cluster to an integrator. The NM configuration options that will typically be set by an Integrator are collected in the `NmInstantiation` element. The Machine Manifest delivery to configure `UdpNm` consists of both, the `NmInstantiation` settings together with the `UdpNmCluster` and `UdpNmNode` settings.

The `NmConfig` element is a wrapper that contains all network management specific configuration settings in the `System` model.


Figure 10.27: Network configuration for Nm

Class	NmInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation			
Note	This meta-class defines the attributes for the Nm configuration on a specific machine.			
Base	ARObject, AdaptiveModuleInstantiation, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, NonOsModuleInstantiation, Referrable			
Aggregated by	AtpClassifier.atpFeature, Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
networkHandle	NmNetworkHandle	*	aggr	Supported NmNetworkHandles used to control Partial Network Clusters/VLANs.

Table 10.56: NmInstantiation

Class	NmNetworkHandle			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation			
Note	Group of partialNetworks and/or VLANs that can be controlled collectively.			
Base	ARObject, Referrable			
Aggregated by	NmInstantiation.networkHandle			
Attribute	Type	Mult.	Kind	Note
partialNetwork	PncMappingIdent	*	ref	Reference to a Partial Network that is included in the Nm NetworkHandle.
vlan	EthernetCommunication Connector	*	ref	Reference to a VLAN that is included in the NmNetwork Handle.

Table 10.57: NmNetworkHandle

AUTOSAR Adaptive Network Management is based on periodic NM messages, which are received by all [UdpNmNodes](#) in the [UdpNmCluster](#) via multicast. Reception of NM packets indicates that sending [UdpNmNodes](#) want to keep the [UdpNmCluster](#) awake.

If any node is ready to go to sleep mode, it stops sending NM messages, but as long as NM packets from other [UdpNmNodes](#) are received, it postpones transition to sleep mode.

[TPS_MANI_03167]{DRAFT} Network configuration for Nm [The UDP multicast connection over which Network Management messages are transported is configured with the [UdpNmNetworkConfiguration](#) that is aggregated by the [UdpNmCluster](#) in the role [networkConfiguration](#). The attribute [udpPort](#) is used to configure the port number over which the Nm message is transmitted and received. The IP Address is configured either by [ipv4MulticastIpAddress](#) or [ipv6MulticastIpAddress](#).] ([RS_MANI_00023](#))

Class	UdpNmNetworkConfiguration			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SystemDesign			
Note	This meta-class defines the attributes for the configuration of a UDP port and UDP multicast IP address of the Nm communication on a VLAN.			
Base	<i>ARObject</i>			
Aggregated by	UdpNmCluster.networkConfiguration			
Attribute	Type	Mult.	Kind	Note
ipv4MulticastIpAddress	Ip4AddressString	0..1	attr	Multicast IPv4 Address to which the message will be transmitted.
ipv6MulticastIpAddress	Ip6AddressString	0..1	attr	Multicast IPv6 Address to which the message will be transmitted
priority	PositiveInteger	0..1	attr	This attribute defines the VLAN frame priority for messages on the Socket defined by the udpPort and the multicast IP address. Values from 0 (best effort) to 7 (highest) are allowed.
udpPort	PositiveInteger	0..1	attr	This attribute allows to configure a udp port number that is used for reception and transmission of UdpNm messages.

Table 10.58: UdpNmNetworkConfiguration

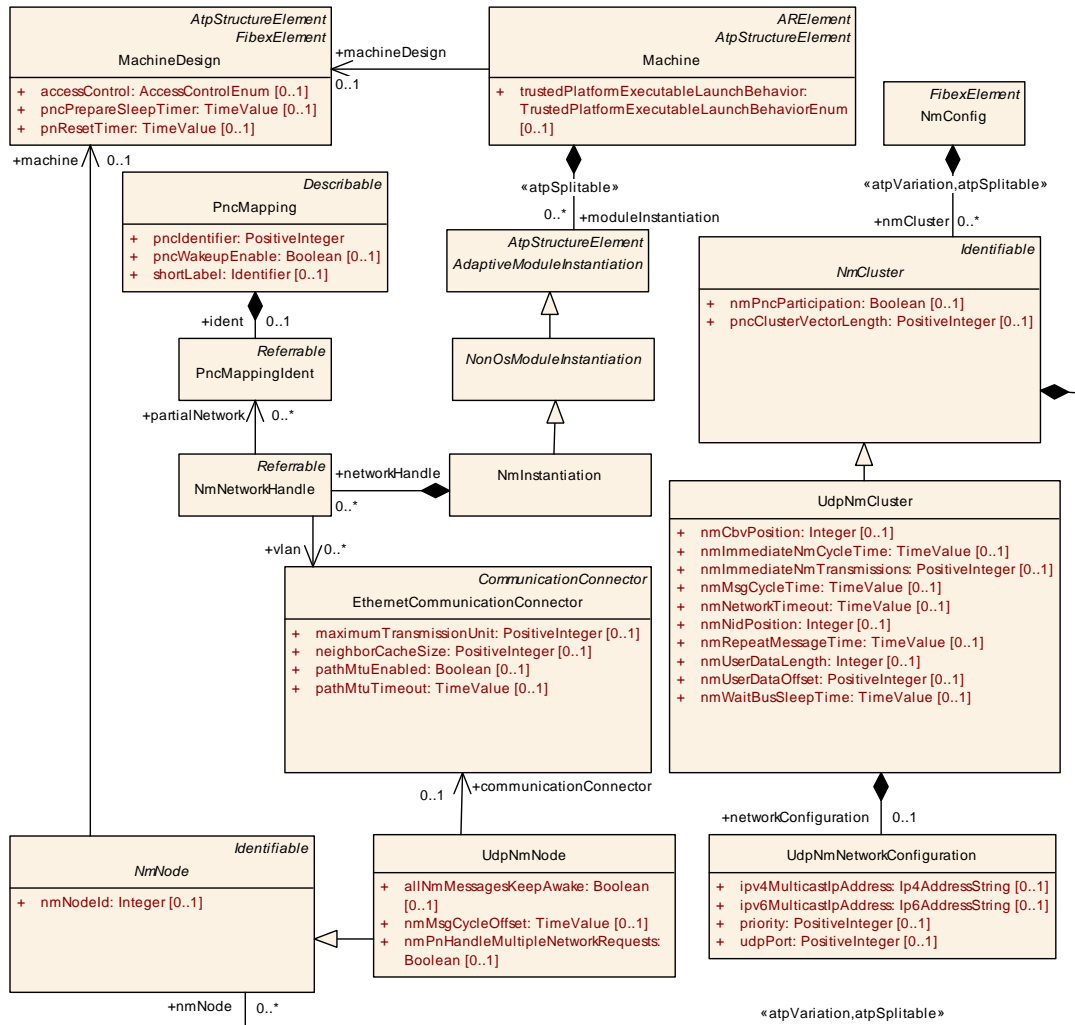


Figure 10.28: NM Cluster configuration

[TPS_MANI_03279]{DRAFT} **Priority of Nm messages** [The attribute `priority` in the `UdpNmNetworkConfiguration` can be used to assign a VLAN priority to Network Management messages that are transmitted over the Socket defined by the `UdpNmNetworkConfiguration.udpPort` and `ipv4MulticastIpAddress` or `ipv6MulticastIpAddress`.] (*RS_MANI_00023*)

[constr_3419]{DRAFT} **Allowed usage of `UdpNmNetworkConfiguration` attributes** [The `UdpNmNetworkConfiguration` that is aggregated by `UdpNmCluster` in the role `networkConfiguration` shall have either

- `ipv4MulticastIpAddress` or
- `ipv6MulticastIpAddress`.

]()

Class	NmConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::NetworkManagement			
Note	Contains the all configuration elements for AUTOSAR Nm. Tags: atp.recommendedPackage=NmConfigs			
Base	ARObject, CollectableElement, FibexElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
nmCluster	NmCluster	*	aggr	Collection of NM Clusters atpVariation: Derived, because cluster can be variable. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=nmCluster.shortName, nmCluster.variationPoint.shortLabel vh.latestBindingTime=postBuild

Table 10.59: NmConfig

Class	NmCluster (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::NetworkManagement			
Note	Set of NM nodes coordinated with use of the NM algorithm.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	CanNmCluster, FlexrayNmCluster, UdpNmCluster			
Aggregated by	NmConfig.nmCluster			
Attribute	Type	Mult.	Kind	Note
communicationCluster	CommunicationCluster	0..1	ref	Association to a CommunicationCluster in the topology description.
nmNode	NmNode	*	aggr	Collection of NmNodes of the NmCluster. atpVariation: Derived, because NmNode can be variable. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=nmNode.shortName, nmNode.variationPoint.shortLabel vh.latestBindingTime=postBuild
nmPncParticipation	Boolean	0..1	attr	Defines whether this NmCluster contributes to the partial network mechanism.
pncClusterVectorLength	PositiveInteger	0..1	attr	Optionally defines the length of the PNC Vector per CommunicationCluster (and VLAN in case of UdpNm). If not defined then System.pncVectorLength applies. Should only make the PNC Vector shorter (or same length as defined in System.pncVectorLength). Tags: atp.Status=draft

Table 10.60: NmCluster

Class	UdpNmCluster			
Package	M2::AUTOSARTemplates::SystemTemplate::NetworkManagement			
Note	Udp specific NmCluster attributes			
Base	ARObject, Identifiable, MultilanguageReferrable, NmCluster, Referrable			
Aggregated by	NmConfig.nmCluster			





Class		UdpNmCluster		
Attribute	Type	Mult.	Kind	Note
network Configuration	UdpNmNetwork Configuration	0..1	aggr	Configuration of a UDP port and UDP multicast IP address of the Nm communication on a VLAN. Tags: atp.Status=draft
nmCbvPosition	Integer	0..1	attr	Defines the position of the control bit vector within the Nm Pdu (Byte position). If this attribute is not configured, the Control Bit Vector is not used.
nmImmediate NmCycleTime	TimeValue	0..1	attr	Defines the immediate NmPdu cycle time in seconds which is used for nmImmediateNmTransmissions NmPdu transmissions. This attribute is only valid if nmImmediate NmTransmissions is greater one.
nmImmediate Nm Transmissions	PositiveInteger	0..1	attr	Defines the number of immediate NmPdus which shall be transmitted. If the value is zero no immediate NmPdus are transmitted. The cycle time of immediate NmPdus is defined by nmImmediateNmCycleTime.
nmMsgCycle Time	TimeValue	0..1	attr	Period of a NmPdu in seconds. It determines the periodic rate in the periodic transmission mode with bus load reduction and is the basis for transmit scheduling in the periodic transmission mode without bus load reduction.
nmNetwork Timeout	TimeValue	0..1	attr	Network Timeout for NmPdus in seconds. It denotes the time how long the UdpNm shall stay in the Network Mode before transition into Prepare Bus-Sleep Mode shall take place.
nmNidPosition	Integer	0..1	attr	Defines the byte position of the source node identifier within the NmPdu. If this attribute is not configured, the Node Identification is not used.
nmRepeat MessageTime	TimeValue	0..1	attr	Timeout for Repeat Message State in seconds. Defines the time how long the NM shall stay in the Repeat Message State.
nmUserData Length	Integer	0..1	attr	Defines the length in bytes of the user data contained in the Nm message. User data excludes the PNC bit vector.
nmUserData Offset	PositiveInteger	0..1	attr	Specifies the offset (in bytes) of the user data information in the NM message. User data excludes the PNC bit vector. Tags: atp.Status=draft
nmWaitBus SleepTime	TimeValue	0..1	attr	Timeout for bus calm down phase in seconds. It denotes the time how long the CanNm shall stay in the Prepare Bus-Sleep Mode before transition into Bus-Sleep Mode shall take place.
vlan	EthernetPhysical Channel	0..1	ref	Reference to the vlan (represented by the Ethernet PhysicalChannel) this UdpNmCluster shall apply to.

Table 10.61: UdpNmCluster

Class	NmNode (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::NetworkManagement			
Note	The linking of NmEcus to NmClusters is realized via the NmNodes.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	CanNmNode , FlexrayNmNode , UdpNmNode			
Aggregated by	NmCluster.nmNode			
Attribute	Type	Mult.	Kind	Note





Class	NmNode (abstract)			
machine	MachineDesign	0..1	ref	Reference to the machine that contains the NmNode. Tags: atp.Status=draft
nmNodeId	Integer	0..1	attr	Node identifier of local NmNode. Shall be unique in the NmCluster.

Table 10.62: NmNode

Class	UdpNmNode			
Package	M2::AUTOSARTemplates::SystemTemplate::NetworkManagement			
Note	Udp specific NM Node attributes.			
Base	ARObject , Identifiable , MultilanguageReferrable , NmNode , Referrable			
Aggregated by	NmCluster.nmNode			
Attribute	Type	Mult.	Kind	Note
allNmMessagesKeepAwake	Boolean	0..1	attr	Specifies if Nm drops irrelevant NM PDUs. false: Only NM PDUs with a Partial Network Information Bit (PNI) = true and containing a Partial Network request for this ECU trigger the standard RX indication handling and thus keep the ECU awake true: Every NM PDU triggers the standard RX indication handling and keeps the ECU awake
communicationConnector	EthernetCommunicationConnector	0..1	ref	Reference to the CommunicationConnector that represents the UdpNmNode in the topology description. Tags: atp.Status=draft
nmMsgCycleOffset	TimeValue	0..1	attr	Node specific time offset in the periodic transmission node. It determines the start delay of the transmission. Specified in seconds.
nmPnHandleMultipleNetworkRequests	Boolean	0..1	attr	Specifies if NM performs an additional transition from Network Mode to Repeat Message State (true) or not (false).

Table 10.63: UdpNmNode

10.7.2 Relation between Function Group states and Network Handles

[TPS_MANI_01343]{DRAFT} **Relation between [Function Group States](#) and [NmNetworkHandle](#)** [An essential part of the network management on the *AUTOSAR adaptive platform* is the understanding which [Function Group State](#) requires network access. This relation can be expressed by means of meta-class [NmHandleToFunctionGroupStateMapping](#).] ([RS_MANI_00023](#))

The relation between [Function Group States](#) and network handles is in principle bi-directional, i.e. the following use cases exist for the creation of an [NmHandleToFunctionGroupStateMapping](#):

- The application software wants to indicate which [Function Group States](#) require network access. This means that attribute [mappingDirection](#) of the first [NmHandleToFunctionGroupStateMapping](#) shall be set to [NmHandleMappingDirectionEnum.functionGroupStateToNmHandle](#).

- The application software wants to indicate which **Function Group State** shall be set if the network goes down. This means that attribute **mappingDirection** shall be set to **NmHandleMappingDirectionEnum.nmHandleInactiveToFunctionGroupState**.
- The application software wants to indicate which **Function Group State** shall be set if the network goes up. This means that attribute **mappingDirection** shall be set to **NmHandleMappingDirectionEnum.nmHandleActiveToFunctionGroupState**.

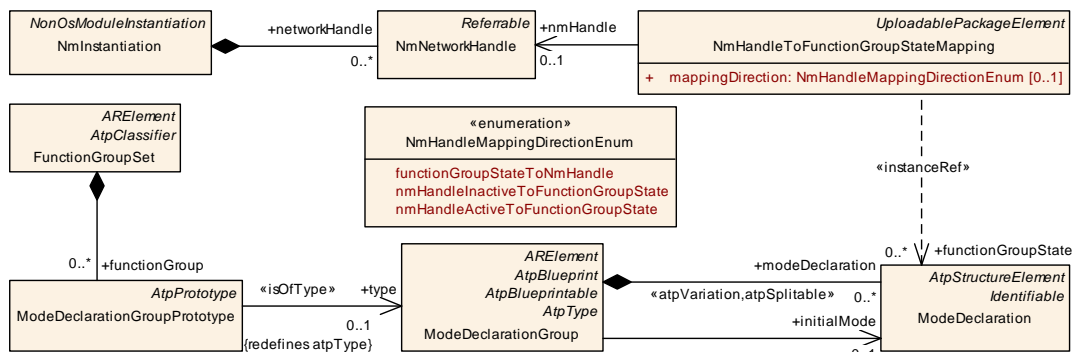


Figure 10.29: Mapping between NmNetworkHandle and Function Group States

Class	NmHandleToFunctionGroupStateMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation			
Note	This meta-class represents the ability to create a mapping between an NmNetworkHandle and a collection of function group states. This way, the impact of function groups on the network management can be specified. Tags: atp.recommendedPackage=NmHandleToFunctionGroupStateMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
functionGroup State	ModeDeclaration	*	iref	This reference identifies the collection of function group states in the context of the mapping. InstanceRef implemented by: FunctionGroupStateInFunctionGroupSetInstanceRef
mapping Direction	NmHandleMappingDirectionEnum	0..1	attr	This attribute describes the direction of the mapping.
nmHandle	NmNetworkHandle	0..1	ref	This reference identifies the applicable NmNetwork Handle in the context of the mapping.

Table 10.64: NmHandleToFunctionGroupStateMapping

Enumeration	NmHandleMappingDirectionEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation
Note	This enumeration provides direction values for the mapping of NM handles to function group states.
Aggregated by	NmHandleToFunctionGroupStateMapping.mappingDirection





Enumeration	NmHandleMappingDirectionEnum
Literal	Description
functionGroupStateToNmHandle	The purpose of the mapping is to indicate which function group state requires network access. Tags: atp.EnumerationLiteralIndex=0
nmHandleActiveToFunctionGroupState	The purpose of the mapping is to indicate that the function group shall be switched to a given state if the network handle becomes active. Tags: atp.EnumerationLiteralIndex=2
nmHandleInactiveToFunctionGroupState	The purpose of the mapping is to indicate that the function group shall be switched to a given state if the network handle becomes inactive. Tags: atp.EnumerationLiteralIndex=1

Table 10.65: NmHandleMappingDirectionEnum

[TPS_MANI_01365]{DRAFT} **Semantics of attribute `NmHandleToFunctionGroupStateMapping.mappingDirection` set to `functionGroupStateToNmHandle`** [If the attribute `NmHandleToFunctionGroupStateMapping.mappingDirection` is set to the value `NmHandleMappingDirectionEnum.functionGroupStateToNmHandle`, then the semantics of the `NmHandleToFunctionGroupStateMapping` is that the referenced `nmHandle` is requested to become active if the `Function Group` to which the referenced `functionGroupState` belongs to is switched to the referenced `Function Group State`, formalized by meta-class `ModeDeclaration`.] (*RS_MANI_00023*)

Please note that the multiplicity of the reference `NmHandleToFunctionGroupStateMapping.functionGroupState` allows for the creation of a "shortcut" such that several `Function Group States` can simultaneously be indicated as requiring communication in the context of a single `NmHandleToFunctionGroupStateMapping`, as depicted in Figure 10.30.

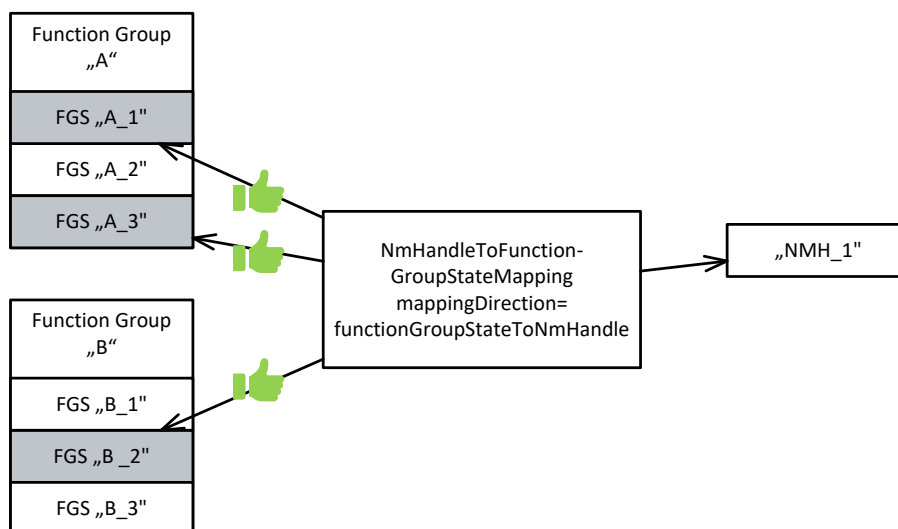


Figure 10.30: Mapping from `Function Group` to NM handle

[TPS_MANI_01366]{DRAFT} **Semantics of attribute `NmHandleToFunctionGroupStateMapping.mappingDirection` set to `nmHandleInactiveToFunctionGroupState`** [If the attribute `NmHandleToFunctionGroupStateMapping.mappingDirection` is set to the value `NmHandleMappingDirectionEnum.nmHandleInactiveToFunctionGroupState`, then the semantics of the `NmHandleToFunctionGroupStateMapping` is that if the referenced `nmHandle` becomes **inactive**, the `Function Group` to which the referenced `functionGroupState` belongs to is switched to the referenced `Function Group State`, formalized by meta-class `ModeDeclaration`.](*RS_MANI_00023*)

[TPS_MANI_01367]{DRAFT} **Semantics of attribute `NmHandleToFunctionGroupStateMapping.mappingDirection` set to `nmHandleActiveToFunctionGroupState`** [If the attribute `NmHandleToFunctionGroupStateMapping.mappingDirection` is set to the value `NmHandleMappingDirectionEnum.nmHandleActiveToFunctionGroupState`, then the semantics of the `NmHandleToFunctionGroupStateMapping` is that if the referenced `nmHandle` becomes **active**, the function group to which the referenced `functionGroupState` belongs to is switched to the referenced `Function Group State`, formalized by meta-class `ModeDeclaration`.](*RS_MANI_00023*)

It is important to note that the mapping from NM Handle to `Function Group State` can only identify on `Function Group State` per `Function Group` because it is obviously impossible to activate two `Function Group States` of the same `Function Group` at the same time.

Nevertheless, if an NM handle becomes active/inactive, it is very likely that this event has an impact on several `SoftwareClusters`. And because `Function Groups` cannot be shared among `SoftwareClusters`, it is necessary to be able to establish a 1:n communication pattern for this case under a precondition described by [*constr_10101*] and sketched by Figure 10.31.

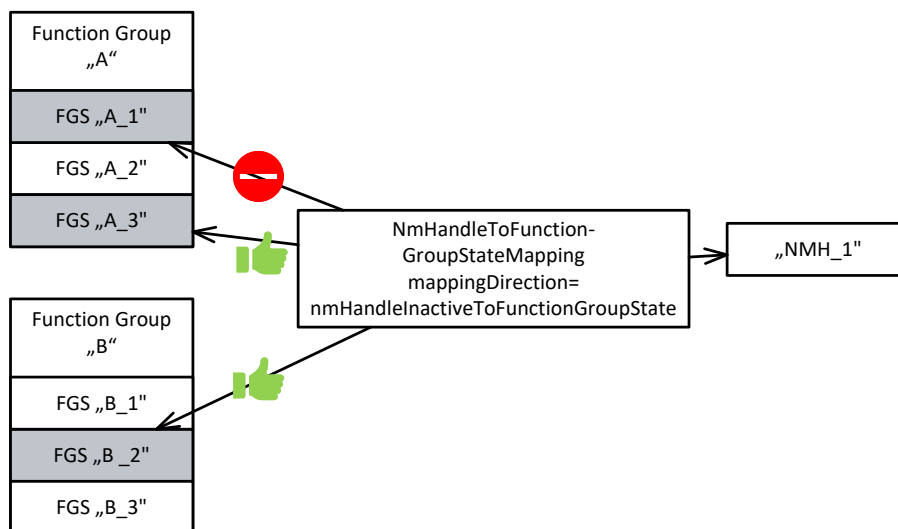


Figure 10.31: Mapping from NM handle to `Function Group`

[constr_10101]{DRAFT} Attribute `NmHandleToFunctionGroupStateMapping.mappingDirection` is set to `NmHandleActiveToFunctionGroupState` or `NmHandleInactiveToFunctionGroupState` [If the value of attribute `NmHandleToFunctionGroupStateMapping.mappingDirection` is set to the value `NmHandleMappingDirectionEnum.nmHandleActiveToFunctionGroupState` or `NmHandleMappingDirectionEnum.nmHandleInactiveToFunctionGroupState`, then the reference `NmHandleToFunctionGroupStateMapping.functionGroupState` shall not refer to two (or more) **ModeDeclarations of the same ModeDeclarationGroup.**]()

10.7.2.1 UdpNm configuration constraints

Please note that the Classic Platform and the Adaptive Platform are using the same model for configuration of UdpNm. Some Classic Platform features like the `NmCoordinator` and `UdpNmClusterCoupling` are not supported in Adaptive Autosar.

But the `TPS_SystemTemplate` [19] contains a more detailed description of `UdpNmClusters` and `UdpNmNodes` and defines modeling constraints that are also valid for the Adaptive Platform.

The following constraints of the `TPS_SystemTemplate` [19] shall be considered if a `UdpNmCluster` with `UdpNmNodes` is described:

- [constr_3078]
- [constr_3079]
- [constr_3080]
- [constr_5223]
- [constr_5224]
- [constr_5225]
- [constr_5226]

In addition, the following Adaptive Platform specific constraints are valid:

[constr_5227]{DRAFT} Mandatory elements of `UdpNmCluster` [The following attributes shall always be defined for the `UdpNmCluster`:

- `nmMsgCycleTime`
- `nmNetworkTimeout`
- `nmRepeatMessageTime`
- `nmWaitBusSleepTime`
- `communicationCluster`

]()

[constr_5228]{DRAFT} Partial Networking timing constraint [For Partial Networking the following timing constraints shall be ensured: $(MachineDesign.pnResetTimer + MachineDesign.pncPrepareSleepTimer) < UdpNmCluster.nmNetworkTimeout$]

[constr_10098]{DRAFT} Relation of MachineDesign.pnResetTimer and UdpNmCluster.nmMsgCycleTime [For the configuration of the partial networking timing, the following condition shall be ensured: $MachineDesign.pnResetTimer > UdpNmCluster.nmMsgCycleTime$]

10.7.3 CAN XL Network Management

The network management for CAN XL is modeled in a very similar way as the UDP NM. Please find details in Figure 10.32.

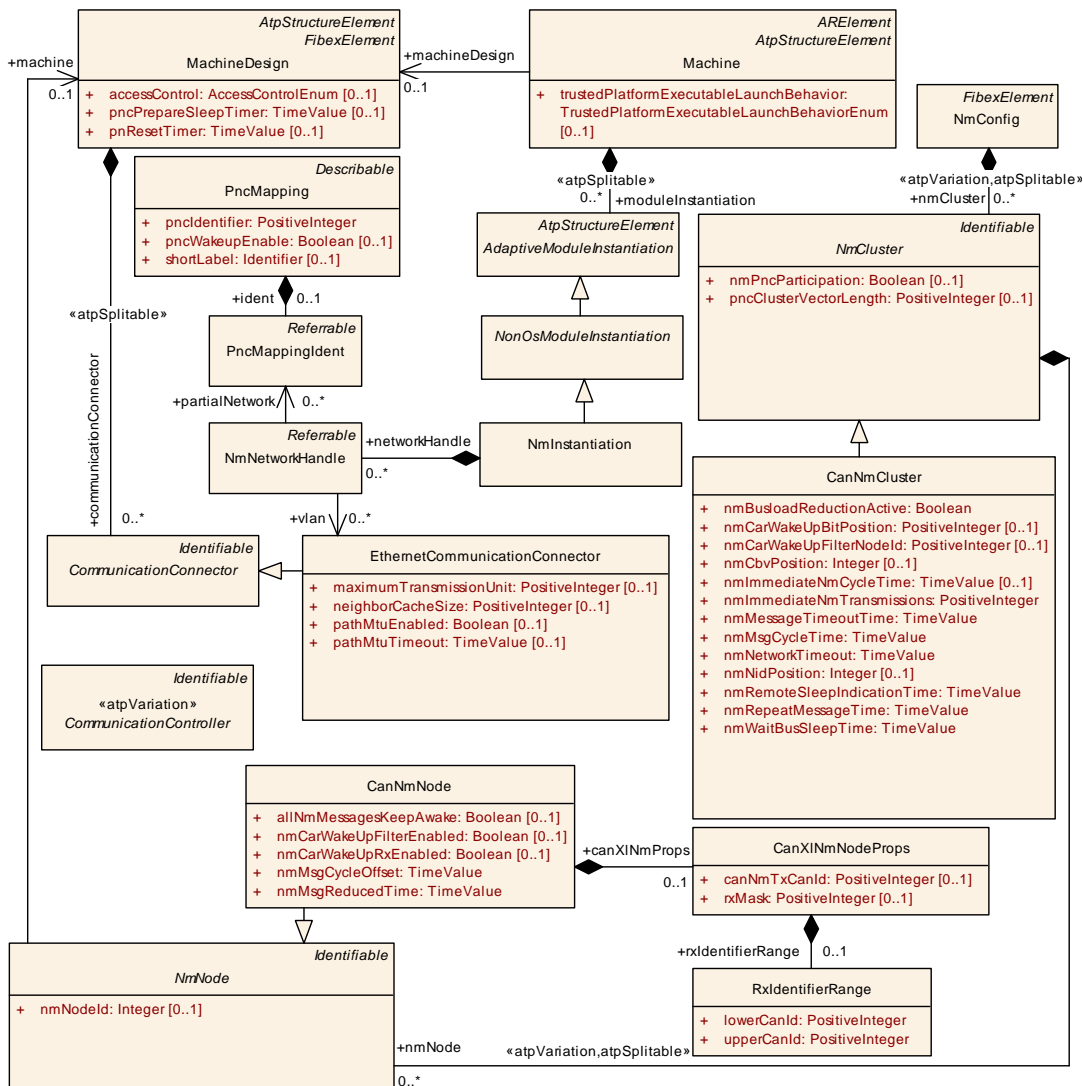


Figure 10.32: NM configuration for CAN XL

Although the CAN XL is entirely used to tunnel Ethernet communication, it still needs to be able to participate in the regular network management of the CAN cluster.

For this purpose, a relation between a [EthernetCommunicationConnector](#) and a [CanNmNode](#) that represents the local [Machine](#) in the CAN NM networking needs to be created.

The CAN ID used to transmit NM frames is configured in [CanNmNode.canXlNmProps.canNmTxCanId](#).

The CAN IDs of received NM frames are configured by the respective attributes of the [CanNmNodes](#) connected to the same [CanNmCluster](#).

Class	CanNmNode			
Package	M2::AUTOSARTemplates::SystemTemplate::NetworkManagement			
Note	CAN specific NM Node attributes.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>NmNode</i> , <i>Referrable</i>			
Aggregated by	NmCluster.nmNode			
Attribute	Type	Mult.	Kind	Note
allNmMessages KeepAwake	Boolean	0..1	attr	Specifies if Nm drops irrelevant NM PDUs. false: Only NM PDUs with a Partial Network Information Bit (PNI) = true and containing a Partial Network request for this ECU trigger the standard RX indication handling and thus keep the ECU awake true: Every NM PDU triggers the standard RX indication handling and keeps the ECU awake
canXINmProps	CanXINmNodeProps	0..1	aggr	This aggregation contributes the CAN IDs for the execution of CAN NM on the adaptive platform. Tags: atp.Status=draft
nmCarWakeUp FilterEnabled	Boolean	0..1	attr	If this attribute is set to true the CareWakeUp filtering is supported.
nmCarWakeUp RxEnabled	Boolean	0..1	attr	If set to true this attribute enables the support of CarWake Up bit evaluation in received NmPdus.
nmMsgCycle Offset	TimeValue	1	attr	Node specific time offset in the periodic transmission node. It determines the start delay of the transmission. Specified in seconds.
nmMsg ReducedTime	TimeValue	1	attr	Node specific bus cycle time in the periodic transmission mode with bus load reduction. Specified in seconds.

Table 10.66: CanNmNode

Class	CanXINmNodeProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation			
Note	Definition of CAN attributes in the context of CanXL usage on the adaptive platform.			
Base	<i>ARObject</i>			
Aggregated by	CanNmNode.canXINmProps			
Attribute	Type	Mult.	Kind	Note
canNmTxCanId	PositiveInteger	0..1	attr	This attribute is used to define the identifier the CAN NM frame shall use on the CAN network.





Class	CanXINmNodeProps			
rxIdentifierRange	RxIdentifierRange	0..1	aggr	Optional definition of a CanId range.
rxMask	PositiveInteger	0..1	attr	Identifier mask which denotes the relevant bits in the CAN Identifier. Together with the identifier, this parameter defines a CAN identifier range.

Table 10.67: CanXINmNodeProps

Class	RxIdentifierRange			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Can::CanCommunication			
Note	Optional definition of a CanId range to reduce the effort of specifying every possible FrameTriggering within the defined Id range during reception. All frames received within a range are mapped to the same Pdu that is passed to a upper layer module (e.g. Nm, CDD, PduR).			
Base	ARObject			
Aggregated by	CanFrameTriggering.rxIdentifierRange, CanXINmNodeProps.rxIdentifierRange			
Attribute	Type	Mult.	Kind	Note
lowerCanId	PositiveInteger	1	attr	This attribute can be used together with the upperCanId attribute to define a range of CanIds.
upperCanId	PositiveInteger	1	attr	This attribute can be used together with the lowerCanId attribute to define a range of CanIds.

Table 10.68: RxIdentifierRange

Class	CanNmCluster			
Package	M2::AUTOSARTemplates::SystemTemplate::NetworkManagement			
Note	Can specific NmCluster attributes			
Base	ARObject, Identifiable , MultilanguageReferrable , NmCluster , Referrable			
Aggregated by	NmConfig.nmCluster			
Attribute	Type	Mult.	Kind	Note
nmBusloadReductionActive	Boolean	1	attr	It determines if bus load reduction for the respective Can Nm channel is active or not.
nmCarWakeUpBitPosition	PositiveInteger	0..1	attr	Specifies the bit position of the CarWakeUp within the Nm Pdu.
nmCarWakeUpFilterNodeId	PositiveInteger	0..1	attr	Source node identifier for CarWakeUp filtering.
nmCbvPosition	Integer	0..1	attr	Defines the position of the control bit vector within the Nm Pdu (Byte position). If this attribute is not configured, the Control Bit Vector is not used.
nmImmediateNmCycleTime	TimeValue	0..1	attr	Defines the immediate NmPdu cycle time in seconds which is used for nmImmediateNmTransmissions NmPdu transmissions. This parameter is only valid if CanNm ImmediateNmTransmissions is greater one.
nmImmediateNmTransmissions	PositiveInteger	1	attr	Defines the number of immediate NmPdus which shall be transmitted. If the value is zero no immediate NmPdus are transmitted. The cycle time of immediate NmPdus is defined by nmImmediateNmCycleTime.
nmMessageTimeoutTime	TimeValue	1	attr	Timeout of an NmPdu in seconds. It determines how long the NM shall wait with notification of transmission failure while communication errors occur on the bus.





Class	CanNmCluster			
nmMsgCycleTime	TimeValue	1	attr	Period of a NmPdu in seconds. It determines the periodic rate in the periodic transmission mode with bus load reduction and is the basis for transmit scheduling in the periodic transmission mode without bus load reduction.
nmNetworkTimeout	TimeValue	1	attr	Network Timeout for NmPdus in seconds It denotes the time how long the CanNm shall stay in the Network Mode before transition into Prepare Bus-Sleep Mode shall take place.
nmNidPosition	Integer	0..1	attr	Defines the byte position of the source node identifier within the NmPdu. If this attribute is not configured, the Node Identification is not used.
nmRemoteSleepIndicationTime	TimeValue	1	attr	Timeout for Remote Sleep Indication in seconds. It defines the time how long it shall take to recognize that all other nodes are ready to sleep.
nmRepeatMessageTime	TimeValue	1	attr	Timeout for Repeat Message State in seconds. Defines the time how long the NM shall stay in the Repeat Message State.
nmWaitBusSleepTime	TimeValue	1	attr	Timeout for bus calm down phase in seconds. It denotes the time how long the CanNm shall stay in the Prepare Bus-Sleep Mode before transition into Bus-Sleep Mode shall take place.

Table 10.69: CanNmCluster

10.8 Update and Configuration Management

10.8.1 Overview

[TPS_MANI_01226]{DRAFT} **Machine-specific configuration settings for the UCM module** [The Machine-specific configuration settings for UCM are collected in abstract meta-class `UcmModuleInstantiation` and its two concrete specializations:

- `UcmMasterModuleInstantiation` represents the configuration of a *UCM Master*.
- `UcmSubordinateModuleInstantiation` represents the configuration of a *UCM Subordinate*.

]([RS_MANI_00023](#))

Please find more information about meta-class `UcmMasterModuleInstantiation` in section 10.8.3 and about `UcmSubordinateModuleInstantiation` in section 10.8.4.

Class	<i>UcmModuleInstantiation</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Ucm			
Note	This meta-class represents the ability to define the deployment of a UCM instantiation.			
Base	<i>ARObject</i> , <i>AdaptiveModuleInstantiation</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>NonOsModuleInstantiation</i> , <i>Referrable</i>			
Subclasses	<i>UcmMasterModuleInstantiation</i> , <i>UcmSubordinateModuleInstantiation</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i> , <i>Machine.moduleInstantiation</i>			
Attribute	Type	Mult.	Kind	Note
identifier	String	0..1	attr	This represents the identification of a UCM.
maxBlockSize	PositiveInteger	0..1	attr	This attribute denotes the maximum block size (unit: bytes) used in the UCM implementation.
version	StrongRevisionLabelString	0..1	attr	This attribute defines the software version of the UCM on this platform. Note that the definition of the version is required if the ability of the SoftwarePackage to require a minimum version of the UCM is utilized.

Table 10.70: UcmModuleInstantiation

[constr_10200]{DRAFT} **Multiplicity of attribute *UcmModuleInstantiation.identifier*** [For each *UcmModuleInstantiation*, the attribute *identifier* shall exist **at the time when the creation of the manifest is finished.**]()

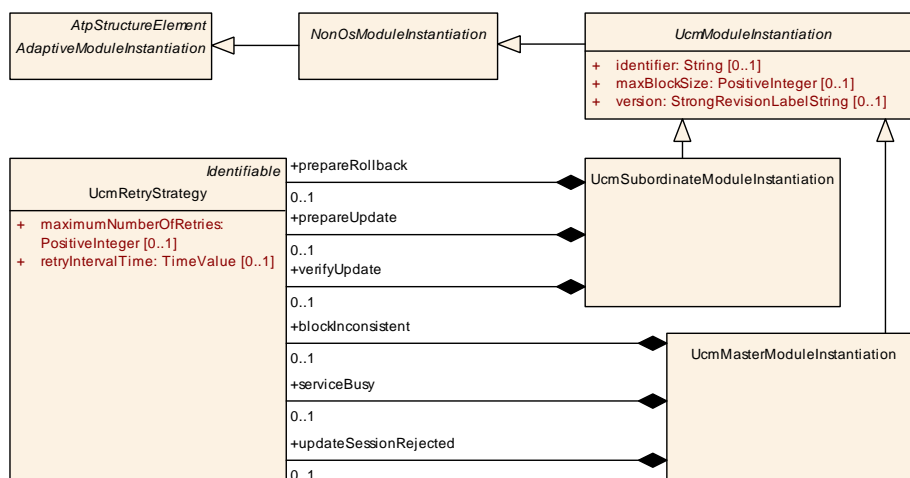


Figure 10.33: Modeling of *UcmModuleInstantiation*

[TPS_MANI_01227]{DRAFT} **Semantics of attribute *UcmModuleInstantiation.identifier*** [Attribute *UcmModuleInstantiation.identifier* shall be used to identify a specific UCM on a specific *Machine* during a service discovery run by a master UCM or VUM.](*RS_MANI_00023*)

The usage of attribute *UcmModuleInstantiation.identifier* is documented in Figure 10.34. The master UCM or VUM acts as a client in a service discovery that is configured to search for *any* server.

The individual UCMs offer their service and then the master UCM as the client calls a specific *method* in the server's *ServiceInterface* to reveal the *identifier* of each server.

In the case of this example there are three slave UCMs with `identifier` set to 1, 2, and 3. The master UCM instantiates a proxy for each of the slave UCMs such that the value of the respective `identifier` can be retrieved from the proxy in order to be able to communicate with a specific slave UCM.

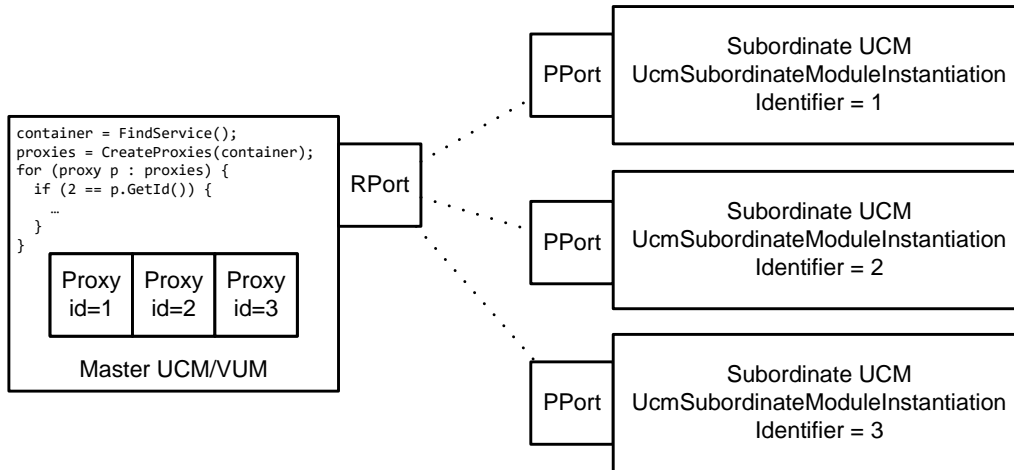


Figure 10.34: Identification of subordinate UCM modules by the master UCM

The master UCM or VUM can then instantiate proxies for each service offer and programmatically access the respective server going forward.

[constr_1691]{DRAFT} `UcmModuleInstantiation.identifier` shall be unique [The value of attribute `UcmModuleInstantiation.identifier` shall be unique for each `Machine` in a given vehicle.]()

10.8.2 Retry Strategy

[TPS_MANI_01375]{DRAFT} Semantics of meta-class `UcmRetryStrategy` [Both the `UcmMasterModuleInstantiation` and the `UcmSubordinateModuleInstantiation` have the ability to retry certain activities if these activities don't succeed. The configuration of such retry cycles is done by means of meta-class `UcmRetryStrategy`.] ([RS_MANI_00023](#))

Class	<code>UcmRetryStrategy</code>
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Ucm
Note	This meta-class describes the configuration of the retry strategy for a sub-class of <code>UcmModuleImplementation</code> .
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>
Aggregated by	<code>UcmMasterModuleInstantiation.blockInconsistent</code> , <code>UcmMasterModuleInstantiation.serviceBusy</code> , <code>UcmMasterModuleInstantiation.updateSessionRejected</code> , <code>UcmSubordinateModuleInstantiation.prepareRollback</code> , <code>UcmSubordinateModuleInstantiation.prepareUpdate</code> , <code>UcmSubordinateModuleInstantiation.verifyUpdate</code>





Class	UcmRetryStrategy			
Attribute	Type	Mult.	Kind	Note
maximumNumberOfRetries	PositiveInteger	0..1	attr	This attribute defines the maximum number of time the UCM module instantiation shall attempt a retry.
retryIntervalTime	TimeValue	0..1	attr	This attribute defines the time (in seconds) between two retry attempts.

Table 10.71: UcmRetryStrategy

[constr_10105]{DRAFT} Existence of [UcmRetryStrategy.maximumNumberOfRetries](#) [For each [UcmRetryStrategy](#), attribute [maximumNumberOfRetries](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10106]{DRAFT} Existence of [UcmRetryStrategy.retryIntervalTime](#) [For each [UcmRetryStrategy](#), attribute [retryIntervalTime](#) shall exist **at the time when the creation of the manifest is finished.**]()

10.8.3 UCM Master Module Instantiation

[TPS_MANI_01376]{DRAFT} Semantics of meta-class [UcmMasterModuleInstantiation](#) [Meta-class [UcmMasterModuleInstantiation](#) is used to configure the deployment of a *UCM Master* and the various retry strategies associated with the *UCM Master*.] ([RS_MANI_00023](#))

Class	UcmMasterModuleInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Ucm			
Note	This meta-class represents the ability to define the deployment of a UCM Master instantiation.			
Base	ARObject , AdaptiveModuleInstantiation , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , NonOsModuleInstantiation , Referrable , UcmModuleInstantiation			
Aggregated by	AtpClassifier.atpFeature , Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
blockInconsistent	UcmRetryStrategy	0..1	aggr	This attribute defines the retry strategy of the UCM Master for the case that the block is inconsistent.
serviceBusy	UcmRetryStrategy	0..1	aggr	This attribute defines the retry strategy of the UCM Master for the case that the service is busy.
updateSessionRejected	UcmRetryStrategy	0..1	aggr	This attribute defines the retry strategy of the UcmMaster for the case that the update session is rejected.

Table 10.72: UcmMasterModuleInstantiation

[constr_10107]{DRAFT} Existence of the attribute [UcmMasterModuleInstantiation.blockInconsistent](#) [The attribute [UcmMasterModuleInstantiation.blockInconsistent](#) shall **at the time when the creation of the manifest is finished.**]()

[constr_10108]{DRAFT} Existence of the attribute `UcmMasterModuleInstantiation.serviceBusy` [The attribute `UcmMasterModuleInstantiation.serviceBusy` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10109]{DRAFT} Existence of the attribute `UcmMasterModuleInstantiation.updateSessionRejected` [The attribute `UcmMasterModuleInstantiation.updateSessionRejected` shall exist **at the time when the creation of the manifest is finished.**]()

10.8.4 UCM Subordinate Module Instantiation

[TPS_MANI_01377]{DRAFT} Semantics of meta-class `UcmSubordinateModuleInstantiation` [Meta-class `UcmSubordinateModuleInstantiation` is used to configure the deployment of a *UCM Subordinate* and the various retry strategies associated with the *UCM Subordinate*.] ([RS_MANI_00023](#))

Class	<code>UcmSubordinateModuleInstantiation</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Ucm			
Note	This meta-class represents the ability to define the deployment of a UCM Subordinate instantiation.			
Base	<i>ARObject</i> , <i>AdaptiveModuleInstantiation</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>NonOsModuleInstantiation</i> , <i>Referrable</i> , <i>UcmModuleInstantiation</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i> , <i>Machine.moduleInstantiation</i>			
Attribute	Type	Mult.	Kind	Note
<code>prepareRollback</code>	<code>UcmRetryStrategy</code>	0..1	aggr	This attribute identifies the configuration of prepare rollback retries initiated by the Ucm Subordinate.
<code>prepareUpdate</code>	<code>UcmRetryStrategy</code>	0..1	aggr	This attribute identifies the configuration of prepare update retries initiated by the Ucm Subordinate.
<code>verifyUpdate</code>	<code>UcmRetryStrategy</code>	0..1	aggr	This attribute identifies the configuration of verify update retries initiated by the Ucm Subordinate.

Table 10.73: UcmSubordinateModuleInstantiation

[constr_10374]{DRAFT} Existence of the attribute `UcmSubordinateModuleInstantiation.verifyUpdate` [The attribute `UcmSubordinateModuleInstantiation.verifyUpdate` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10375]{DRAFT} Existence of the attribute `UcmSubordinateModuleInstantiation.prepareUpdate` [The attribute `UcmSubordinateModuleInstantiation.prepareUpdate` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10376]{DRAFT} Existence of the attribute `UcmSubordinateModuleInstantiation.prepareRollback` [The attribute `UcmSubordinateModuleInstantiation.prepareRollback` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10110]{DRAFT} Existence of UcmSubordinateModuleInstantiation on a Machine [For each `Machine`, a `ProcessToMachineMapping` shall exist that refers in the role `machine` to the `Machine` and in the role `nonOsModuleInstantiation` to a `UcmSubordinateModuleInstantiation`.

This rule shall be imposed **at the time when the creation of the manifest is finished.**]()

10.9 IAM configuration

The definition of the deployment for the *Identity and Access Manager* represents the creation of actual grants, as opposed to the definition of grants on design level.

One important aspect of the modeling on deployment level is that it is not intended to include a large portion of the design model. The goal is to keep the deployment part as self-contained as possible.

While this approach represents a significant benefit for the size of deployment models it also creates some sort of disconnect between design and deployment. In other words, the connection of the modeling of a specific `Grant` to the respective intent in the design model is not immediately obvious.

To mitigate this issue, AUTOSAR introduced the `GrantDesign` that in turn allows for the identification of the corresponding intent modeling. When loading the design model and deployment model together into a suitable tool it would still be possible to run an analysis in terms of completeness of the overall IAM configuration.

The enforcement of access restrictions is not mandatory for a `Machine`. Therefore, the existence of a `Grant` by itself is not sufficient to activate the IAM mechanisms.

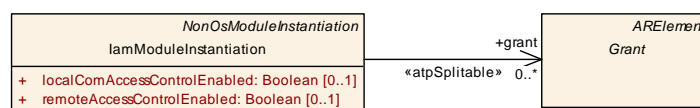


Figure 10.35: Modeling of the `IamModuleInstantiation`

[constr_1695]{DRAFT} Semantics of a Grant depends on the existence of IamModuleInstantiation [The existence of `Grants` shall only be enforced if in the context of the enclosing `Machine` an `IamModuleInstantiation` has been defined and is referencing the `Grant`.]()

[constr_3677]{DRAFT} ComGrants referencing DDS Service Instances [`ComGrants` associated with `DdsProvidedServiceInstances` or `DdsRequiredServiceInstances` via the `serviceInstance` attribute shall not be referenced by `IamModuleInstantiation.grant`, since access control in the DDS Network Binding is delegated to DDS Security.]()

Class	Grant (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class serves as the abstract base class for defining specific Grants Tags: atp.Status=candidate			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	ComFindServiceGrant , ComGrant , ComOfferServiceGrant , RawDataStreamGrant			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.74: Grant

Class	ComGrant (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class serves as the abstract base class for defining specific ComGrants Tags: atp.Status=candidate			
Base	ARElement , ARObject , CollectableElement , Grant , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	ComEventGrant , ComFieldGrant , ComMethodGrant			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
remoteSubject	AbstractIamRemoteSubject	*	ref	This optional reference defines the remoteSubject that is allowed to access the defined Object via the Grant. Tags: atp.Status=candidate
serviceInstance	AdaptivePlatformServiceInstance	0..1	ref	This reference identifies the applicable AdaptivePlatform ServiceInstance for which the grant applies. Tags: atp.Status=candidate

Table 10.75: ComGrant

[constr_10201]{DRAFT} Multiplicity of of the reference in the role [ComGrant.serviceInstance](#) [For each [ComGrant](#), the reference in the role [serviceInstance](#) shall exist **at the time when the creation of the manifest is finished.**]()

Further information about DDS Security can be found in section [11.5.3](#).

10.9.1 Com Grant Deployment

10.9.1.1 Com Field Grant Deployment

[TPS_MANI_01237]{DRAFT} Semantics of meta-class [ComFieldGrant](#) [Meta-class [ComFieldGrant](#) shall be used to award access to a given [field](#) (identified by means of the reference to meta-class [ServiceFieldDeployment](#) in the role [serviceDeployment](#)) in the context of a given [AdaptivePlatformServiceInstance](#) referenced in the role [serviceInstance](#).] ([RS_MANI_00060](#))

In other words, if a given `AdaptivePlatformServiceInstance` and the respective `ServiceFieldDeployment` are not referenced from a `ComFieldGrant` and an `IamModuleInstantiation` exists then this specific communication shall be suppressed.

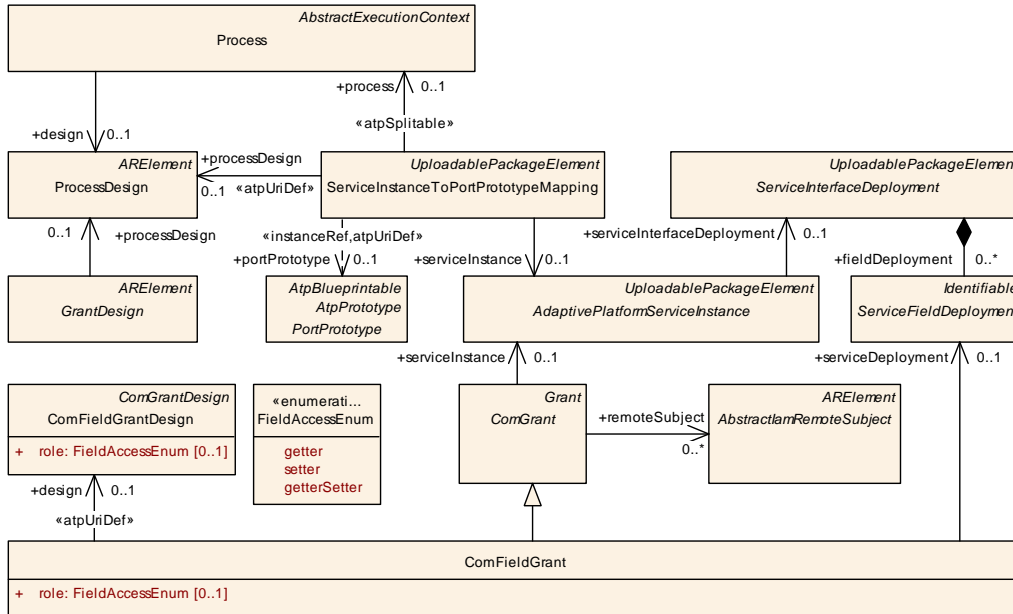


Figure 10.36: Modeling of the ComFieldGrant

Class	ComFieldGrant			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class represents the ability to grant access to a ServiceInterface.field. Tags: atp.Status=candidate atp.recommendedPackage=Grants			
Base	ARElement , ARObject , CollectableElement , ComGrant , Grant , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
design	ComFieldGrantDesign	0..1	ref	This reference identifies the ComFieldGrantDesign that the enclosing ComFieldGrant was created from. Stereotypes: atpUriDef Tags: atp.Status=candidate
role	FieldAccessEnum	0..1	attr	This attribute provides the ability to further specify the access to the ServiceInterface.field. Tags: atp.Status=candidate
service Deployment	ServiceField Deployment	0..1	ref	This reference identifies the applicable deployment within the context of an AdaptivePlatformServiceInstance for which the grant applies. Tags: atp.Status=candidate

Table 10.76: ComFieldGrant

[constr_10202]{DRAFT} Multiplicity of attribute `ComFieldGrant.role` [For each `ComFieldGrant`, the attribute `role` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10203]{DRAFT} Multiplicity of the reference in the role `ComFieldGrant.serviceDeployment` [For each `ComFieldGrant`, the reference in the role `serviceDeployment` shall exist **at the time when the creation of the manifest is finished.**]()

10.9.1.2 Com Method Grant Deployment

[TPS_MANI_01238]{DRAFT} Semantics of meta-class `ComMethodGrant` [Meta-class `ComMethodGrant` shall be used to clear the call of a given `method` (identified by means of the reference to meta-class `ServiceMethodDeployment` in the role `serviceDeployment`) in the context of a given `AdaptivePlatformServiceInstance` referenced in the role `serviceInstance`.] (*RS_MANI_00060*)

In other words, if a given `AdaptivePlatformServiceInstance` and the respective `ServiceMethodDeployment` are not referenced from a `ComMethodGrant` and an `IamModuleInstantiation` exists **then this specific communication shall be suppressed.**

Class	ComMethodGrant			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class represents the ability to grant access to a <code>ServiceInterface.method</code> . Tags: atp.Status=candidate atp.recommendedPackage=Grants			
Base	<i>ARElement, ARObject, CollectableElement, ComGrant, Grant, Identifiable, MultilanguageReferrable, PackageableElement, Referrable</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
design	ComMethodGrantDesign	0..1	ref	This reference identifies the <code>ComMethodGrantDesign</code> that the enclosing <code>ComMethodGrant</code> was created from. Stereotypes: atpUriDef Tags: atp.Status=candidate
service Deployment	ServiceMethodDeployment	0..1	ref	This reference identifies the applicable deployment within the context of an <code>AdaptivePlatformServiceInstance</code> for which the grant applies. Tags: atp.Status=candidate

Table 10.77: ComMethodGrant

[constr_10204]{DRAFT} Multiplicity of the reference in the role `ComMethodGrant.serviceDeployment` [For each `ComMethodGrant`, the reference in the role `serviceDeployment` shall exist **at the time when the creation of the manifest is finished.**]()

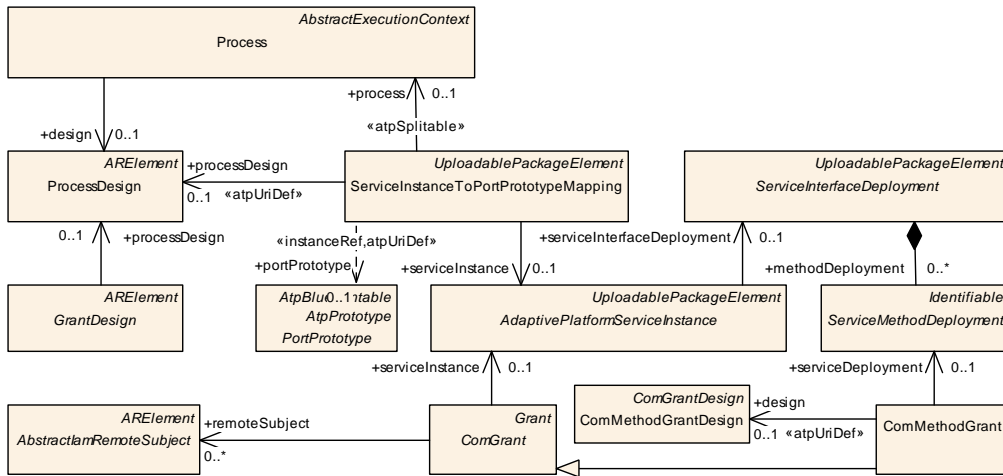


Figure 10.37: Modeling of the ComMethodGrant

10.9.1.3 Com Event Grant Deployment

[TPS_MANI_01239]{DRAFT} **Semantics of meta-class ComEventGrant** [Meta-class ComEventGrant shall be used to award access to a given event or trigger (identified by means of the reference to meta-class ServiceEventDeployment in the role serviceDeployment) in the context of a given AdaptivePlatformServiceInstance referenced in the role serviceInstance.] (RS_MANI_00060)

In other words, if a given AdaptivePlatformServiceInstance and the respective ServiceEventDeployment are not referenced from a ComEventGrant and an IamModuleInstantiation exists then this specific communication shall be suppressed.

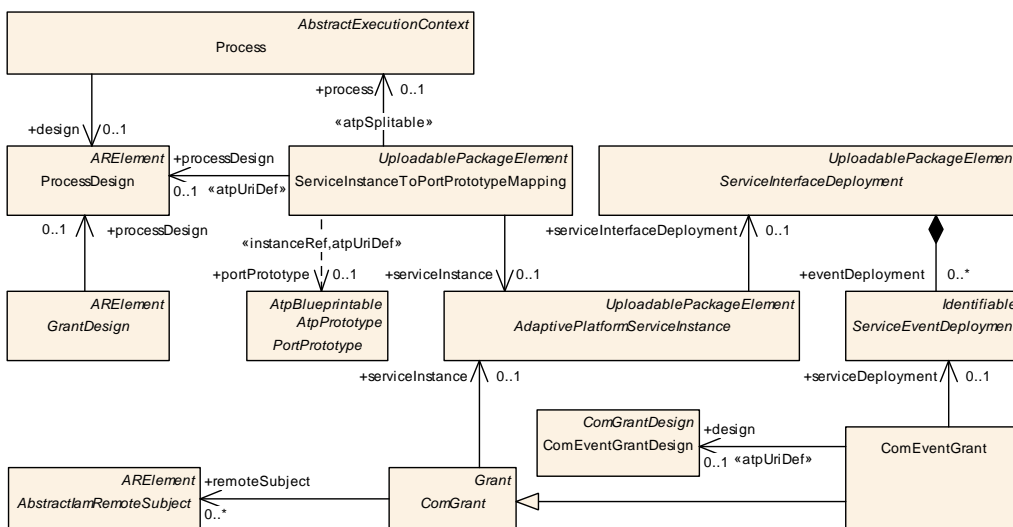


Figure 10.38: Modeling of the ComEventGrant

Class	ComEventGrant			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class represents the ability to grant access to a ServiceInterface.event. Tags: atp.Status=candidate atp.recommendedPackage=Grants			
Base	ARElement , ARObject , CollectableElement , ComGrant , Grant , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
design	ComEventGrantDesign	0..1	ref	This reference identifies the ComEventGrantDesign that the enclosing ComEventGrant was created from. Stereotypes: atpUriDef Tags: atp.Status=candidate
service Deployment	ServiceEvent Deployment	0..1	ref	This reference identifies the applicable deployment within the context of an AdaptivePlatformServiceInstance for which the grant applies. Tags: atp.Status=candidate

Table 10.78: ComEventGrant

[constr_10205]{DRAFT} Multiplicity of the reference in the role [ComEventGrant.serviceDeployment](#) [For each [ComEventGrant](#), the reference in the role [serviceDeployment](#) shall exist **at the time when the creation of the manifest is finished.**]()

10.9.1.4 Com Offer Service Grant Deployment

The enforcement of service discovery rights is modeled by means of meta-classes [ComOfferServiceGrant](#) and [ComFindServiceGrant](#).

[TPS_MANI_01240]{DRAFT} Semantics of meta-class [ComOfferServiceGrant](#) [Meta-class [ComOfferServiceGrant](#) shall be used to award the right to offer the referenced [AdaptivePlatformServiceInstance](#).] ([RS_MANI_00060](#))

Class	ComOfferServiceGrant			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class represents the ability to grant the offering of a service. Tags: atp.Status=candidate atp.recommendedPackage=Grants			
Base	ARElement , ARObject , CollectableElement , Grant , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	ComOfferServiceGrant			
design	ComOfferServiceGrant Design	0..1	ref	This reference identifies the ComOfferServiceGrant Design that the enclosing ComOfferServiceGrant was created from. Stereotypes: atpUriDef Tags: atp.Status=candidate
serviceInstance	AdaptivePlatform ServiceInstance	0..1	ref	This reference identifies the AdaptivePlatformService Instances for which the grant applies. Tags: atp.Status=candidate

Table 10.79: ComOfferServiceGrant

[constr_10206]{DRAFT} **Multiplicity of the reference in the role [ComOfferServiceGrant.serviceInstance](#)** [For each [ComOfferServiceGrant](#), the reference in the role [serviceInstance](#) shall exist **at the time when the creation of the manifest is finished.**]()

[TPS_MANI_01241]{DRAFT} **Semantics of meta-class [ComFindServiceGrant](#)** [Meta-class [ComFindServiceGrant](#) shall be used to award the right to start a find of the referenced [AdaptivePlatformServiceInstance](#).] ([RS_MANI_00060](#))

Class	ComFindServiceGrant			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class represents the ability to grant the finding a service. Tags: atp.Status=candidate atp.recommendedPackage=Grants			
Base	ARElement , ARObject , CollectableElement , Grant , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
design	ComFindServiceGrant Design	0..1	ref	This reference identifies the ComFindServiceGrantDesign that the enclosing ComFindServiceGrant was created from. Stereotypes: atpUriDef Tags: atp.Status=candidate
serviceInstance	AdaptivePlatform ServiceInstance	0..1	ref	This reference identifies the AdaptivePlatformService Instances for which the grant applies. Tags: atp.Status=candidate

Table 10.80: ComFindServiceGrant

10.9.2 Grant Deployment for Raw Streaming Data

The definition of abstract meta-class [RawDataStreamGrant](#) on the level of deployment complements the existence of [RawDataStreamGrantDesign](#) on design level.

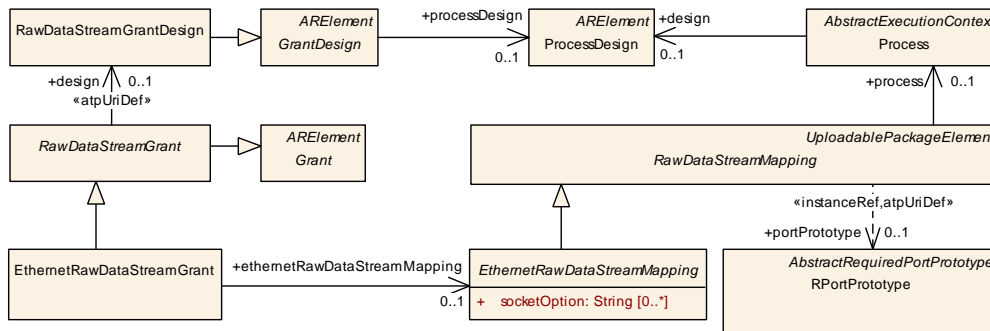


Figure 10.39: Modeling of the RawDataStreamGrant

[TPS_MANI_01307]{DRAFT} **Semantics of meta-class EthernetRawDataStreamGrant** [Meta-class EthernetRawDataStreamGrant provides the deployment-level IAM semantics for raw data streams that run on TCP/IP sockets. For this purpose, the reference in the role ethernetRawDataStreamMapping to meta-class EthernetRawDataStreamMapping exists.] (RS_MANI_00060, RS_MANI_00067)

Class	<i>RawDataStreamGrant</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This abstract meta-class represents the ability to define the IAM configuration for a RawDataStream on deployment level. Tags: atp.Status=candidate			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Grant</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>			
Subclasses	<i>EthernetRawDataStreamGrant</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
design	<i>RawDataStreamGrantDesign</i>	0..1	ref	This reference identifies the RawDataStreamGrantDesign that the enclosing RawDataStreamEventGrant was created from. Stereotypes: atpUriDef Tags: atp.Status=candidate

Table 10.81: RawDataStreamGrant

Class	<i>EthernetRawDataStreamGrant</i>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class represents the ability to define the IAM configuration for a EthernetRawDataStream on deployment level. Tags: atp.Status=candidate atp.recommendedPackage=Grants			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Grant</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>RawDataStreamGrant</i> , <i>Referrable</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note





Class	EthernetRawDataStreamGrant			
ethernetRawDataStreamMapping	EthernetRawDataStreamMapping	0..1	ref	This reference identifies the applicable EthernetRawDataStream to which the enclosing EthernetRawDataStream Grant shall apply. Tags: atp.Status=candidate

Table 10.82: EthernetRawDataStreamGrant

10.9.3 Remote access control

The overview of the remote access control was already introduced in chapter 3.22.3. Please note that for the modeling of [AbstractIamRemoteSubjects](#) the same approach is used in the Design and in the Deployment. So if [AbstractIamRemoteSubjects](#) were defined during the design phase they can be taken over into the deployment.

This chapter defines how [ComGrants](#) with a defined [remoteSubjects](#) shall be interpreted.

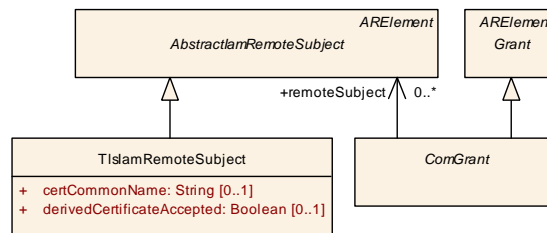


Figure 10.40: Modeling of the relation of [ComGrants](#) to the corresponding [remoteSubjects](#)

[TPS_MANI_03245]{DRAFT} Definition of [ComMethodGrant.remoteSubjects](#) on server side [If the [ComMethodGrant](#) references a [ProvidedApServiceInstance](#) in the role [serviceInstance](#) then the [ComMethodGrant.remoteSubject](#) reference defines the [remoteSubjects](#) that are allowed to call the defined [method](#) that is referenced by the [ComMethodGrant](#) in the role [serviceDeployment](#).] ([RS_MANI_00060](#))

[TPS_MANI_03246]{DRAFT} Definition of [ComMethodGrant.remoteSubjects](#) on client side [If the [ComMethodGrant](#) references a [RequiredApServiceInstance](#) in the role [serviceInstance](#) then the [ComMethodGrant.remoteSubject](#) reference defines the [remoteSubjects](#) to which a [ServiceMethodDeployment.method](#) call is allowed to be sent.] ([RS_MANI_00060](#))

[TPS_MANI_03247]{DRAFT} Definition of [ComEventGrant.remoteSubjects](#) on provider side [If the [ComEventGrant](#) references a [ProvidedApServiceInstance](#) in the role [serviceInstance](#) then the [ComEventGrant.remoteSubject](#) reference defines the [remoteSubjects](#) to which an [ServiceEventDeployment.event](#) is allowed to be sent.] ([RS_MANI_00060](#))

[TPS_MANI_03248]{DRAFT} **Definition of `ComEventGrant.remoteSubjects` on receiver side** [If the `ComEventGrant` references a `RequiredApServiceInstance` in the role `serviceInstance` then the `ComEventGrant.remoteSubject` reference defines the `remoteSubjects` from which an `ServiceEventDeployment.event` is allowed to be received.]([RS_MANI_00060](#))

[TPS_MANI_03249]{DRAFT} **Definition of `ComFieldGrant.remoteSubjects` on provider side** [If the `ComFieldGrant` references a `ProvidedApServiceInstance` in the role `serviceInstance` then the `ComFieldGrant.remoteSubject` reference defines the `remoteSubjects` that are allowed to access the `Field` that is referenced by the `ServiceFieldDeployment` that in turn is referenced by the `ComFieldGrant` in the role `serviceDeployment`. This allows the following communication between the local `Machine` and the `AbstractIamRemoteSubject`:

- the `Field` notifier is allowed to be sent to `remoteSubjects`,
- if `ComFieldGrant.role` equals `setter` or `getterSetter`, then the setter call is allowed to be received from the `remoteSubjects`,
- if `ComFieldGrant.role` equals `setter` or `getterSetter`, then the setter return is allowed to be sent to `remoteSubjects`,
- if `ComFieldGrant.role` equals `getter` or `getterSetter`, then the getter call is allowed to be received from the `remoteSubjects`,
- if `ComFieldGrant.role` equals `getter` or `getterSetter`, then the getter return is allowed to be sent to `remoteSubjects`.

]([RS_MANI_00060](#))

[TPS_MANI_03250]{DRAFT} **Definition of `ComFieldGrant.remoteSubjects` on client side** [If the `ComFieldGrant` references a `RequiredApServiceInstance` in the role `serviceInstance` then the `ComFieldGrant.remoteSubject` reference defines the `remoteSubjects` that are allowed to provide the `Field` for access that is referenced by the `ServiceFieldDeployment` that in turn is referenced by the `ComFieldGrant` in the role `serviceDeployment`. This will allow the following communication between the local `Machine` and the `AbstractIamRemoteSubject`:

- the `Field` notifier is allowed to be received from `remoteSubjects`,
- if `ComFieldGrant.role` equals `setter` or `getterSetter`, then the setter call is allowed to be sent to the `remoteSubjects`,
- if `ComFieldGrant.role` equals `setter` or `getterSetter`, then the setter return is allowed to be received from `remoteSubjects`,
- if `ComFieldGrant.role` equals `getter` or `getterSetter`, the getter call is allowed to be sent to the `remoteSubjects`,
- if `ComFieldGrant.role` equals `getter` or `getterSetter`, the getter return is allowed to be received from `remoteSubjects`.

|(RS_MANI_00060)

Please note that a `ComGrant` with the `remoteSubject` reference defines that a remote access control for this `ComGrant` will be performed. Such a `ComGrant` with the `remoteSubject` reference does not enforce any `Machine` local access restrictions.

To enforce local access restrictions for the same `ServiceInterface` element of the same `AdaptivePlatformServiceInstance` an additional `ComGrant` needs to be defined that points to the same `serviceInstance` and to the same `ComFieldGrant.serviceDeployment` or `ComEventGrant.serviceDeployment` or `ComMethodGrant.serviceDeployment` but does not contain the `remoteSubject` reference.

10.10 Crypto Deployment

This chapter explains the configuration of the Crypto functional cluster and the interaction of application Software with the Crypto stack [15].

[TPS_MANI_03260]{DRAFT} **Semantics of meta-class `CryptoModuleInstantiation`** [The representation of the Crypto functional cluster [15] within one specific `Machine` is defined by the `CryptoModuleInstantiation`.] (RS_MANI_00023)

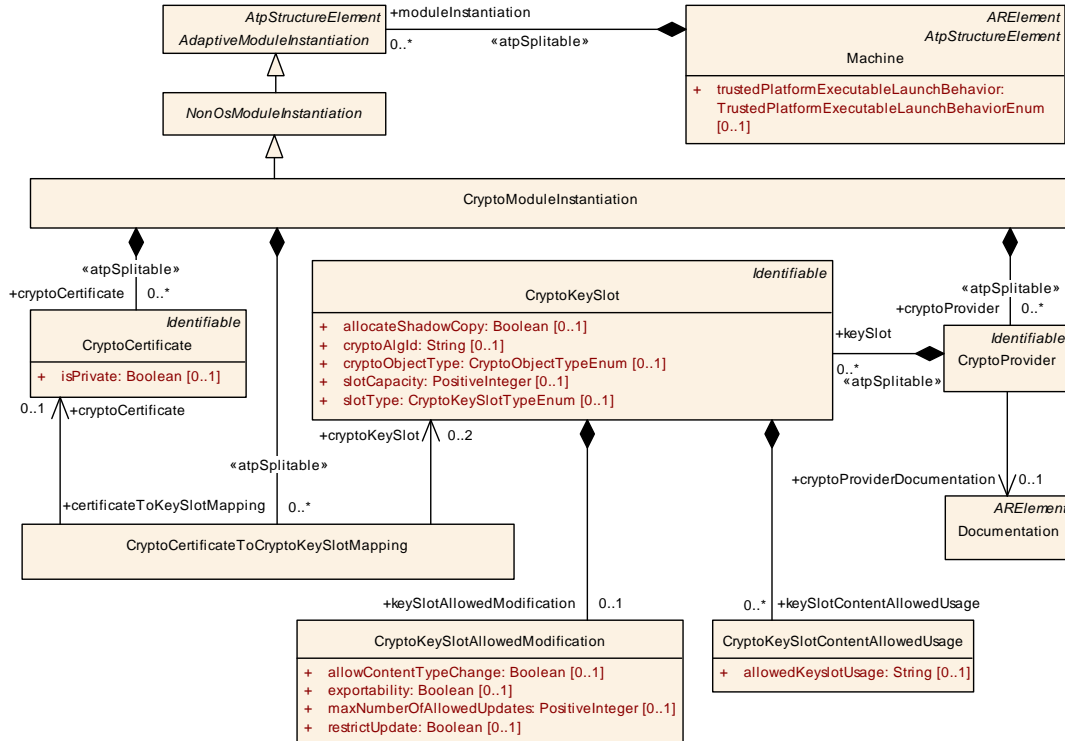


Figure 10.41: CryptoModuleInstantiation Overview

Class	CryptoModuleInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class defines the configuration for the Crypto stack on a specific machine.			
Base	ARObject, AdaptiveModuleInstantiation , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , NonOsModuleInstantiation , Referrable			
Aggregated by	AtpClassifier.atpFeature , Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
certificateToKeySlotMapping	CryptoCertificateToCryptoKeySlotMapping	*	aggr	List of CryptoCertificateToCryptoKeySlotMappings available in the CryptoStack. Stereotypes: atpSplitable Tags: atp.Splitkey=certificateToKeySlotMapping
cryptoCertificate	CryptoCertificate	*	aggr	List of CryptoCertificates managed in the CryptoStack Stereotypes: atpSplitable Tags: atp.Splitkey=cryptoCertificate.shortName
cryptoProvider	CryptoProvider	*	aggr	List of CryptoProviders provided by the CryptoStack Stereotypes: atpSplitable Tags: atp.Splitkey=cryptoProvider.shortName

Table 10.83: CryptoModuleInstantiation

10.10.1 Crypto Provider

[TPS_MANI_03261]{DRAFT} **Support of [CryptoProviders](#)** [The Crypto functional cluster is able to support multiple [CryptoProviders](#). Each [CryptoProvider](#) implements a software- or a hardware-based cryptographic library.] ([RS_MANI_00023](#))

Class	CryptoProvider			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	CryptoProvider implements cryptographic primitives (algorithms) supported by the stack. Implementation of this component may be software or hardware based (HSM/TPM).			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	CryptoModuleInstantiation.cryptoProvider			
Attribute	Type	Mult.	Kind	Note
cryptoProviderDocumentation	Documentation	0..1	ref	Documentation of the CryptoProvider that describes the implemented cryptographic primitives.
keySlot	CryptoKeySlot	*	aggr	This aggregation represents the key slots that are allocated by the CryptoProvider. Stereotypes: atpSplitable Tags: atp.Splitkey=keySlot.shortName

Table 10.84: CryptoProvider

Please note that each [CryptoProvider](#) can be described in more detail with the [cryptoProviderDocumentation](#) that uses the [Documentation](#) element to provide means for a more detailed description.

[TPS_MANI_03262]{DRAFT} **Semantics of [CryptoProviderToPortPrototypeMapping](#)** [Meta-class [CryptoProviderToPortPrototypeMapping](#) has the ability to map a specific [PortPrototype](#) referenced in the role [portPrototype](#) to a [CryptoProvider](#) referenced in the role [cryptoProvider](#).

The mapping also comprises a reference to meta-class `process` in order to accommodate for the fact that identical combinations of `cryptoProvider` and `portPrototype` may or may not apply for a given `Process` that represents the enclosing `Executable` at runtime. [\(RS_MANI_00023\)](#)

Class	CryptoProviderToPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class represents the ability to define a mapping between a <code>CryptoProvider</code> on deployment level to a given <code>PortPrototype</code> that is typed by a <code>CryptoProviderInterface</code> . Tags: atp.recommendedPackage=CryptoProviderToPortPrototypeMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
cryptoProvider	CryptoProvider	0..1	ref	This reference represents the mapped <code>cryptoProvider</code> .
portPrototype	RPortPrototype	0..1	iref	This reference represents the mapped <code>PortPrototype</code> . InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef
process	Process	0..1	ref	This reference represents the process required as context for the mapping.

Table 10.85: CryptoProviderToPortPrototypeMapping

[constr_10207]{DRAFT} Multiplicity of the reference in the role `CryptoProviderToPortPrototypeMapping.cryptoProvider` [For each `CryptoProviderToPortPrototypeMapping`, the reference in the role `cryptoProvider` shall exist **at the time when the creation of the manifest is finished.** [\(\)](#)

[constr_10208]{DRAFT} Multiplicity of the reference in the role `CryptoProviderToPortPrototypeMapping.process` [For each `CryptoProviderToPortPrototypeMapping`, the reference in the role `process` shall exist **at the time when the creation of the manifest is finished.** [\(\)](#)

[constr_5240]{DRAFT} Restriction applicable for `CryptoProviderToPortPrototypeMapping.portPrototype` [The reference `CryptoProviderToPortPrototypeMapping.portPrototype` shall only be used for an `RPortPrototype` typed by a `CryptoProviderInterface`. [\(\)](#)

The application developer uses the `ara::core::InstanceSpecifier` as local identifier in the API call that represents the path to the modeled `RPortPrototype`. The Integrator maps the `RPortPrototype` in the deployment model with the `CryptoProviderToPortPrototypeMapping` to the concrete `CryptoProvider`.

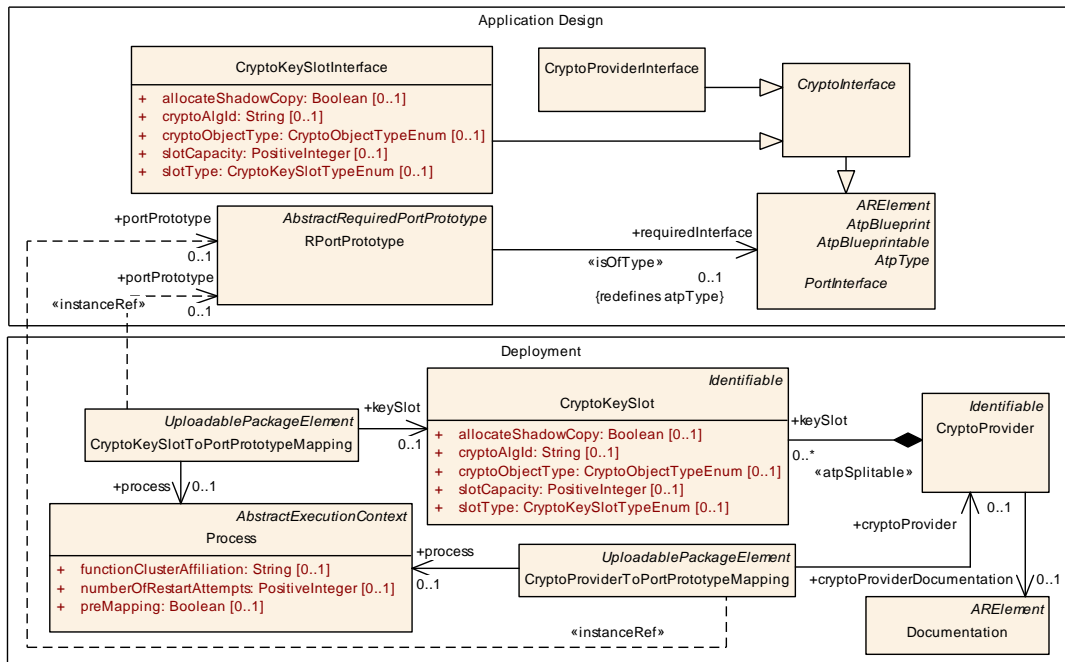


Figure 10.42: Mapping of CryptoProviders and CryptoKeySlots to RPortPrototypes

10.10.2 Crypto Key Slot

The Key Storage Provider is responsible for the storage of different type of key material. The crypto objects that are stored by the Key Storage Provider are represented as [CryptoKeySlots](#) in the model.

[TPS_MANI_03263]{DRAFT} **Assignment of [CryptoKeySlots](#) to [CryptoProviders](#)** [Crypto objects that are used by the [CryptoProvider](#) are described by the [CryptoKeySlots](#) that are aggregated by the [CryptoProvider](#) in the role [keySlot](#).] ([RS_MANI_00023](#))

Class	CryptoKeySlot			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class represents the ability to define a concrete key to be used for a crypto operation. Tags: atp.ManifestKind=MachineManifest			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	CryptoProvider .keySlot			
Attribute	Type	Mult.	Kind	Note
allocateShadowCopy	Boolean	0..1	attr	This attribute defines whether a shadow copy of this Key Slot shall be allocated to enable rollback of a failed Key Slot update campaign (see interface BeginTransaction).





Class	CryptoKeySlot			
cryptoAlgId	String	0..1	attr	This attribute defines a crypto algorithm restriction (kAlgId Any means without restriction). The algorithm can be specified partially: family & length, mode, padding. Future Crypto Providers can support some crypto algorithms that are not well known/ standardized today, therefore AUTOSAR doesn't provide a concrete list of crypto algorithms' identifiers and doesn't suppose usage of numerical identifiers. Instead of this a provider supplier should provide string names of supported algorithms in accompanying documentation. The name of a crypto algorithm shall follow the rules defined in the specification of cryptography for Adaptive Platform.
cryptoObjectType	CryptoObjectTypeEnum	0..1	attr	Object type that can be stored in the slot. If this field contains "Undefined" then mSlotCapacity must be provided and larger then 0. Tags: atp.Status=candidate
keySlotAllowedModification	CryptoKeySlotAllowedModification	0..1	aggr	Restricts how this keySlot may be used Tags: atp.Status=candidate
keySlotContentAllowedUsage	CryptoKeySlotContentAllowedUsage	*	aggr	Restriction of allowed usage of a key stored to the slot. Tags: atp.Status=candidate
slotCapacity	PositiveInteger	0..1	attr	Capacity of the slot in bytes to be reserved by the stack vendor. One use case is to define this value in case that the cryptoObjectType is undefined and the slot size can not be deduced from cryptoObjectType and cryptoAlgId. "0" means slot size can be deduced from cryptoObjectType and cryptoAlgId.
slotType	CryptoKeySlotTypeEnum	0..1	attr	This attribute defines whether the keySlot is exclusively used by the Application; or whether it is used by Stack Services and managed by a Key Manager Application. Tags: atp.Status=candidate

Table 10.86: CryptoKeySlot

[TPS_MANI_03264]{DRAFT} **Semantics of [CryptoKeySlotToPortPrototypeMapping](#)** [Meta-class [CryptoKeySlotToPortPrototypeMapping](#) has the ability to map a specific [PortPrototype](#) referenced in the role [portPrototype](#) to a [CryptoKeySlot](#) referenced in the role [keySlot](#).

The mapping also comprises a reference to meta-class [process](#) in order to accommodate for the fact that identical combinations of [keySlot](#) and [portPrototype](#) may or may not apply for a given [Process](#) that represents the enclosing [Executable](#) at runtime.] ([RS_MANI_00023](#))

Class	CryptoKeySlotToPortPrototypeMapping
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment
Note	This meta-class represents the ability to define a mapping between a CryptoKeySlot on deployment level to a given PortPrototype that is typed by a CryptoKeySlotInterface . Tags: atp.recommendedPackage=CryptoKeySlotToPortPrototypeMappings
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement
Aggregated by	ARPackage.element





Class		CryptoKeySlotToPortPrototypeMapping		
Attribute	Type	Mult.	Kind	Note
keySlot	CryptoKeySlot	0..1	ref	This reference represents the mapped CryptoKeySlot.
portPrototype	RPortPrototype	0..1	iref	This reference represents the mapped PortPrototype. InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef
process	Process	0..1	ref	This reference represents the process required as context for the mapping.

Table 10.87: CryptoKeySlotToPortPrototypeMapping

[constr_10209]{DRAFT} Multiplicity of the reference in the role [CryptoKeySlotToPortPrototypeMapping.keySlot](#) [For each [CryptoKeySlotToPortPrototypeMapping](#), the reference in the role `keySlot` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10210]{DRAFT} Multiplicity of the reference in the role [CryptoKeySlotToPortPrototypeMapping.process](#) [For each [CryptoKeySlotToPortPrototypeMapping](#), the reference in the role `process` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_5241]{DRAFT} Restriction applicable for [CryptoKeySlotToPortPrototypeMapping.portPrototype](#) [The reference [CryptoKeySlotToPortPrototypeMapping.portPrototype](#) shall only be used for an [RPortPrototype](#) typed by a [CryptoKeySlotInterface](#).]()

The application developer uses the `ara::core::InstanceSpecifier` as local identifier in the API call that represents the path to the modeled [RPortPrototype](#). The Integrator maps the [RPortPrototype](#) in the deployment model with the [CryptoKeySlotToPortPrototypeMapping](#) to the concrete [CryptoKeySlot](#) that is stored by the Key Storage Provider. The information from the deployment model is therefore used to replace the local identifier from the Application Design by the concrete [CryptoKeySlot](#).

10.10.3 Crypto Certificate

[TPS_MANI_03265]{DRAFT} Support of [CryptoCertificates](#) [Certificates stored by the Certificate Management Provider that is available in the Crypto functional cluster are modeled as [CryptoCertificates](#).] ([RS_MANI_00023](#))

Class	CryptoCertificate
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment
Note	This meta-class represents the ability to model a cryptographic certificate.
Base	AObject , Identifiable , MultilanguageReferrable , Referrable
Aggregated by	CryptoModuleInstantiation.cryptoCertificate





Class	CryptoCertificate			
Attribute	Type	Mult.	Kind	Note
isPrivate	Boolean	0..1	attr	This attribute controls the possibility to access the content of the CryptoCertificateSlot by Find() interfaces of the X509 Provider.

Table 10.88: CryptoCertificate

[TPS_MANI_03266]{DRAFT} **Semantics of CryptoCertificateToCryptoKeySlotMapping** [The [CryptoCertificateToCryptoKeySlotMapping](#) is used to assign a private key and optionally a public key to the [CryptoCertificate](#).] ([RS_MANI_00023](#))

Class	CryptoCertificateToCryptoKeySlotMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class represents the ability to define a mapping between a CryptoKeySlot and a Crypto Certificate.			
Base	ARObject			
Aggregated by	CryptoModuleInstantiation.certificateToKeySlotMapping			
Attribute	Type	Mult.	Kind	Note
crypto Certificate	CryptoCertificate	0..1	ref	This reference represents the mapped cryptoCertificate.
cryptoKeySlot	CryptoKeySlot	0..2	ref	This reference represents the mapped cryptoKeySlot.

Table 10.89: CryptoCertificateToCryptoKeySlotMapping

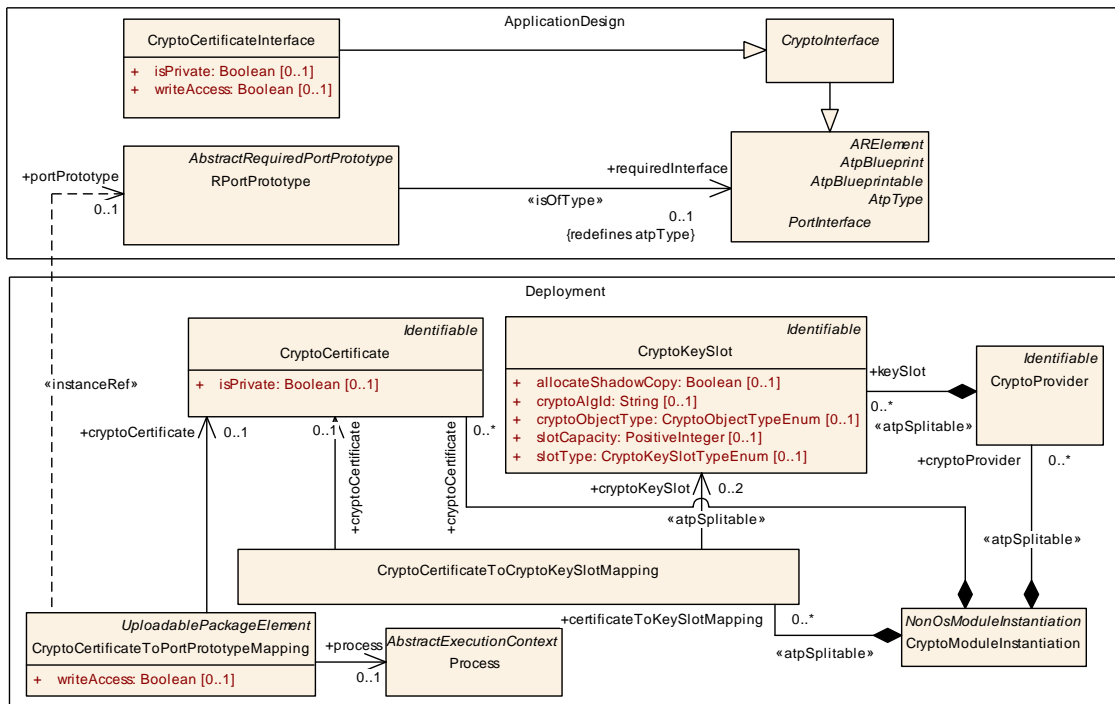


Figure 10.43: Mapping of CryptoCertificates to RPortPrototypes

[constr_10211]{DRAFT} **Multiplicity of the reference in the role `CryptoCertificateToCryptoKeySlotMapping.cryptoCertificate`** [For each `CryptoCertificateToCryptoKeySlotMapping`, the reference in the role `cryptoCertificate` shall exist **at the time when the creation of the manifest is finished.**]()

[TPS_MANI_03267]{DRAFT} **Semantics of `CryptoCertificateToPortPrototypeMapping`** [Meta-class `CryptoCertificateToPortPrototypeMapping` has the ability to map a specific `PortPrototype` referenced in the role `portPrototype` to a `CryptoCertificate` referenced in the role `cryptoCertificate`.

The mapping also comprises a reference to meta-class `process` in order to accommodate for the fact that identical combinations of `cryptoCertificate` and `portPrototype` may or may not apply for a given `Process` that represents the enclosing `Executable` at runtime.]([RS_MANI_00023](#))

Class	CryptoCertificateToPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class represents the ability to define a mapping between a <code>CryptoCertificate</code> on deployment level to a given <code>PortPrototype</code> that is typed by a <code>CryptoCertificateInterface</code> . Tags: atp.recommendedPackage=CryptoCertificateToPortPrototypeMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
cryptoCertificate	CryptoCertificate	0..1	ref	This reference represents the mapped <code>cryptoCertificate</code> .
portPrototype	RPortPrototype	0..1	iref	This reference represents the mapped <code>PortPrototype</code> . InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef
process	Process	0..1	ref	This reference represents the process required as context for the mapping.
writeAccess	Boolean	0..1	attr	This attribute defines whether the application has write-access to the <code>CryptoCertificate</code> (True) or only read-access (False).

Table 10.90: `CryptoCertificateToPortPrototypeMapping`

[constr_5242]{DRAFT} **Restriction applicable for `CryptoCertificateToPortPrototypeMapping.portPrototype`** [The reference `CryptoCertificateToPortPrototypeMapping.portPrototype` shall only be used for an `RPortPrototype` typed by a `CryptoCertificateInterface`.]()

The application developer uses the `ara::core::InstanceSpecifier` as local identifier in the API call that represents the path to the modeled `RPortPrototype`. The Integrator maps the `RPortPrototype` in the deployment model with the `CryptoCertificateToPortPrototypeMapping` to the concrete `CryptoCertificate` that is stored by the Certificate Management Provider. The information from the deployment model is therefore used to replace the local identifier from the Application Design by the concrete `CryptoCertificate`.

10.11 IdsM Deployment

10.11.1 IdsM Instantiation

The definition of the deployment for the Intrusion Detection System Manager (IdsM) is modeled by means of the meta-class `IdsmModuleInstantiation`

Class	IdsmModuleInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IntrusionDetectionSystem			
Note	This meta-class defines the attributes for the IdsM configuration on a specific machine. Tags: atp.Status=candidate			
Base	<i>ARObject</i> , <i>AdaptiveModuleInstantiation</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>IdsPlatformInstantiation</i> , <i>MultilanguageReferrable</i> , <i>NonOsModuleInstantiation</i> , <i>Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i> , <i>Machine.moduleInstantiation</i>			
Attribute	Type	Mult.	Kind	Note
reportable SecurityEvent	<code>SecurityEventMapping</code>	*	ref	Collection of reportable instances of security events. Stereotypes: atpSplitable Tags: atp.Splitkey=reportableSecurityEvent atp.Status=candidate

Table 10.91: IdsmModuleInstantiation

[constr_10021]{DRAFT} Existence of `IdsmModuleInstantiation` [On each `Machine`, only one instance of the `Intrusion Detection System Manager` (modeled by `IdsmModuleInstantiation`) shall exist.]()

This instance manages all the reported SEvs created by SWCLs or Function Clusters on this Adaptive Machine.

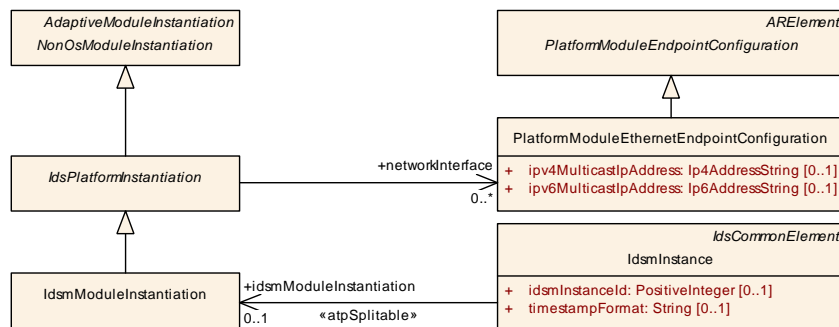


Figure 10.44: Specification of the `IdsmModuleInstantiation`

Meta-class `IdsmModuleInstantiation` is derived from the abstract meta-class `IdsPlatformInstantiation` which acts as an abstract base class for all platform modules that contribute to the implementation of the Intrusion Detection System.

Class	IdsPlatformInstantiation (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IntrusionDetectionSystem			
Note	This meta-class acts as an abstract base class for platform modules that implement the intrusion detection system. Tags: atp.Status=candidate			
Base	ARObject, AdaptiveModuleInstantiation , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , NonOsModuleInstantiation , Referrable			
Subclasses	IdsmModuleInstantiation			
Aggregated by	AtpClassifier .atpFeature, Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
networkInterface	PlatformModuleEthernetEndpointConfiguration	*	ref	This association contains the network configuration that shall be applied to an instance of an IDS entity. Tags: atp.Status=candidate
timeBase	TimeBaseResource	0..1	ref	This reference identifies the applicable time base resource. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=timeBase.timeBaseResource, timeBase.variationPoint.shortLabel atp.Status=candidate vh.latestBindingTime=systemDesignTime

Table 10.92: IdsPlatformInstantiation

[constr_3728]{DRAFT} Upper multiplicity of reference in the role [IdsPlatformInstantiation.networkInterface](#) [In the context of [IdsPlatformInstantiation](#), the reference in the role [networkInterface](#) shall exist at most once at the time when the creation of the manifest is finished.]()

10.11.2 Obtaining custom Time Stamps for Security Events

One of the tasks of an IdsM is to obtain a custom time stamp that corresponds to reported security events under certain circumstances (which are not relevant for the sake of discussing the modeling).

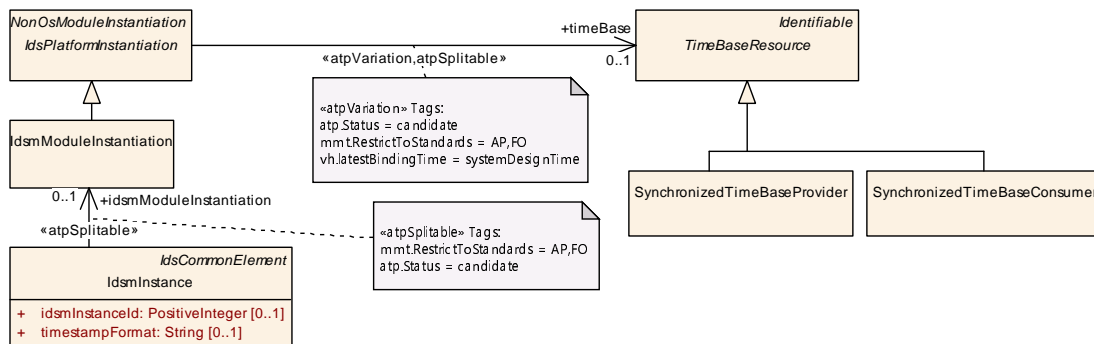


Figure 10.45: Creating an association between a [IdsmModuleInstantiation](#) and a [TimeBaseResource](#)

Time stamps can be obtained from sub-classes of the abstract base-class `TimeBaseResource`. Therefore, `IdsmModuleInstantiation` maintains a reference to `TimeBaseResource`.

10.11.3 Deployment for Security Events

[TPS_MANI_01341]{DRAFT} Security events that are actually reported by a local IdsM [The security events that are actually reported by a local IdsM are represented by meta-class `SecurityEventMapping`, referenced by `IdsmModuleInstantiation` in the role `reportableSecurityEvent`.] (*RS_MANI_00069*)

[TPS_MANI_01342]{DRAFT} Semantics of `SecurityEventMapping` [The semantics of meta-class `SecurityEventMapping` is to identify the

- `PortPrototype` in the context of an `Executable` from which the security event is reported
- `Process` that runs the `Executable`, and from the `Process` the `SecurityEventDefinition` from which the `SecurityEventMapping.id` has been derived.

](*RS_MANI_00069*)

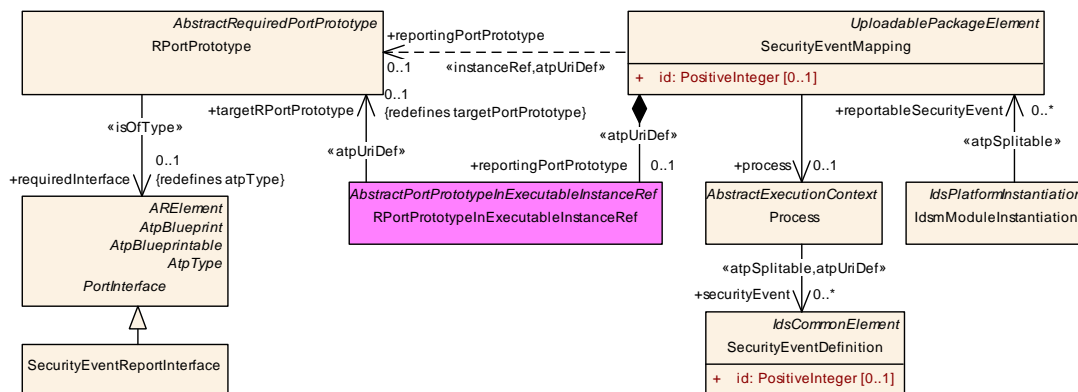


Figure 10.46: Modeling of between a `SecurityEventMapping`

Class	SecurityEventMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IntrusionDetectionSystem			
Note	This meta-class represents a reportable instance of a security event. Tags: atp.Status=candidate atp.recommendedPackage=SecurityEventMappings			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i> , <i>UploadablePackageElement</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note





Class	SecurityEventMapping			
id	PositiveInteger	0..1	attr	This attribute defines the numerical identification of the security event subject to deployment. Tags: atp.Status=candidate
process	Process	0..1	ref	This reference identifies the process in which context the security event is reported. Tags: atp.Status=candidate
reportingPort Prototype	RPortPrototype	0..1	iref	This instanceRef identifies the portPrototype over which the security event is reported. Stereotypes: atpUriDef Tags: atp.Status=candidate InstanceRef implemented by: RPortPrototypeInExecutableInstanceRef

Table 10.93: SecurityEventMapping

[constr_10022]{DRAFT} Restriction for [SecurityEventMapping.process.securityEvent.id](#) w.r.t [SecurityEventMapping.id](#) [The value of [SecurityEventMapping.id](#) shall also occur in one of the [SecurityEventDefinition.id](#) referenced in the role [SecurityEventMapping.process.securityEvent](#) at the time when the creation of the manifest is finished.]()

Rationale for [\[constr_10022\]](#): during the creation of the IdsM deployment, the value of [SecurityEventMapping.id](#) shall be copied from one of the values in [SecurityEventMapping.process.securityEvent.id](#).

10.12 Service-oriented Vehicle Diagnostics

10.12.1 Overview

The SOVD architecture [\[24\]](#) foresees the existence of an SOVD gateway that communicates with:

- an SOVD `Client` outside the vehicle's network
- the collection of SOVD `Servers` inside the vehicle's network.

Some of the configuration items of SOVD gateway and SOVD `Server` can be shared, but some are distinct for one of the two SOVD entities. This aspect is reflected in the formalization as [SovdServerInstantiation](#) and [SovdGatewayInstantiation](#).

[TPS_MANI_01399]{DRAFT} Modeling of the configuration of Service-oriented Vehicle Diagnostics [The deployment-level configuration of SOVD software is represented by abstract meta-class [SovdModuleInstantiation](#) and its two sub-classes:

- [SovdServerInstantiation](#): representation of SOVD `Server` reachable via SOVD somewhere in the vehicle network.
- [SovdGatewayInstantiation](#): representation of the “edge-node” that connects an SOVD `Client` with the SOVD `Servers` in the vehicle network. This

is a logical role, i.e. the `Machine` on which an `SovdGatewayInstantiation` is running could also host one or more `SovdServerInstantiations`.

]([RS_MANI_00023](#), [RS_MANI_00070](#))

[TPS_MANI_01400]{DRAFT} Secure communication between SOVD Gateway and SOVD Server [The *unicast* communication between SOVD gateway and `SOVD Server` is modeled using the same concepts as for other vehicle-internal communication, i.e. by reference to a `CommunicationConnector` in the role `SovdModuleInstantiation.communicationConnector`.] ([RS_MANI_00023](#), [RS_MANI_00070](#))

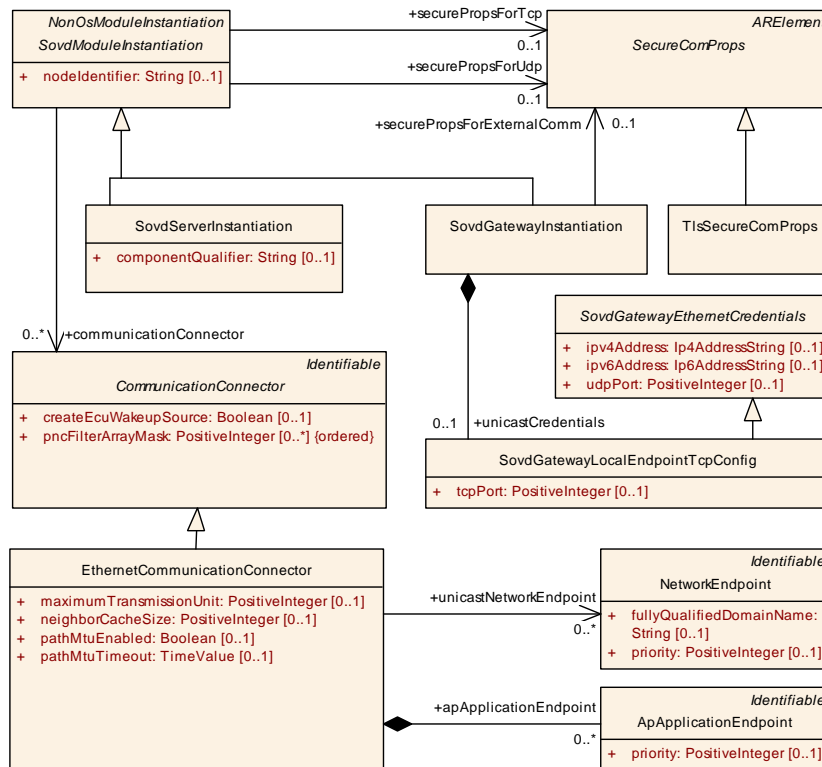


Figure 10.47: Modeling of subclasses of `SovdModuleInstantiation`

[TPS_MANI_01401]{DRAFT} Support for TLS in vehicle-internal SOVD communication [The internal SOVD communication can be secured by TLS. The configuration of the TLS credentials is modeled by means of the references

- `SovdModuleInstantiation.securePropsForTcp`
- `SovdModuleInstantiation.securePropsForUdp`

]([RS_MANI_00023](#), [RS_MANI_00070](#))

Class	SovdModuleInstantiation (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::SOVD			
Note	This abstract meta-class serves as the base class for meta-classes that describe the configuration of an SOVD module. Tags: atp.Status=candidate			
Base	ARObject, AdaptiveModuleInstantiation , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , NonOsModuleInstantiation , Referrable			
Subclasses	SovdGatewayInstantiation , SovdServerInstantiation			
Aggregated by	AtpClassifier.atpFeature , Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
communication Connector	Communication Connector	*	ref	This reference identifies the collection of communication connectors used by the SOVD module instantiation for vehicle-internal communication. Tags: atp.Status=candidate
nodeIdentifier	String	0..1	attr	This attribute represents the local hostname of the SOVD server to be used during the execution of the DNS-SD protocol. Tags: atp.Status=candidate
securePropsFor Tcp	SecureComProps	0..1	ref	This reference is used to identify the applicable TCP secure com properties for the external communication of the enclosing SOVD server. Tags: atp.Status=candidate
securePropsFor Udp	SecureComProps	0..1	ref	This reference is used to identify the applicable UDP secure com properties for the external communication of the enclosing SOVD server. Tags: atp.Status=candidate

Table 10.94: SovdModuleInstantiation

10.12.2 SOVD Server

[TPS_MANI_01402]{DRAFT} Identification of the SOVD Server [The identification of the [SOVD Server](#) is supported by the configuration of the attribute [SovdServerInstantiation.componentQualifier](#).

In other words, the [SOVD Client](#) communicates with the [SOVD Server](#) by putting the value of the [componentQualifier](#) into the *component-identifier part* of the query URL.] ([RS_MANI_00023](#), [RS_MANI_00070](#))

Class	SovdServerInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::SOVD			
Note	This meta-class represents the configuration of an SOVD server. Tags: atp.Status=candidate			
Base	ARObject, AdaptiveModuleInstantiation , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , NonOsModuleInstantiation , Referrable , SovdModuleInstantiation			
Aggregated by	AtpClassifier.atpFeature , Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note





Class	SovdServerInstantiation			
component Qualifier	String	0..1	attr	This attributes described the component qualifier used to compose an SOVD query. Tags: atp.Status=candidate

Table 10.95: SovdServerInstantiation

[constr_10400]{DRAFT} Existence of `SovdServerInstantiation.componentQualifier` [For each `SovdServerInstantiation`, attribute `componentQualifier` shall exist **at the time when the creation of the manifest is finished.**]()

10.12.3 SOVD Gateway

The SOVD gateway represents the “edge-node” of the SOVD-related internal communication network towards the tester.

This means that the SOVD gateway’s configuration not only consists of the definition of internal communication paths, it also needs to expose credentials for the communication with a `SOVD Client` as well as the application of search functionality via *multicast DNS* (mDNS) [25] and *DNS Service Discovery* (DNS-SD) [26].

[TPS_MANI_01403]{DRAFT} External communication of the SOVD gateway [The specification of external communication with the `SOVD Client` needs to cover the following cases:

- multicast DNS: usage of standardized mDNS credentials².
- DNS-SD: configuration of hostname in the form of `SovdModuleInstantiation.nodeIdentifier`.
- unicast communication with the diagnostic client: aggregation of `SovdGatewayLocalEndpointTcpConfig` in the role `SovdGatewayInstantiation.unicastCredentials`.

] ([RS_MANI_00023](#), [RS_MANI_00070](#))

[TPS_MANI_01404]{DRAFT} Secure communication between SOVD gateway and `SOVD Client` [The communication between SOVD gateway and `SOVD Client` can be secured by TLS.

The TLS configuration for the SOVD gateway can be created by means of the reference in the role `SovdGatewayInstantiation.securePropsForExternalComm.`] ([RS_MANI_00023](#), [RS_MANI_00070](#))

²mDNS uses multicast UDP credentials: 224.0.0.251, port 5353 (IPv4) [27] [28] or FF02::FB (IPv6), port 5353 [29] [28], reserved by IANA.

Class	SovdGatewayInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::SOVD			
Note	This meta-class represents the configuration of an SOVD gateway. Tags: atp.Status=candidate			
Base	<i>ARObject</i> , AdaptiveModuleInstantiation , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>NonOsModuleInstantiation</i> , <i>Referrable</i> , SovdModuleInstantiation			
Aggregated by	<i>AtpClassifier.atpFeature</i> , Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
securePropsForExternalComm	SecureComProps	0..1	ref	This reference is used to identify the applicable secure com properties for the external communication of the enclosing SOVD gateway. Tags: atp.Status=candidate
unicastCredentials	SovdGatewayLocalEndpointTcpConfig	0..1	aggr	This aggregation is used to describe the unicast credentials for external (i.e. with a tester) communication of the enclosing SOVD gateway. Tags: atp.Status=candidate

Table 10.96: SovdGatewayInstantiation

Class	SovdGatewayLocalEndpointTcpConfig			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::SOVD			
Note	This meta-class provides the ability to define the TCP configuration of a local endpoint for external communication of an SOVD gateway. Tags: atp.Status=candidate			
Base	<i>ARObject</i> , SovdGatewayEthernetCredentials			
Aggregated by	SovdGatewayInstantiation.unicastCredentials			
Attribute	Type	Mult.	Kind	Note
tcpPort	PositiveInteger	0..1	attr	This attribute describes the port number of the port used for TCP communication. Tags: atp.Status=candidate

Table 10.97: SovdGatewayLocalEndpointTcpConfig

[constr_10401]{DRAFT} **Existence of [SovdGatewayLocalEndpointTcpConfig.tcpPort](#)** [For each [SovdGatewayLocalEndpointTcpConfig](#), attribute [tcpPort](#) shall exist **at the time when the creation of the manifest is finished.**]()

Class	<i>SovdGatewayEthernetCredentials</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::SOVD			
Note	This meta-class represents the ability to define Ethernet credentials for the purpose of connecting a client to an SOVD gateway. Tags: atp.Status=candidate			
Base	<i>ARObject</i>			
Subclasses	SovdGatewayLocalEndpointTcpConfig			
Attribute	Type	Mult.	Kind	Note





Class	SovdGatewayEthernetCredentials (abstract)			
ipv4Address	Ip4AddressString	0..1	attr	This attribute represents the IPv4 address for the case that IPv4 is used for communication between the SOVD gateway and a client. Tags: atp.Status=candidate
ipv6Address	Ip6AddressString	0..1	attr	This attribute represents the IPv6 address for the case that IPv6 is used for communication between the SOVD gateway and a client. Tags: atp.Status=candidate
udpPort	PositiveInteger	0..1	attr	This attribute describes the port number of the port used for UDP communication. Tags: atp.Status=candidate

Table 10.98: SovdGatewayEthernetCredentials

[constr_10402]{DRAFT} Existence of SovdGatewayEthernetCredentials.ipv4Address vs. SovdGatewayEthernetCredentials.ipv6Address [For each `SovdGatewayEthernetCredentials`, at least one of attributes

- `SovdGatewayEthernetCredentials.ipv4Address`
- `SovdGatewayEthernetCredentials.ipv6Address`

shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10403]{DRAFT} Existence of SovdGatewayEthernetCredentials.udpPort [For each `SovdGatewayEthernetCredentials`, attribute `udpPort` shall exist **at the time when the creation of the manifest is finished.**]()

10.13 Firewall Deployment

AUTOSAR supports an Ethernet packet filtering firewall as an additional security layer. Such a firewall checks, for example, the source and destination IP address, protocols (UDP and TCP) and port addresses. If the address information matches then the packet is considered secured.

Two kinds of firewalls are supported:

1. Stateful packet filtering firewalls
2. Stateless packet filtering firewalls

The stateful firewall monitors the state of network connections and analyzes the complete context of traffic and data packets. The context involves the metadata of the packets (e.g. the ports and IP address of the endpoint and destination) and the state refers to the policy based on the connection state. Approved traffic requests will be added to an approved list and will be allowed to proceed to the network.

The stateless firewall supports a rule-based filtering of traffic based on the evaluation of IP packet parameters without knowledge of the connection status (e.g. TCP session). The filtering can either be an allow list- or a block list-based.

[TPS_MANI_03296]{DRAFT} Machine-specific configuration settings for Firewall
[The Machine-specific configuration settings for the Firewall module are collected in [AdaptiveFirewallModuleInstantiation](#).]()

Class	AdaptiveFirewallModuleInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	This meta-class defines the attributes for the Firewall configuration on a specific machine. Tags: atp.Status=candidate			
Base	<i>ARObject</i> , <i>AdaptiveModuleInstantiation</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>NonOsModuleInstantiation</i> , <i>Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i> , <i>Machine.moduleInstantiation</i>			
Attribute	Type	Mult.	Kind	Note
stateDependent Firewall	StateDependentFirewall	0..1	ref	Firewall rules that are defined in a firewall state Tags: atp.Status=candidate

Table 10.99: AdaptiveFirewallModuleInstantiation

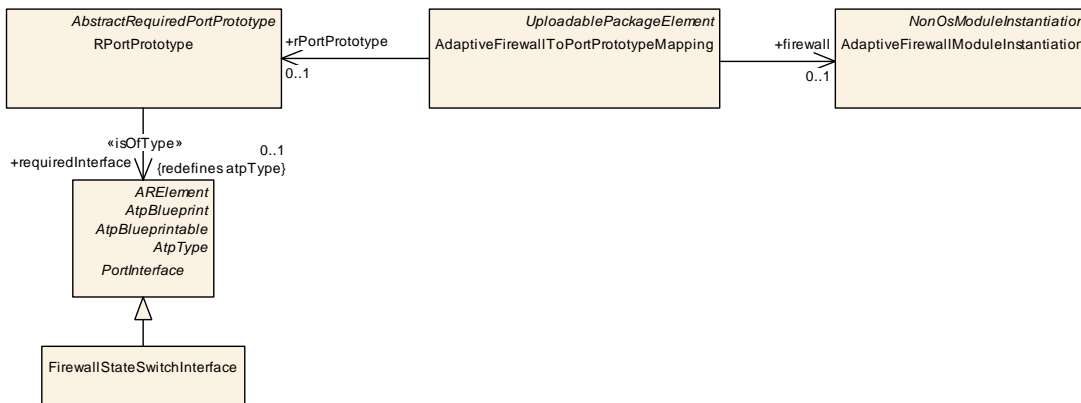


Figure 10.48: AdaptiveFirewallModuleInstantiation and the relationship to Application with a RPortPrototype typed by a FirewallStateSwitchInterface

Class	AdaptiveFirewallToPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	This meta-class maps the AdaptiveFirewall moduleInstantiation to the RPortPrototype that is typed by a FirewallModeSwitchInterface. Tags: atp.Status=candidate atp.recommendedPackage=AdaptiveFirewallToPortPrototypeMappings			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i> , <i>UploadablePackageElement</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note





Class	AdaptiveFirewallToPortPrototypeMapping			
firewall	AdaptiveFirewallModuleInstantiation	0..1	ref	Reference to the Firewall module Tags: atp.Status=candidate
rPortPrototype	RPortPrototype	0..1	ref	Reference to RPortPrototype typed by a FirewallModeSwitchInterface Tags: atp.Status=candidate

Table 10.100: AdaptiveFirewallToPortPrototypeMapping

[TPS_MANI_03297]{DRAFT} Semantics of [AdaptiveFirewallToPortPrototypeMapping](#) [Meta-class [AdaptiveFirewallToPortPrototypeMapping](#) has the ability to map a specific [RPortPrototype](#) typed by the [FirewallStateSwitchInterface](#) to the configured [AdaptiveFirewallModuleInstantiation](#).]()

[constr_5358]{DRAFT} [AdaptiveFirewallToPortPrototypeMapping.rPortPrototype](#) restriction [The [AdaptiveFirewallToPortPrototypeMapping](#) is only allowed to reference a [RPortPrototype](#) that is typed by the [FirewallStateSwitchInterface](#). This rule shall be imposed **at any time in the workflow**.]()

Firewall functionality can be implemented on Host ECUs and on switches (as network firewalls). This is the reason why the [CouplingElement](#) (that defines a Switch) and the [Machine](#) (via the [AdaptiveFirewallModuleInstantiation](#)) both have an optional reference to the [StateDependentFirewall](#) that defines the entry point for the Firewall configuration.

The in-vehicle traffic may depend on the current state of the firewall statemachine. The firewall rules are adaptable to this and therefore the [StateDependentFirewall](#) is associated with a [firewallState](#).

[TPS_MANI_03298]{DRAFT} Semantics of [StateDependentFirewall](#) [If the [firewallState](#) that is referenced by the [StateDependentFirewall](#) is active, then the firewall rule that is defined by the [StateDependentFirewall](#) shall be considered as active as well.]()

[constr_5348]{DRAFT} Mandatory [initialMode](#) in [ModeDeclarationGroup](#) that is referenced by [StateDependentFirewall](#) [The [ModeDeclarationGroup](#) that is referenced via a [ModeDeclaration](#) from [StateDependentFirewall](#) in the role [firewallState](#) shall define an [initialMode](#) **at the time when the creation of the manifest is finished**.]()

This [initialMode](#) is used in the case that the system boots up and no [FirewallMode](#) is yet set by an application.

[constr_5349]{DRAFT} Mandatory [defaultAction](#) in [StateDependentFirewall](#) [The [StateDependentFirewall](#) shall always define the attribute [defaultAction](#) **at the time when the creation of the manifest is finished**.]()

[TPS_MANI_03299]{DRAFT} **Semantics of FirewallRuleProps** [Each *StateDependentFirewall* defines *FirewallRuleProps* that in turn define a rule expression (*matchingRule*) and an *action* that is performed in case that the rule expression matches.] ()

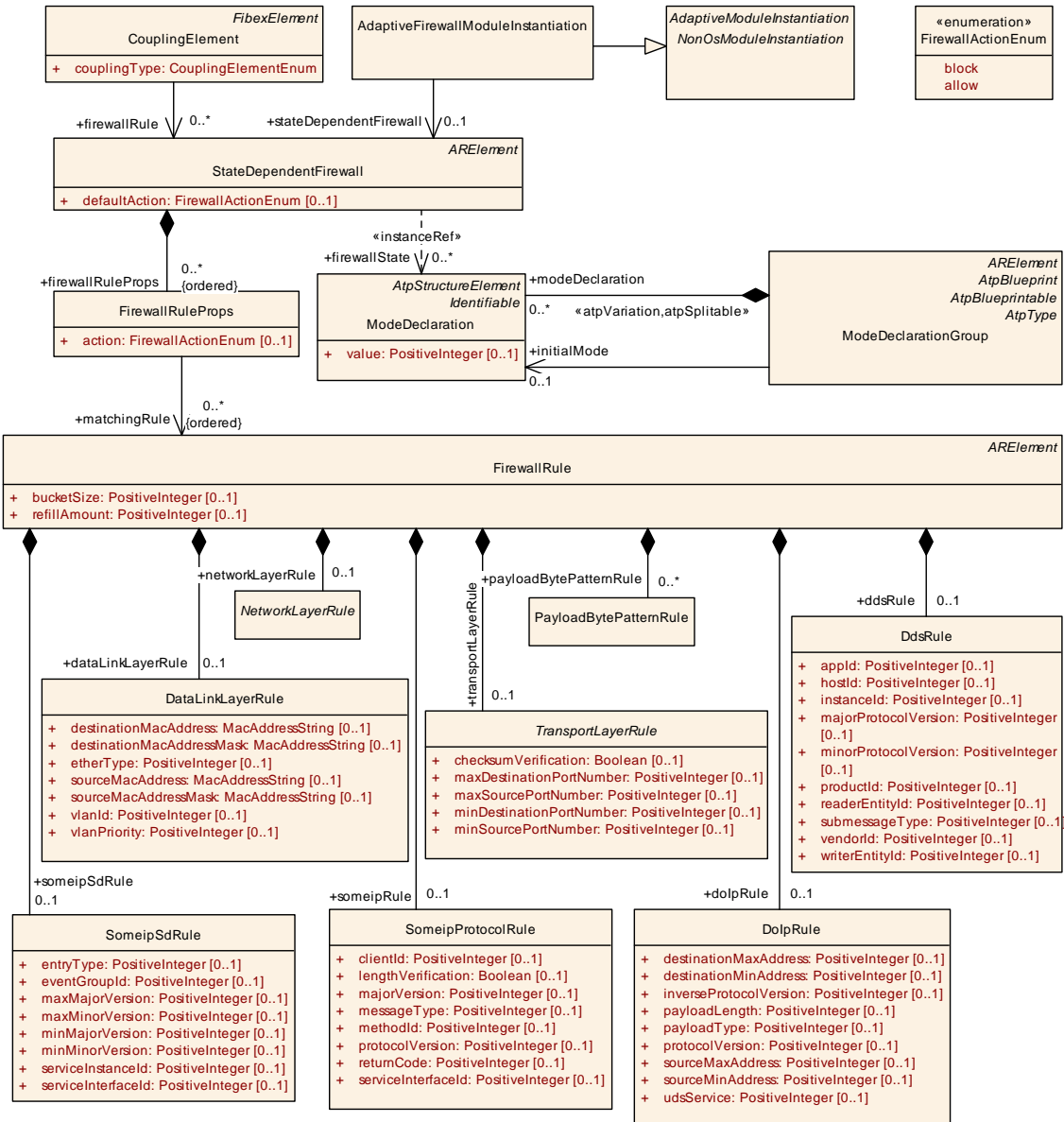


Figure 10.49: Modeling of the Firewall

[constr_5350]{DRAFT} **Mandatory action in FirewallRuleProps** [The *FirewallRuleProps* shall always define the attribute *action* at the time when the creation of the manifest is finished.] ()

[TPS_MANI_03300]{DRAFT} **Semantics of FirewallRule** [The *FirewallRule* defines an expression which matches network traffic against the conditions that are defined by the expression.] ()

[TPS_MANI_03301]{DRAFT} **Semantics of `FirewallRule.refillAmount` and `FirewallRule.bucketSize`** [Every firewall matching rule can be associated with a rate limit for limiting network traffic. In AUTOSAR, the rate limit is implemented by a leaky bucket algorithm. The attributes `FirewallRule.refillAmount` and `FirewallRule.bucketSize` are used to configure the rate limit algorithm.]()

[constr_5351]{DRAFT} **`FirewallRule` is allowed to aggregate at most one protocol subelement** [A `FirewallRule` is allowed to aggregate either:

- `someipSdRule`
- `someipRule`
- `doIpRule`

This rule shall be imposed **at any time in the workflow.**]()

If a firewall rule needs to cover different different Protocols (e.g. SOME/IP, DoIP) then several `FirewallRules` need to be defined because of [constr_5351]. Please note that a `FirewallRule` is allowed to aggregate a `DataLinkLayerRule`, a `NetworkLayerRule` and a `TransportLayerRule` at the same time in addition to one of the subelements mentioned in [constr_5351].

Class	StateDependentFirewall			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Firewall rules that are defined in a firewall state Tags: atp.Status=candidate atp.recommendedPackage=StateDependentFirewallRules			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
defaultAction	FirewallActionEnum	0..1	attr	This attribute defines a defaultAction in case that the VehicleMode is not yet set. Tags: atp.Status=candidate
firewallRule Props (ordered)	FirewallRuleProps	*	aggr	Collection of firewall rules that apply in the vehicle mode Tags: atp.Status=candidate
firewallState	ModeDeclaration	*	iref	Reference to firewall states in which the Firewall is active. If one of the referenced ModeDeclarations is the current firewall state then the firewall rule shall be considered as active. Tags: atp.Status=candidate InstanceRef implemented by: FirewallStateInFirwall StateSwitchInterfaceInstanceRef

Table 10.101: StateDependentFirewall

Class	FirewallRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Firewall Rule that defines the control information in individual packets. Tags: atp.Status=candidate atp.recommendedPackage=FirewallRules			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
bucketSize	PositiveInteger	0..1	attr	This attribute defines the capacity of the queue for rate limitation (leaky-bucket Algorithm). Tags: atp.Status=candidate
dataLinkLayerRule	DataLinkLayerRule	0..1	aggr	Configuration of rules on the Data Link Layer Tags: atp.Status=candidate
ddsRule	DdsRule	0..1	aggr	Configuration of firewall rules for DDS. Tags: atp.Status=candidate
dolpRule	DolpRule	0..1	aggr	Configuration of firewall rules for DoIP messages Tags: atp.Status=candidate
networkLayerRule	NetworkLayerRule	0..1	aggr	Configuration of rules on the Network Layer Tags: atp.Status=candidate
payloadBytePatternRule	PayloadBytePatternRule	*	aggr	Configuration of generic firewall rules Tags: atp.Status=candidate
refillAmount	PositiveInteger	0..1	attr	This attribute defines the output rate that describes how many packets leave the queue per second (leaky-bucket Algorithm). Tags: atp.Status=candidate
someipRule	SomeipProtocolRule	0..1	aggr	Configuration of firewall rules for SOME/IP messages Tags: atp.Status=candidate
someipSdRule	SomeipSdRule	0..1	aggr	Configuration of firewall rules for SOME/IP Service Discovery messages Tags: atp.Status=candidate
transportLayerRule	TransportLayerRule	0..1	aggr	Configuration of rules on the Transport Layer Tags: atp.Status=candidate

Table 10.102: FirewallRule

Class	FirewallRuleProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Firewall rule that is defined by an action that is performed if the referenced pattern matches. Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	StateDependentFirewall.firewallRuleProps			
Attribute	Type	Mult.	Kind	Note
action	FirewallActionEnum	0..1	attr	Action that is performed by the firewall if the matching Rule is fulfilled. Tags: atp.Status=candidate





Class	FirewallRuleProps			
matchingRule (ordered)	FirewallRule	*	ref	This element defines a rule expression against which the network traffic is matched. Tags: atp.Status=candidate

Table 10.103: FirewallRuleProps

Enumeration	FirewallActionEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall
Note	List of actions that the Firewall is able to perform. Tags: atp.Status=candidate
Aggregated by	FirewallRuleProps.action , StateDependentFirewall.defaultAction
Literal	Description
allow	Firewall allows the communication Tags: atp.EnumerationLiteralIndex=1 atp.Status=candidate
block	Firewall blocks the communication Tags: atp.EnumerationLiteralIndex=0 atp.Status=candidate

Table 10.104: FirewallActionEnum

10.13.1 Firewall rules on Datalink layer

[TPS_MANI_03302]{DRAFT} **Firewall rules on Data Link Layer** [The meta-class [DataLinkLayerRule](#) is used to define firewall rules on the Data Link Layer (second layer of the seven-layer OSI model).] ()

[TPS_MANI_03303]{DRAFT} **Filtering of packets with a single MAC address and MAC address range** [The [sourceMacAddressMask](#) is specifying which bits in the [sourceMacAddress](#) are static to define a source MAC Address or source MAC Address Range. For each bit position in the MAC mask a 1 indicates that the corresponding address bit is significant and a 0 indicates that the address bit is ignored. [destinationMacAddressMask](#) and [destinationMacAddress](#) shall be used in the same way to define a destination MAC Address or destination MAC Address Range.] ()

If, for example, only the first four octets of a MAC address are relevant, a [sourceMacAddressMask](#) of ff:ff:ff:ff:00:00 is used. A [sourceMacAddressMask](#) of ff:ff:ff:ff:ff:ff defines that all address bits are relevant and is used to define a single MAC address.

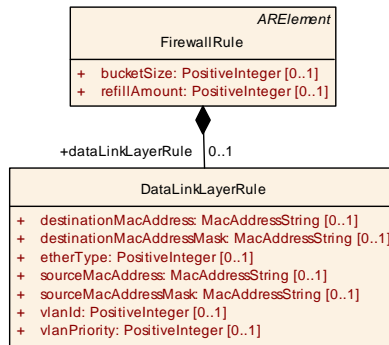


Figure 10.50: Modeling of Firewall rules on Data Link Layer

Class	DataLinkLayerRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of filter rules on the DataLink layer Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	FirewallRule.dataLinkLayerRule			
Attribute	Type	Mult.	Kind	Note
destinationMac Address	MacAddressString	0..1	attr	Filter to match packets with the destination MAC address. Tags: atp.Status=candidate
destinationMac AddressMask	MacAddressString	0..1	attr	Filter to match packets with the destination MAC address range. The destinationMacAddress with the destinationMacAddressMask defines the MAC address range. Tags: atp.Status=candidate
etherType	PositiveInteger	0..1	attr	Filter to match packets based on the EtherType field in the Ethernet frame. The EtherType is used to indicate which protocol is encapsulated in the payload of the frame. Tags: atp.Status=candidate
sourceMac Address	MacAddressString	0..1	attr	Filter to match packets with the source MAC address. Tags: atp.Status=candidate
sourceMac AddressMask	MacAddressString	0..1	attr	Filter to match packets with the source MAC address range. The sourceMacAddress with the sourceMacAddressMask defines the MAC address range. Tags: atp.Status=candidate
vlanId	PositiveInteger	0..1	attr	Filter of packets with a specific VlanId. Tags: atp.Status=candidate
vlanPriority	PositiveInteger	0..1	attr	Filter of packets with a specific Vlan priority. Tags: atp.Status=candidate

Table 10.105: DataLinkLayerRule

10.13.2 Firewall rules on Network layer

[TPS_MANI_03304]{DRAFT} **Firewall rules on Network Layer** [The meta-class [NetworkLayerRule](#) is used to define firewall rules on the Network Layer (third layer of the seven-layer OSI model).] ()

[TPS_MANI_03305]{DRAFT} **Filtering of packets with a single IP address and IP address range** [The `Ipv4Rule.sourceNetworkMask` (or `Ipv6Rule.sourceNetworkMask`) is specifying which bits in the `Ipv4Rule.sourceIpAddress` (or `Ipv6Rule.sourceIpAddress`) are static to define a source IP Address or source IP Address Range. `destinationIpAddress` and `destinationNetworkMask` shall be used in the same way to define a destination IP Address or destination IP Address Range.]()

If for example only the first three octets of a IP address are relevant, a `sourceNetworkMask` of 255.255.255.0 is used. The 255 octets in the mask define that the corresponding numbers in the IP address are static and never change. In this example the first three octets are fixed and the fourth octet is 0. This means that on the fourth octet all individual numbers from 1-254 are valid.

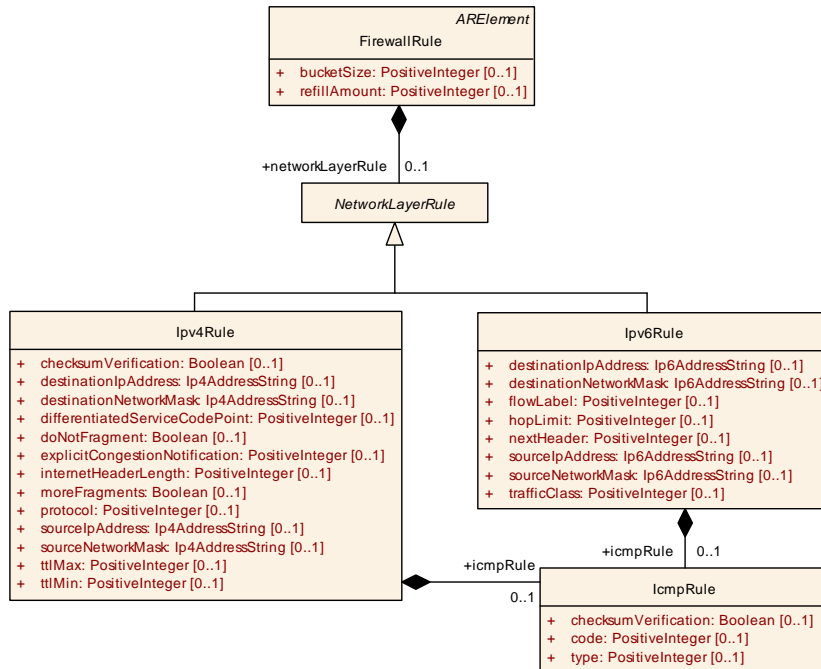


Figure 10.51: Modeling of Firewall rules on Network Layer

Class	<i>NetworkLayerRule</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of filter rules on the Network layer Tags: atp.Status=candidate			
Base	<i>ARObject</i>			
Subclasses	<code>Ipv4Rule</code> , <code>Ipv6Rule</code>			
Aggregated by	<code>FirewallRule.networkLayerRule</code>			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 10.106: NetworkLayerRule

Class	Ipv4Rule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of filter rules on IPv4 level. Tags: atp.Status=candidate			
Base	ARObject , NetworkLayerRule			
Aggregated by	FirewallRule.networkLayerRule			
Attribute	Type	Mult.	Kind	Note
checksum Verification	Boolean	0..1	attr	Defines whether a Ipv4 header checksum verification is performed or not. Tags: atp.Status=candidate
destinationIp Address	Ip4AddressString	0..1	attr	Filter to match packets with the destination IPv4 address. Tags: atp.Status=candidate
destination NetworkMask	Ip4AddressString	0..1	attr	Filter to match packets with the destination IPv4 address range. The destinationIpAddress with the destination NetworkMask defines the IP address range. Tags: atp.Status=candidate
differentiated ServiceCode Point	PositiveInteger	0..1	attr	Filter to match packets with a DSCP value. Tags: atp.Status=candidate
doNotFragment	Boolean	0..1	attr	Filter to match packets that have the doNotFragment bit in the Header set. Tags: atp.Status=candidate
explicit Congestion Notification	PositiveInteger	0..1	attr	Filter to match packets with a ECN code point. Tags: atp.Status=candidate
icmpRule	IcmpRule	0..1	aggr	Configuration of filter rules for ICMP (Internet Control Message Protocol). Tags: atp.Status=candidate
internetHeader Length	PositiveInteger	0..1	attr	Filter to match packets with a minimum ipv4 header length. Tags: atp.Status=candidate
moreFragments	Boolean	0..1	attr	Filter to match packets that have the moreFragments flag in the Header set. Tags: atp.Status=candidate
protocol	PositiveInteger	0..1	attr	Filter to match packets with a IP protocol number . Tags: atp.Status=candidate
sourceIp Address	Ip4AddressString	0..1	attr	Filter to match packets with the source IPv4 address. Tags: atp.Status=candidate
sourceNetwork Mask	Ip4AddressString	0..1	attr	Filter to match packets with the source IPv4 address range. The sourceIpAddress with the sourceNetwork Mask defines the IP address range. Tags: atp.Status=candidate
ttlMax	PositiveInteger	0..1	attr	Filter to match packets with a maximum ttl value (TimeTo Live defines the lifetime of data on the network). Tags: atp.Status=candidate
ttlMin	PositiveInteger	0..1	attr	Filter to match packets with a minimum ttl value (TimeTo Live defines the lifetime of data on the network). Tags: atp.Status=candidate

Table 10.107: Ipv4Rule

Class	Ipv6Rule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of filter rules on IPv6 level. Tags: atp.Status=candidate			
Base	<i>ARObject</i> , NetworkLayerRule			
Aggregated by	FirewallRule.networkLayerRule			
Attribute	Type	Mult.	Kind	Note
destinationIp Address	Ip6AddressString	0..1	attr	Filter to match packets with the destination IPv6 address. Tags: atp.Status=candidate
destination NetworkMask	Ip6AddressString	0..1	attr	Filter to match packets with the destination IPv6 address range. The destinationIpAddress with the destination NetworkMask defines the MAC address range. Tags: atp.Status=candidate
flowLabel	PositiveInteger	0..1	attr	Filter to match packets with a defined flow label. Tags: atp.Status=candidate
hopLimit	PositiveInteger	0..1	attr	Filter to match packets with a minimum hop limit. Tags: atp.Status=candidate
icmpRule	IcmpRule	0..1	aggr	Configuration of filter rules for ICMP (Internet Control Message Protocol). Tags: atp.Status=candidate
nextHeader	PositiveInteger	0..1	attr	Filter to match packets with a defined type of an extension header. Tags: atp.Status=candidate
sourceIp Address	Ip6AddressString	0..1	attr	Filter to match packets with the source IPv6 address. Tags: atp.Status=candidate
sourceNetwork Mask	Ip6AddressString	0..1	attr	Filter to match packets with the source IPv6 address range. The sourceIp Address with the sourceNetwork Mask defines the IP address range. Tags: atp.Status=candidate
trafficClass	PositiveInteger	0..1	attr	Filter to match packets with a defined traffic class or priority. Tags: atp.Status=candidate

Table 10.108: Ipv6Rule

Class	IcmpRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of filter rules for ICMP (Internet Control Message Protocol). Tags: atp.Status=candidate			
Base	<i>ARObject</i>			
Aggregated by	Ipv4Rule.icmpRule , Ipv6Rule.icmpRule			
Attribute	Type	Mult.	Kind	Note
checksum Verification	Boolean	0..1	attr	Defines whether a Icmp header checksum verification is performed or not. Tags: atp.Status=candidate
code	PositiveInteger	0..1	attr	Filter to match packets with the Icmp code. Tags: atp.Status=candidate
type	PositiveInteger	0..1	attr	Filter to match packets with the Icmp type. Tags: atp.Status=candidate

Table 10.109: IcmpRule

10.13.3 Firewall rules on Transport layer

[TPS_MANI_03306]{DRAFT} **Firewall rules on Transport Layer** [The meta-class `TransportLayerRule` is used to define firewall rules on the Transport Layer (fourth layer of the seven-layer OSI model).] ()

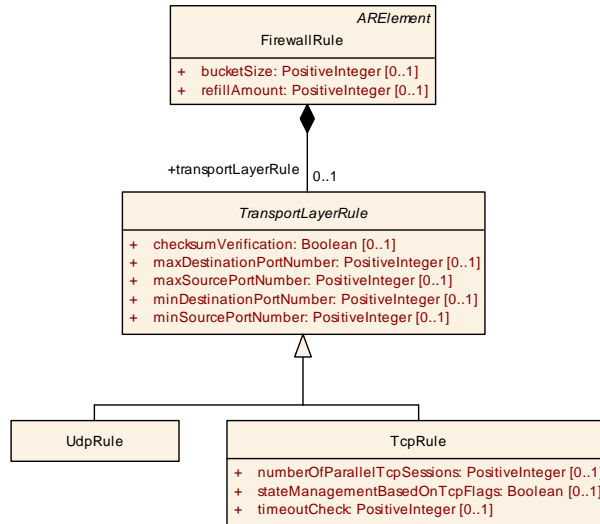


Figure 10.52: Modeling of Firewall rules on Transport Layer

Class	<i>TransportLayerRule</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of filter rules on Transport Layer level. Tags: atp.Status=candidate			
Base	ARObject			
Subclasses	TcpRule, UdpRule			
Aggregated by	FirewallRule.transportLayerRule			
Attribute	Type	Mult.	Kind	Note
checksum Verification	Boolean	0..1	attr	Defines whether checksum verification is performed or not. Tags: atp.Status=candidate
maxDestination PortNumber	PositiveInteger	0..1	attr	Filter to match packets with the maximum destination UDP/TCP port number. Tags: atp.Status=candidate
maxSourcePort Number	PositiveInteger	0..1	attr	Filter to match packets with the maximum source UDP/TCP port number. Tags: atp.Status=candidate
minDestination PortNumber	PositiveInteger	0..1	attr	Filter to match packets with the minimum destination UDP/TCP port number. Tags: atp.Status=candidate
minSourcePort Number	PositiveInteger	0..1	attr	Filter to match packets with the minimum source UDP/TCP port number. Tags: atp.Status=candidate

Table 10.110: TransportLayerRule

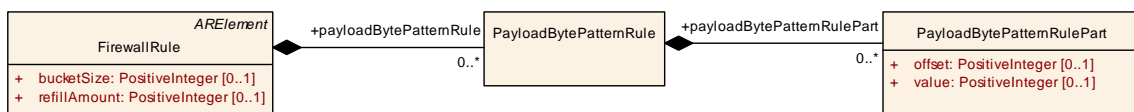
Class	UdpRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of UDP filter rules. Tags: atp.Status=candidate			
Base	ARObject, TransportLayerRule			
Aggregated by	FirewallRule.transportLayerRule			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.111: UdpRule

Class	TcpRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of TCP filter rules. Tags: atp.Status=candidate			
Base	ARObject, TransportLayerRule			
Aggregated by	FirewallRule.transportLayerRule			
Attribute	Type	Mult.	Kind	Note
numberOfParallelTcpSessions	PositiveInteger	0..1	attr	This attribute defines the maximal number of TCP Sessions that are allowed to be established. Tags: atp.Status=candidate
stateManagementBasedOnTcpFlags	Boolean	0..1	attr	This attribute defines whether the StateManagement is based on TCP flags or not. Tags: atp.Status=candidate
timeoutCheck	PositiveInteger	0..1	attr	This attribute defines the TCP Session timeout in seconds Tags: atp.Status=candidate

Table 10.112: TcpRule

10.13.4 Firewall rules via byte pattern


Figure 10.53: Modeling of Firewall rules via byte pattern

[TPS_MANI_03307]{DRAFT} **Byte-Pattern Firewall rule** [The meta-class [PayloadBytePatternRule](#) is used to define a generic firewall rule that specifies individually the value for each byte of the Ethernet frame. Each [PayloadBytePatternRulePart](#) that is aggregated by [PayloadBytePatternRule](#) defines one byte in the Ethernet frame. The [offset](#) defines the position in the Ethernet Frame and the [value](#) defines the byteValue.]()

Class	PayloadBytePatternRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of a generic firewall rule that defines the individual bytes of a message that shall match. Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	FirewallRule.payloadBytePatternRule			
Attribute	Type	Mult.	Kind	Note
payloadBytePatternRulePart	PayloadBytePatternRulePart	*	aggr	Configuration of bytes in the message, Tags: atp.Status=candidate

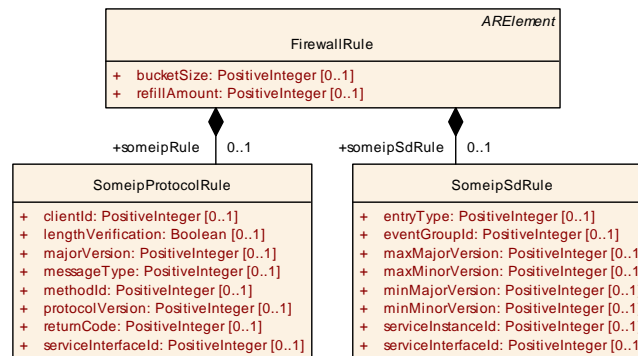
Table 10.113: PayloadBytePatternRule

Class	PayloadBytePatternRulePart			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of one byte in the datagram, Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	PayloadBytePatternRule.payloadBytePatternRulePart			
Attribute	Type	Mult.	Kind	Note
offset	PositiveInteger	0..1	attr	This attribute defines the byte offset in the datagram (start byte of the Ethernet frame, i.e. offset 0 corresponds to the first byte of the destination MAC address). Tags: atp.Status=candidate
value	PositiveInteger	0..1	attr	This attribute defines the byteValue (0..255) in the datagram. Tags: atp.Status=candidate

Table 10.114: PayloadBytePatternRulePart

10.13.5 Firewall deep packet inspection of SOME/IP SD and SOME/IP messages

[TPS_MANI_03308]{DRAFT} **Deep inspection of SOME/IP SD messages** [The meta-class `SomeipSdRule` is used to define a firewall rule for SOME/IP SD messages.]()


Figure 10.54: Modeling of SOME/IP Firewall rules

[TPS_MANI_03309]{DRAFT} **Deep inspection of SOME/IP messages** [The meta-class `SomeipProtocolRule` is used to define a firewall rule for SOME/IP messages.]
 ()

Class	SomeipProtocolRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of SOME/IP firewall rules Tags: atp.Status=candidate			
Base	<i>ARObject</i>			
Aggregated by	FirewallRule.someipRule			
Attribute	Type	Mult.	Kind	Note
clientId	PositiveInteger	0..1	attr	Filter for SOME/IP messages in which the clientId in the SOME/IP header matches. Tags: atp.Status=candidate
lengthVerification	Boolean	0..1	attr	Defines whether length verification is performed or not. Tags: atp.Status=candidate
majorVersion	PositiveInteger	0..1	attr	Filter for SOME/IP messages in which the majorVersion in the SOME/IP header matches. Tags: atp.Status=candidate
messageType	PositiveInteger	0..1	attr	Filter for SOME/IP messages in which the messageType in the SOME/IP header matches. Tags: atp.Status=candidate
methodId	PositiveInteger	0..1	attr	Filter for SOME/IP messages in which the methodId in the SOME/IP header matches. Tags: atp.Status=candidate
protocolVersion	PositiveInteger	0..1	attr	Filter for SOME/IP messages in which the protocolVersion in the SOME/IP header matches. Tags: atp.Status=candidate
returnCode	PositiveInteger	0..1	attr	Filter for SOME/IP messages in which the returnCode in the SOME/IP header matches. Tags: atp.Status=candidate
serviceInterfaceId	PositiveInteger	0..1	attr	Filter for SOME/IP messages in which the serviceInterfaceId in the SOME/IP header matches. Tags: atp.Status=candidate

Table 10.115: SomeipProtocolRule

Class	SomeipSdRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of SOME/IP Service Discovery firewall rules Tags: atp.Status=candidate			
Base	<i>ARObject</i>			
Aggregated by	FirewallRule.someipSdRule			
Attribute	Type	Mult.	Kind	Note
entryType	PositiveInteger	0..1	attr	Filter for SOME/IP SD messages in which the entryType in the SOME/IP header matches. Tags: atp.Status=candidate





Class	SomeipSdRule			
eventGroupId	PositiveInteger	0..1	attr	Filter for SOME/IP SD messages in which the eventGroupId in the SOME/IP header matches. Tags: atp.Status=candidate
maxMajorVersion	PositiveInteger	0..1	attr	Filter for SOME/IP SD messages in which the Major Version in the SOME/IP header is smaller or equal than maxMajorVersion. Tags: atp.Status=candidate
maxMinorVersion	PositiveInteger	0..1	attr	Filter for SOME/IP SD messages in which the Minor Version in the SOME/IP header is smaller or equal than maxMinorVersion. Tags: atp.Status=candidate
minMajorVersion	PositiveInteger	0..1	attr	Filter for SOME/IP SD messages in which the Major Version in the SOME/IP header is greater or equal than minMajorVersion. Tags: atp.Status=candidate
minMinorVersion	PositiveInteger	0..1	attr	Filter for SOME/IP SD messages in which the Minor Version in the SOME/IP header is greater or equal than minMinorVersion. Tags: atp.Status=candidate
serviceInstanceId	PositiveInteger	0..1	attr	Filter for SOME/IP SD messages in which the service InstanceId in the SOME/IP header matches. Tags: atp.Status=candidate
serviceInterfaceId	PositiveInteger	0..1	attr	Filter for SOME/IP SD messages in which the service InterfaceId in the SOME/IP header matches. Tags: atp.Status=candidate

Table 10.116: SomeipSdRule

10.13.6 Firewall deep packet inspection of DoIP messages

[TPS_MANI_03310]{DRAFT} **Deep inspection of DoIP messages** [The meta-class DoIpRule is used to define a firewall rule for DoIP messages.]()

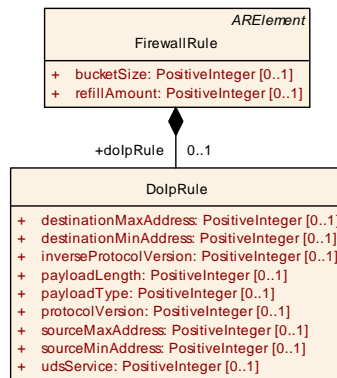


Figure 10.55: Modeling of DoIP Firewall rules

Class	DolpRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of a generic firewall rule Tags: atp.Status=candidate			
Base	<i>ARObject</i>			
Aggregated by	FirewallRule.dolpRule			
Attribute	Type	Mult.	Kind	Note
destinationMaxAddress	PositiveInteger	0..1	attr	Filter to match DoIP messages in which the destination Address is smaller or equal than destinationMaxAddress. Tags: atp.Status=candidate
destinationMinAddress	PositiveInteger	0..1	attr	Filter to match DoIP messages in which the destination Address is greater or equal than destinationMinAddress. Tags: atp.Status=candidate
inverseProtocolVersion	PositiveInteger	0..1	attr	Filter to match DoIP messages in which the inverseprotocolVersion in the DoIP header matches. Tags: atp.Status=candidate
payloadLength	PositiveInteger	0..1	attr	Filter to match DoIP messages in which the payload Length in the DoIP header matches. Tags: atp.Status=candidate
payloadType	PositiveInteger	0..1	attr	Filter to match DoIP messages in which the payloadType in the DoIP header matches. Tags: atp.Status=candidate
protocolVersion	PositiveInteger	0..1	attr	Filter to match DoIP messages in which the protocol Version in the DoIP header matches. Tags: atp.Status=candidate
sourceMaxAddress	PositiveInteger	0..1	attr	Filter to match DoIP messages in which the source Address is smaller or equal than sourceMaxAddress. Tags: atp.Status=candidate
sourceMinAddress	PositiveInteger	0..1	attr	Filter to match DoIP messages in which the source Address is greater or equal than sourceMinAddress.. Tags: atp.Status=candidate
udsService	PositiveInteger	0..1	attr	Filter to match DoIP messages that contain the uds Service. Tags: atp.Status=candidate

Table 10.117: DolpRule

10.13.7 Firewall deep packet inspection of DDS messages

[TPS_MANI_03311]{DRAFT} **Deep inspection of DDS messages** [The meta-class [DdsRule](#) is used to define a firewall rule for DDS messages.]()

[constr_5352]{DRAFT} **DdsRule.submessageType value restriction** [The value of [DdsRule.submessageType](#) is restricted to the following values:

- 0x01 (PAD)
- 0x06 (ACKNACK)
- 0x07 (HEARTBEAT)

- 0x08 (GAP)
- 0x09 (INFO_TS)
- 0x0c (INFO_SRC)
- 0x0d (INFO_REPLY_IP4)
- 0x0e (INFO_DST)
- 0x0f (INFO_REPLY)
- 0x12 (NACK_FRAG)
- 0x13 (HEARTBEAT_FRAG)
- 0x15 (DATA)
- 0x16 (DATA_FRAG)

This rule shall be imposed **at any time in the workflow.**]()

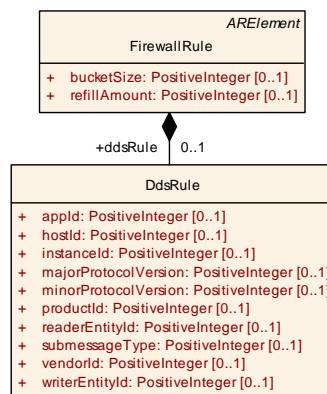


Figure 10.56: Modeling of DDS Firewall rules

[constr_5353]{DRAFT} DdsRule.readerEntityId and DdsRule.writerEntityId value restriction [The value of `DdsRule.readerEntityId` and `DdsRule.writerEntityId` is only allowed to be set if the value of `DdsRule.submessageType` is set to one of the following values:

- 0x06 (ACKNACK)
- 0x07 (HEARTBEAT)
- 0x08 (GAP)
- 0x15 (DATA)

This rule shall be imposed **at any time in the workflow.**]()

Class	DdsRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Firewall			
Note	Configuration of a DDS firewall rule Tags: atp.Status=candidate			
Base	ARObject			
Aggregated by	FirewallRule.ddsRule			
Attribute	Type	Mult.	Kind	Note
appld	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the appld in the DDSI-RTPS header and the INFO_DST (0x0E) submessage matches. Tags: atp.Status=candidate
hostId	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the hostId in the DDSI-RTPS header and the INFO_DST (0x0E) submessage matches. Tags: atp.Status=candidate
instanceId	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the instanceId in the DDSI-RTPS header and the INFO_DST (0x0E) submessage matches. Tags: atp.Status=candidate
majorProtocolVersion	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the major ProtocolVersion in the DDSI-RTPS header matches. Tags: atp.Status=candidate
minorProtocolVersion	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the minor ProtocolVersion in the DDSI-RTPS header matches. Tags: atp.Status=candidate
productId	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the productId in the DDSI-RTPS header matches. Tags: atp.Status=candidate
readerEntityId	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the readerEntity ID in a DDSI-RTPS submessage matches Tags: atp.Status=candidate
submessageType	PositiveInteger	0..1	attr	Defines the allowed submessage type in the DDSI-RTPS message Tags: atp.Status=candidate
vendorId	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the vendorId in the DDSI-RTPS header matches. Tags: atp.Status=candidate
writerEntityId	PositiveInteger	0..1	attr	Filter for DDSI-RTPS messages in which the writerEntity ID in a DDSI-RTPS submessage matches Tags: atp.Status=candidate

Table 10.118: DdsRule

10.14 State Management Deployment

10.14.1 Overview

The entry point for the deployment-level configuration of the State Management on the AUTOSAR adaptive platform is represented by meta-class [StateManagementModuleInstantiation](#), a sub-class of [NonOsModuleInstantiation](#).

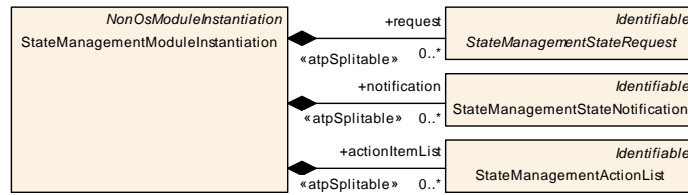


Figure 10.57: Modeling of the `StateManagementModuleInstantiation`

Class				
StateManagementModuleInstantiation				
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class represents the deployment-level configuration of the state management on the AUTOSAR adaptive platform. Tags:atp.Status=draft			
Base	ARObject, AdaptiveModuleInstantiation, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, NonOsModuleInstantiation, Referrable			
Aggregated by	AtpClassifier.atpFeature, Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
actionItemList	StateManagementActionList	*	aggr	This represents the collection of action item lists defined in the context of the enclosing state management module. Stereotypes: atpSplitable Tags: atp.Splitkey=actionItemList.shortName atp.Status=draft
notification	StateManagementStateNotification	*	aggr	This aggregation represents the state switch notifications handled by the state manager. Stereotypes: atpSplitable Tags: atp.Splitkey=notification.shortName atp.Status=draft
request	StateManagementStateRequest	*	aggr	This aggregation represents the state requests handled by the state manager. Stereotypes: atpSplitable Tags: atp.Splitkey=request.shortName atp.Status=draft

Table 10.119: StateManagementModuleInstantiation

The job of the State Management on the AUTOSAR adaptive platform is to control two kinds of states:

- the state of a `Function Group`, modeled as a `ModeDeclarationGroup-Prototype` owned by a `FunctionGroupSet`, that is referenced by a `SoftwareCluster` in the role `claimedFunctionGroup`.

Note that these states are only indirectly controlled, because the actual state switch for `Function Groups` is in the responsibility of the Execution Management.

- the state of an “internal” state machine, owned by `StateManagementStateNotifications`.

10.14.2 Requests to State Management

[TPS_MANI_01391]{DRAFT} **Semantics of `StateManagementStateRequest`**
 [Meta-class `StateManagementStateRequest` that is aggregated directly at the `StateManagementModuleInstantiation` represents the ability to configure requests to State Management.] (*RS_MANI_00023*)

Please note that meta-class `StateManagementStateRequest` is modeled as an abstract class so that the concrete sub-classes that correspond to different flavors of requests (which are also respected for the definition of applicable `PortInterfaces`, see section 3.7) can be individually considered.

In particular, the State Management accepts requests for state changes in two different flavors:

- “triggers” (i.e. request for a state change from select functional clusters), modeled by mean of meta-class `StateManagementRequestTrigger`, see section 10.14.2.1.
- “errors” (i.e. error report from a functional cluster), modeled by means of meta-class `StateManagementRequestError`, see section 10.14.2.2.

As depicted in Figure 10.58, `StateManagementStateRequest` also references an `RPortPrototype` as the source of inputs from outside the State Management.

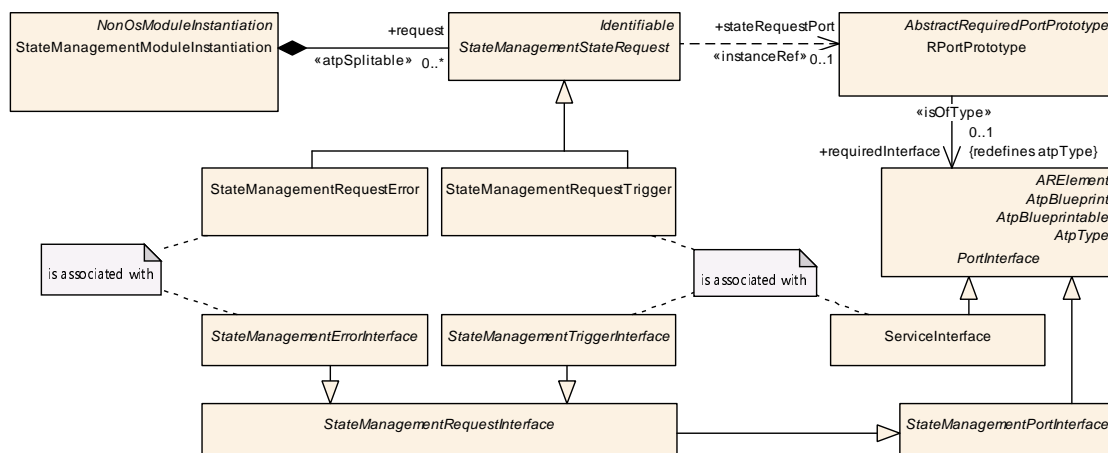


Figure 10.58: Modeling of `StateManagementStateRequest`

Figure 10.59 also shows that the configuration of State Management on the AUTOSAR adaptive platform is modeled as a hybrid of deployment-level `StateManagementModuleInstantiation` and the definition of an `Executable` that is executed as a `Process`.

The connection between the `StateManagementModuleInstantiation` and the `Executable/Process` is created by `ProcessToMachineMapping` that references both the `StateManagementModuleInstantiation` and the `Process`, as depicted in Figure 10.1.

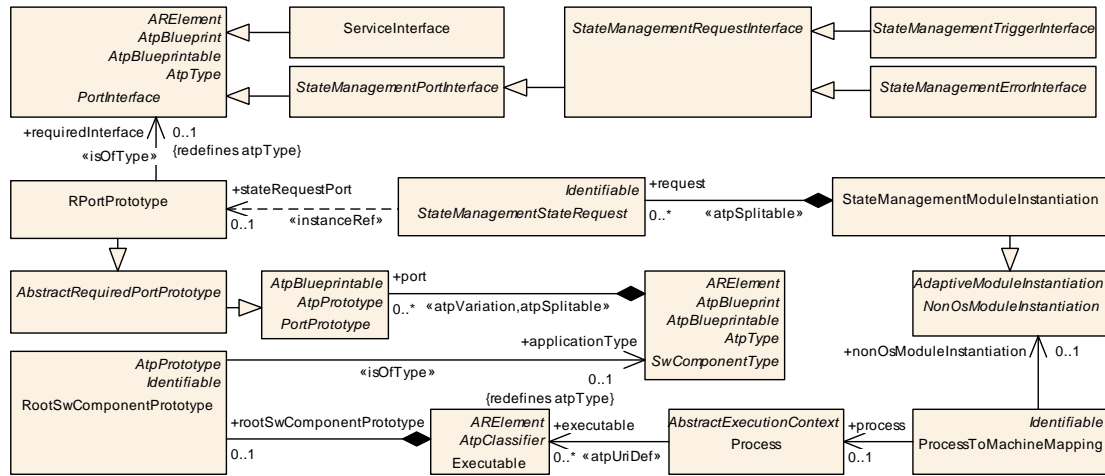


Figure 10.59: Modeling of **StateManagementStateRequest** including the association with the modeling of **Executable**

Class	StateManagementStateRequest (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This abstract class serves as the base class for state requests on the AUTOSAR adaptive platform. Tags: atp.Status=draft			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	StateManagementRequestError, StateManagementRequestTrigger			
Aggregated by	StateManagementModuleInstantiation.request			
Attribute	Type	Mult.	Kind	Note
stateRequestPort	RPortPrototype	0..1	iref	This represents the RPortPrototype in the application software that is issuing the request for state change. Tags: atp.Status=draft InstanceRef implemented by: RPortPrototypeIn ExecutableInstanceRef

Table 10.120: StateManagementStateRequest

[constr_10390]{DRAFT} Existence of attribute **StateManagementStateRequest.stateRequestPort** [For each **StateManagementStateRequest**, the aggregation in the role **stateRequestPort** shall exist **at the time when the creation of the manifest is finished.**]()

10.14.2.1 Trigger Requests to State Management

Trigger requests to State Management are configured by means of meta-class **StateManagementRequestTrigger**.

As depicted by Figure 10.58, the existence of a **StateManagementRequestTrigger** is associated with either a subclass of **StateManagementTriggerInterface** or a **ServiceInterface**. This relation is formalized in [constr_10384].

[constr_10384]{DRAFT} PortInterface used for trigger state requests [Each `RPortPrototype` that is referenced by a `StateManagementRequestTrigger` shall be typed by either

- a subclass of `StateManagementTriggerInterface` or
- a `ServiceInterface`.

This rule shall be imposed **at the time when the creation of the manifest is finished.**]()

Class	StateManagementRequestTrigger			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class has the ability to configure a trigger request to the state management. Tags: atp.Status=draft			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code> , <code>StateManagementStateRequest</code>			
Aggregated by	<code>StateManagementModuleInstantiation.request</code>			
Attribute	Type	Mult.	Kind	Note
rule	<code>StateManagementRequestRule</code>	*	aggr	This aggregation represents the collection of rules applicable for the trigger request. Tags: atp.Status=draft

Table 10.121: StateManagementRequestTrigger

10.14.2.2 Error Requests to State Management

Error submissions to State Management are configured by means of meta-class `StateManagementRequestError`, see Figure 10.58.

As depicted by Figure 10.58, the existence of a `StateManagementRequestTrigger` is associated with a subclass of `StateManagementTriggerInterface`. This relation is formalized in **[constr_10385]**.

[constr_10385]{DRAFT} PortInterface used for error state requests [Each `RPortPrototype` that is referenced by a `StateManagementRequestError` shall be typed by subclass of `StateManagementErrorInterface` **at the time when the creation of the manifest is finished.**]()

Class	StateManagementRequestError			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class has the ability to configure the submission of an error to the state management. Tags: atp.Status=draft atp.recommendedPackage=StateManagementRequests			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code> , <code>StateManagementStateRequest</code>			
Aggregated by	<code>StateManagementModuleInstantiation.request</code>			
Attribute	Type	Mult.	Kind	Note





Class	StateManagementRequestError			
rule	StateManagementRequestRule	*	aggr	This aggregation represents the collection of rules applicable for the error request. Tags: atp.Status=draft

Table 10.122: StateManagementRequestError

10.14.3 Notifications from State Management

[TPS_MANI_01392]{DRAFT} **Semantics of StateManagementStateNotification** [Notifications are used to make state users aware of state changes. Meta-class StateManagementStateNotification is aggregated at StateManagementModuleInstantiation and in turn aggregates ModeDeclarationGroupPrototype and therefore one StateManagementStateNotification becomes the **owner of one internal state machine.**] (RS_MANI_00023)

Please note that it is positively supported that several StateManagementStateNotification aggregate a ModeDeclarationGroupPrototype typed by the identical ModeDeclarationGroup as their internal state machine. This way, several instances of the same “type” of state machine are created.

A StateManagementModuleInstantiation references a PPortPrototype (typed by a ServiceInterface) that shall be taken to provide the actual state notification.

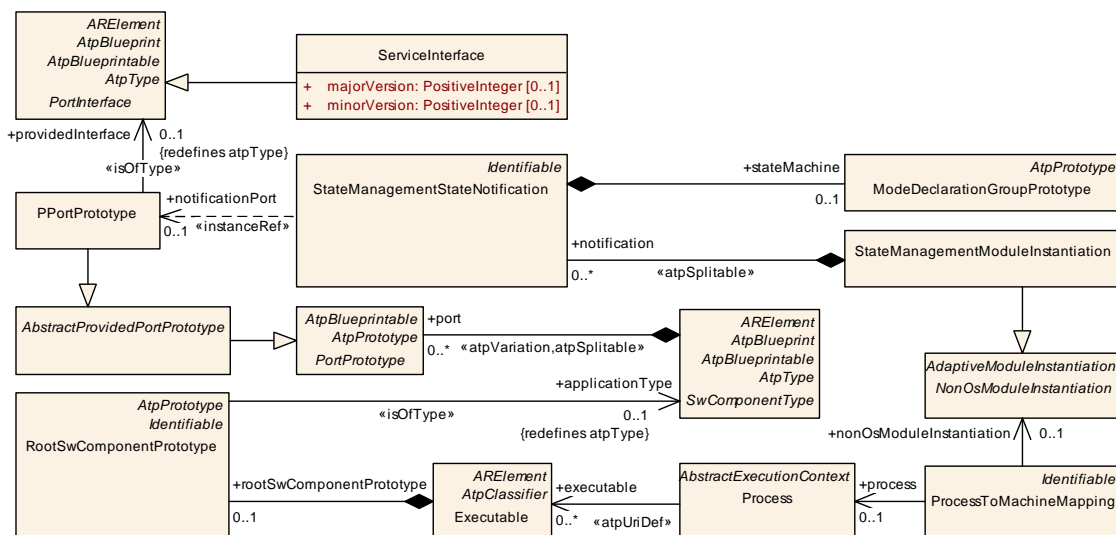


Figure 10.60: Modeling of StateManagementStateNotification

[constr_10388]{DRAFT} **Restriction for a PortInterface used for state switch notifications** [Each PPortPrototype that is referenced by a StateManagementStateNotification shall be typed by a ServiceInterface at the time when the creation of the manifest is finished.] ()

[constr_10391]{DRAFT} Existence of attribute `StateManagementStateNotification.notificationPort` [For each `StateManagementStateNotification`, the aggregation in the role `notificationPort` shall exist at the time when the creation of the manifest is finished.]()

Figure 10.60 also depicts the relation between the modeled `Executable` that implements the State Management functionality and the deployment aspects represented by the `StateManagementModuleInstantiation`.

Class	<code>StateManagementStateNotification</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class represents the ability to formalize state notifications on the AUTOSAR adaptive platform. Tags: atp.Status=draft			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>			
Aggregated by	<code>StateManagementModuleInstantiation.notification</code>			
Attribute	Type	Mult.	Kind	Note
notificationPort	<code>PPortPrototype</code>	0..1	iref	This instanceRef identifies the PPortPrototype over which the notification is to be conveyed. Tags: atp.Status=draft InstanceRef implemented by: <code>PPortPrototypeInExecutableInstanceRef</code>
stateMachine	<code>ModeDeclarationGroupPrototype</code>	0..1	aggr	This aggregation represents the existence of an actual state machine. Tags: atp.Status=draft

Table 10.123: StateManagementStateNotification

10.14.4 Rules

10.14.4.1 Overview

[TPS_MANI_01384]{DRAFT} Semantics of `StateManagementRequestRule` [The purpose of `StateManagementRequestRule` is to evaluate an incoming request against a given comparison value.

If the evaluation of the `formula` owned by the `StateManagementRequestRule` yields `true`, then a state machine (modeled as a `ModeDeclarationGroupPrototype`) is forwarded from the current state (represented by meta-class `ModeDeclaration`) to the `nextState`, as specified by the definition of the specific subclass of `StateManagementRequestRule`.]([RS_MANI_00023](#))



Figure 10.61: Modeling of StateManagementRequestRule

Class	StateManagementRequestRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class represents a rule for deciding about a state change. Tags: atp.Status=draft			
Base	ARObject			
Aggregated by	StateManagementRequestError.rule, StateManagementRequestTrigger.rule			
Attribute	Type	Mult.	Kind	Note
formula	StateManagementCompareFormula	0..1	aggr	This aggregation represents the definition of the formula for the StateManagementRequestRule Tags: atp.Status=draft
nextState	ModeDeclaration	0..1	iref	This reference identifies the state to be switched to if the condition is fulfilled. Tags: atp.Status=draft InstanceRef implemented by: ModeDeclarationInStateManagementStateNotificationInstanceRef

Table 10.124: StateManagementRequestRule

[constr_10392]{DRAFT} Existence of attribute StateManagementRequestRule.formula [For each StateManagementRequestRule, the aggregation in the role formula shall exist at the time when the creation of the manifest is finished.]()

[constr_10393]{DRAFT} Existence of reference in the role StateManagementRequestRule.nextState [For each StateManagementRequestRule, the reference in the role nextState shall exist at the time when the creation of the manifest is finished.]()

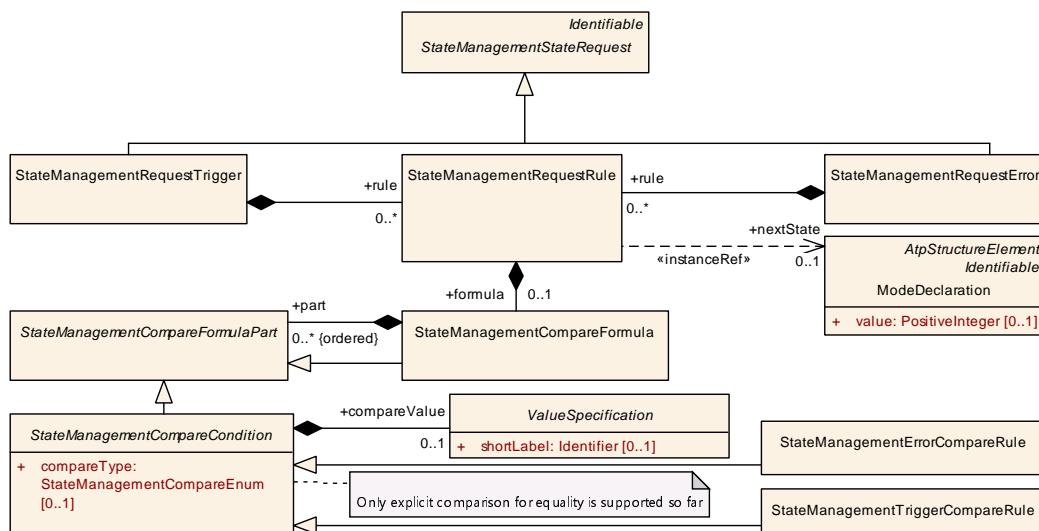


Figure 10.62: Relation between StateManagementStateRequest and StateManagementRequestRule

The general approach for rule formulation is very generic, although the State Management for the time being has only little requirements for rule evaluation: one value is checked against a reference value. But since the complexity of rule formulation might grow over time, the model is already prepared for future extensions.

The meta-model supports the formulation of hierarchical comparisons such that state changes could be evaluated against not only a single input, but also – where applicable – collection of inputs.

The execution of state changes is subject to the evaluation of rules that are owned by the respective request classes. This relation is depicted in Figure 10.62.

The states that are involved in the evaluation of State Management rules are entirely “internal” states, [Function Group States](#) are not affected and shall³ not be used for rule evaluation.

Class	StateManagementCompareFormula			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	A StateManagementCompareFormula embodies the computation instruction that is to be evaluated at runtime to determine if the aggregating request rule yields true or false. The formula itself consists of parts which are combined by the logical operations specified by StateManagementCompareFormula .op. Tags: atp.Status=draft			
Base	ARObject, StateManagementCompareFormulaPart			
Aggregated by	StateManagementCompareFormula.part , StateManagementRequestRule.formula			
Attribute	Type	Mult.	Kind	Note
part (ordered)	StateManagementCompareFormulaPart	*	aggr	This aggregation represents the collection of formula parts that can be combined by logical operators. Tags: atp.Status=draft

Table 10.125: StateManagementCompareFormula

Enumeration	StateManagementLogicalOperatorEnum			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	Logical AND and OR operation for the evaluation of rules in state management. Tags: atp.Status=draft			
Literal	Description			
logicalAnd	This value represents the semantics of a logical "and" Tags: atp.EnumerationLiteralIndex=0 atp.Status=draft			
logicalOr	This value represents the semantics of a logical "or" Tags: atp.EnumerationLiteralIndex=1 atp.Status=draft			

Table 10.126: StateManagementLogicalOperatorEnum

³The nature of the underlying `instanceRef` modeling would unfortunately not be able to prohibit a brute-force referencing of function groups states.

Class	StateManagementCompareFormulaPart (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	A StateManagementCompareFormulaPart can either be a atomic condition, e.g. a StateManagementTriggerCompareRule or StateManagementErrorCompareRule, or a StateManagementCompareFormula again, which allows arbitrary nesting. Tags: atp.Status=draft			
Base	ARObject			
Subclasses	StateManagementCompareCondition, StateManagementCompareFormula			
Aggregated by	StateManagementCompareFormula.part			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.127: StateManagementCompareFormulaPart

Class	StateManagementCompareCondition (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	StateManagementCompareConditions are atomic conditions. They are based on the idea of a comparison at runtime of some variable data with something constant. The type of the comparison (==, !=, <, <=, ...) is specified in StateManagementCompareCondition.compareType. Tags: atp.Status=draft			
Base	ARObject, StateManagementCompareFormulaPart			
Subclasses	StateManagementErrorCompareRule, StateManagementTriggerCompareRule			
Aggregated by	StateManagementCompareFormula.part			
Attribute	Type	Mult.	Kind	Note
compareType	StateManagementCompareEnum	0..1	attr	This attributes represents the concrete type of the comparison. Tags: atp.Status=draft
compareValue	ValueSpecification	0..1	aggr	This aggregation represents the reference value against which the value obtained from request shall be compared to. Tags: atp.Status=draft

Table 10.128: StateManagementCompareCondition

[constr_10394]{DRAFT} Existence of attribute StateManagementCompareCondition.compareType [For each StateManagementCompareCondition, the aggregation in the role compareType shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10395]{DRAFT} Existence of attribute StateManagementCompareCondition.compareValue [For each StateManagementCompareCondition, the aggregation in the role compareValue shall exist **at the time when the creation of the manifest is finished.**]()

Enumeration	StateManagementCompareEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement
Note	Enumeration for the type of a comparison of values usually expressed by the following operators: ==, !=, <, <=, >, >= Tags: atp.Status=draft
Aggregated by	StateManagementCompareCondition.compareType
Literal	Description
isEqual	Equal Tags: atp.EnumerationLiteralIndex=0 atp.Status=draft

Table 10.129: StateManagementCompareEnum

10.14.4.2 Trigger Rules

The modeling of the rules for trigger requests is depicted in Figure 10.62 and Figure 10.63.

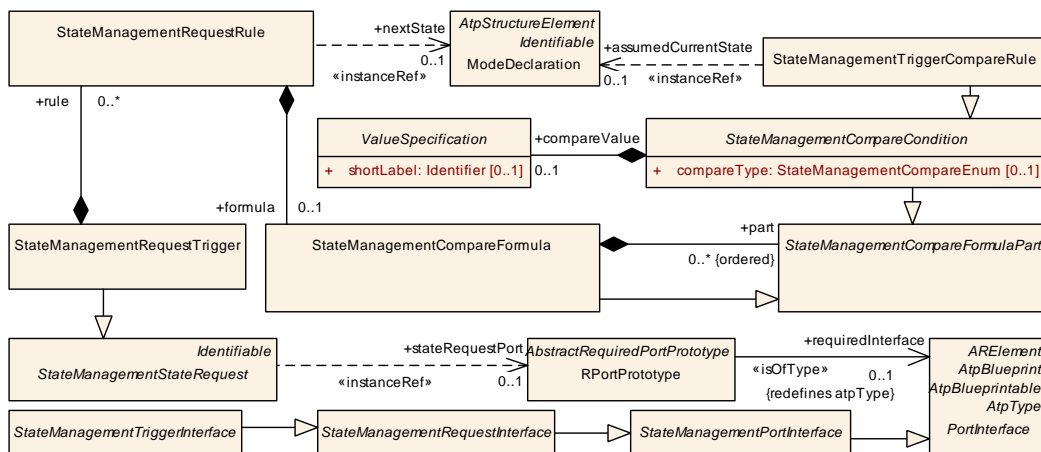


Figure 10.63: Modeling of [StateManagementRequestRule](#) for the “trigger” case

As depicted in Figure 10.63, the definition of the trigger request rule involves two `instanceRefs` to `ModeDeclarationGroup`, as further explained in

[TPS_MANI_01835]{DRAFT} Semantics of [StateManagementRequestTrigger.rule](#) [The semantics of [StateManagementRequestTrigger.rule](#) is mainly defined by the existence of two `instanceRefs`:

- The reference in the role [StateManagementRequestTrigger.rule.nextState](#) denotes the state that shall be switched to if the rule evaluates to `true`.
- The additional reference in the role [StateManagementTriggerCompareRule.assumedCurrentState](#) represents an input to the rule evaluation. In other words, the [rule.formula](#) evaluates to `true` if

- the input value obtained from the `PortPrototype` referenced in the role `StateManagementRequestTrigger.stateRequestPort` typed by either a sub-class of `StateManagementTriggerInterface` or a `ServiceInterface` is equal the compare value **and**
- the reference `StateManagementTriggerCompareRule.assumedCurrentState` identifies the current state.

]()

Class	StateManagementTriggerCompareRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class represents the configuration of a compare rule for the processing of a trigger request. Tags: atp.Status=draft			
Base	<i>ARObject</i> , <i>StateManagementCompareCondition</i> , <i>StateManagementCompareFormulaPart</i>			
Aggregated by	<i>StateManagementCompareFormula</i> .part			
Attribute	Type	Mult.	Kind	Note
assumedCurrentState	ModeDeclaration	0..1	iref	This reference denotes the assumed current state for the given compare rule for trigger values. Tags: atp.Status=draft InstanceRef implemented by: ModeDeclarationInStateManagementStateNotificationInstanceRef

Table 10.130: StateManagementTriggerCompareRule

[constr_10396]{DRAFT} Existence of reference in the role `StateManagementTriggerCompareRule.assumedCurrentState` [For each `StateManagementTriggerCompareRule`, the reference in the role `assumedCurrentState` shall exist at the time when the creation of the manifest is finished.]()

10.14.4.3 Error Rules

The modeling of the rules for error submissions is depicted in Figure 10.62 and Figure 10.64.

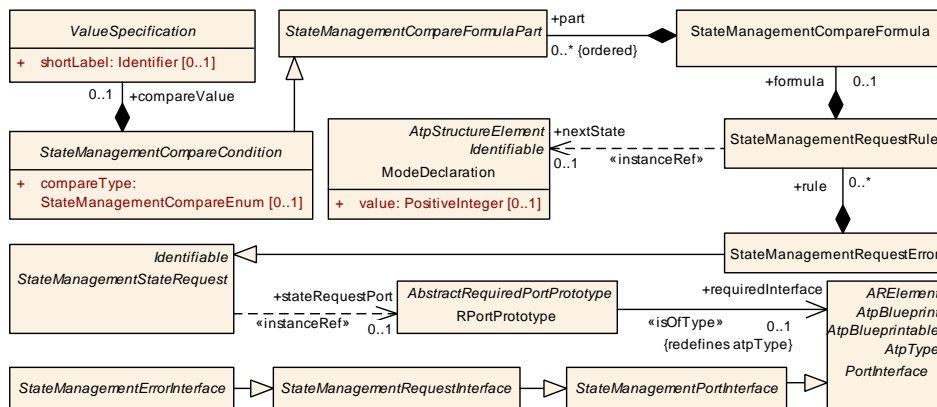


Figure 10.64: Modeling of `StateManagementRequestRule` for the “error” case

[TPS_MANI_01836]{DRAFT} **Semantics of `StateManagementRequestError.rule`** [The semantics of the `rule` is that the affected state machine shall switch to the `nextState` if the `formula` evaluates to `true`.] (*RS_MANI_00023*)

Class	<code>StateManagementErrorCompareRule</code>			
Package	<code>M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement</code>			
Note	This meta-class represents the configuration of a compare rule for the processing of an error submission. Tags: <code>atp.Status=draft</code>			
Base	<code>ARObject</code> , <code>StateManagementCompareCondition</code> , <code>StateManagementCompareFormulaPart</code>			
Aggregated by	<code>StateManagementCompareFormula.part</code>			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.131: `StateManagementErrorCompareRule`

10.14.5 Action Items

[TPS_MANI_01387]{DRAFT} **Semantics of meta-class `StateManagementActionList`** [Whenever a state machine switches to a different state, one or more actions shall be executed in response.

This functionality is modeled by means of the existence of a `StateManagementActionList` that aggregates abstract class `StateManagementActionItems` as an **ordered** collection, i.e. the order of the execution of individual `StateManagementActionItems` is significant.

The concrete sub-classes

- `StateManagementStateMachineActionItem`
- `StateManagementSyncActionItem`
- `StateManagementSetFunctionGroupStateActionItem`

of `StateManagementActionItem` define the specific action item that needs to be executed.

The `StateManagementActionList` refers to a `ModeDeclaration` (an “internal” state, as opposed to a `Function Group State`) as the representation of the state to which the state machine was switched to.] (*RS_MANI_00023*)

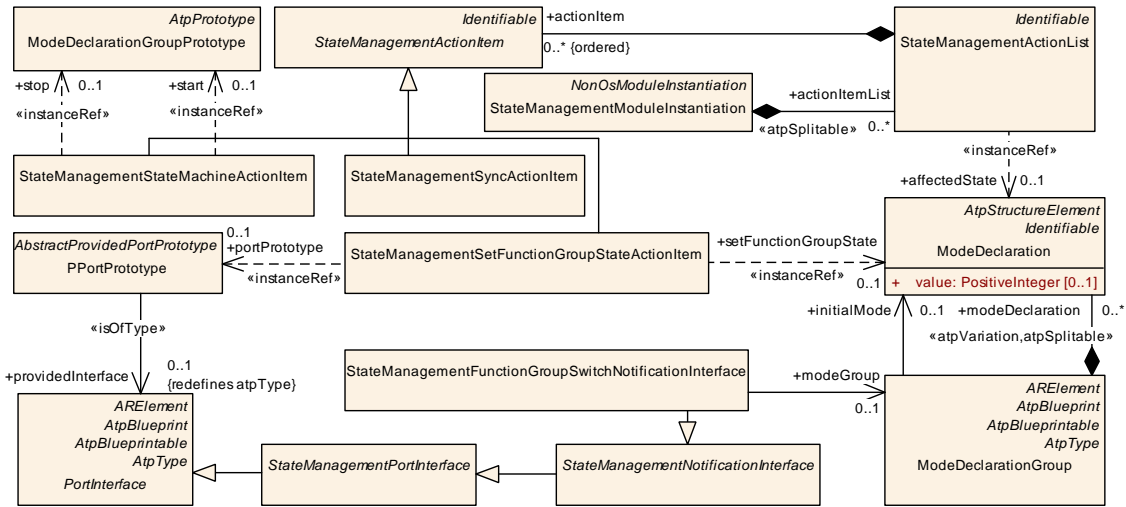


Figure 10.65: Modeling of StateManagementActionList

Class	StateManagementActionList			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class represents the ability to define an action list that is associated with a state of a state machine. Tags: atp.Status=draft			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	StateManagementModuleInstantiation.actionItemList			
Attribute	Type	Mult.	Kind	Note
actionItem (ordered)	StateManagementActionItem	*	aggr	This represents the collection of action items in the context of the action item list. Tags: atp.Status=draft
affectedState	ModeDeclaration	0..1	iref	This reference identifies the state for which the referencing action list applies. Tags: atp.Status=draft InstanceRef implemented by: ModeDeclarationInStateManagementStateNotificationInstanceRef

Table 10.132: StateManagementActionList

[constr_10405]{DRAFT} Existence of reference in the role **StateManagementActionList.affectedState** [For each **StateManagementActionList**, the reference in the role **affectedState** shall exist **at the time when the creation of the manifest is finished.**]()

Class	StateManagementActionItem (abstract)
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement
Note	This meta-class represents an action item that is executed in response to a state change. Tags: atp.Status=draft
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable
Subclasses	StateManagementSetFunctionGroupStateActionItem, StateManagementStateMachineActionItem, StateManagementSyncActionItem





Class	<i>StateManagementActionItem</i> (abstract)			
Aggregated by	StateManagementActionList.actionItem			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.133: StateManagementActionItem

10.14.5.1 State Machine State Machine Action Item

[TPS_MANI_01388]{DRAFT} **Semantics of the meta-class [StateManagementStateMachineActionItem](#)** [A [StateManagementStateMachineActionItem](#) can be used to start or stop a state machine in the context of State Management.

This activity is typically needed to interact with subordinate State Management software that comes with a specific [SoftwareCluster](#) and is responsible for the State Management of the enclosing [SoftwareCluster](#).] (*RS_MANI_00023*)

The purpose of the [StateManagementStateMachineActionItem](#) is to either start or stop a given state machine. There is therefore no valid use case for both references in the role [start](#) and [stop](#) to exist at the same time.

[constr_10386]{DRAFT} **Existence of references [StateManagementStateMachineActionItem.start](#) and [stop](#)** [For each [StateManagementStateMachineActionItem](#), **at most one** of the two references

- [start](#)
- [stop](#)

shall exist **at the time when the creation of the manifest is finished**.] ()

Class	StateManagementStateMachineActionItem			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class represents a state management action item to start or stop a state machine. Tags: atp.Status=draft			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable , StateManagementActionItem			
Aggregated by	StateManagementActionList.actionItem			
Attribute	Type	Mult.	Kind	Note
start	ModeDeclarationGroup Prototype	0..1	iref	This reference identifies the state machine that shall be started when the enclosing action list item is executed. Tags: atp.Status=draft InstanceRef implemented by: ModeDeclarationGroup PrototypeInExecutableInstanceRef





Class	StateManagementStateMachineActionItem			
stop	ModeDeclarationGroup Prototype	0..1	iref	This reference identifies the state machine that shall be stopped when the enclosing action list item is executed. Tags: atp.Status=draft InstanceRef implemented by: ModeDeclarationGroup PrototypeInExecutableInstanceRef

Table 10.134: StateManagementStateMachineActionItem

10.14.5.2 Sync Action Item

[TPS_MANI_01389]{DRAFT} **Semantics of meta-class [StateManagementSyncActionItem](#)** [A [StateManagementSyncActionItem](#) can be used to introduce a synchronization point at which the workflow waits for the completion of actions that could (in theory) be executed in parallel.

In other words, any [StateManagementActionItem](#) positioned after the [StateManagementSyncActionItem](#) can only be executed if the [StateManagementActionItem](#) placed before the [StateManagementSyncActionItem](#) are finished.] ([RS_MANI_00023](#))

Class	StateManagementSyncActionItem			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class represents a state management action item to synchronize state machines. Tags: atp.Status=draft			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable , StateManagementActionItem			
Aggregated by	StateManagementActionList.actionItem			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.135: StateManagementSyncActionItem

10.14.5.3 Function Group Action Item

[TPS_MANI_01390]{DRAFT} **Semantics of meta-class [StateManagementSetFunctionGroupStateActionItem](#)** [The purpose of [StateManagementSetFunctionGroupStateActionItem](#) is to enable the switch of the state machine representing a specific [Function Group](#) to a new [Function Group State](#), identified by means of the reference in the role [StateManagementSetFunctionGroupStateActionItem.setFunctionGroupState](#).] ([RS_MANI_00023](#))

Each [StateManagementSetFunctionGroupStateActionItem](#) references

- a [ModeDeclaration](#) that represents a [Function Group State](#) and

- a `PortPrototype` over which the switch to the new `Function Group State` shall be communicated.

It is obviously very important that the `ModeDeclarationGroup` that is used in the context of the definition of the `Function Group` is identical⁴ to the definition of the `StateManagementFunctionGroupSwitchNotificationInterface.modeGroup`. This consequence is the basis for the definition of [`constr_10387`].

[constr_10387]{DRAFT} Consistency of `StateManagementSetFunctionGroupStateActionItem.portPrototype` and `StateManagementSetFunctionGroupStateActionItem.setFunctionGroupState` [For each `StateManagementSetFunctionGroupStateActionItem`, the `ModeDeclarationGroup` used to type the `ModeDeclaration` that is referenced in the role `setFunctionGroupState` shall be identical to the `ModeDeclarationGroup` referenced in the role `modeGroup` from the `StateManagementFunctionGroupSwitchNotificationInterface` that is used to type the `PortPrototype` that is referenced in the role `portPrototype` from the affected `StateManagementSetFunctionGroupStateActionItem`.

This rule shall be imposed **at the time when the creation of the manifest is finished.** |()

Please note that the relation described in [`constr_10387`] is depicted in Figure 10.65.

Class	<code>StateManagementSetFunctionGroupStateActionItem</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::StateManagement			
Note	This meta-class represents a state management action item to set a specific state in a specific function group. Tags: atp.Status=draft			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code> , <code>StateManagementActionItem</code>			
Aggregated by	<code>StateManagementActionList.actionItem</code>			
Attribute	Type	Mult.	Kind	Note
portPrototype	<code>PortPrototype</code>	0..1	iref	This reference identifies the PortPrototype over which the function group state switch shall be communicated. Tags: atp.Status=draft InstanceRef implemented by: <code>PortPrototypeInExecutableInstanceRef</code>
setFunctionGroupState	<code>ModeDeclaration</code>	0..1	iref	This reference identifies the function group step that shall become active after the action step terminates. Tags: atp.Status=draft InstanceRef implemented by: <code>FunctionGroupStateInFunctionGroupSetInstanceRef</code>

Table 10.136: StateManagementSetFunctionGroupStateActionItem

[constr_10397]{DRAFT} Existence of reference in the role `StateManagementSetFunctionGroupStateActionItem.portPrototype` [For each `StateManagementSetFunctionGroupStateActionItem`, the reference in the role

⁴Technically, it would be sufficient if the two affected `ModeDeclarationGroups` were compatible. But the utilization of the concept of compatibility doesn't (yet) have the same foothold on the *AUTOSAR adaptive platform* as it has on the *AUTOSAR classic platform*.

portPrototype shall exist at the time when the creation of the manifest is finished.>()

[constr_10398]{DRAFT} Existence of reference in the role StateManagementSetFunctionGroupStateActionItem.setFunctionGroupState [For each StateManagementSetFunctionGroupStateActionItem, the reference in the role setFunctionGroupState shall exist at the time when the creation of the manifest is finished.]()

10.15 Deterministic Synchronization

10.15.1 Deterministic Synchronization Instantiation

The purpose of the deterministic synchronization is to ensure that a collection of so-called *Deterministic Clients* operates in lock-step, coordinated by a so-called *Deterministic Sync Master*.

The coordination of the lock-step execution requires some configuration on the deployment level, implemented as two sub-classes of abstract base class *DeterministicSyncInstantiation* (that is in turn derived from *NonOsModuleInstantiation*): *DeterministicSyncMaster* and *DeterministicClient*.

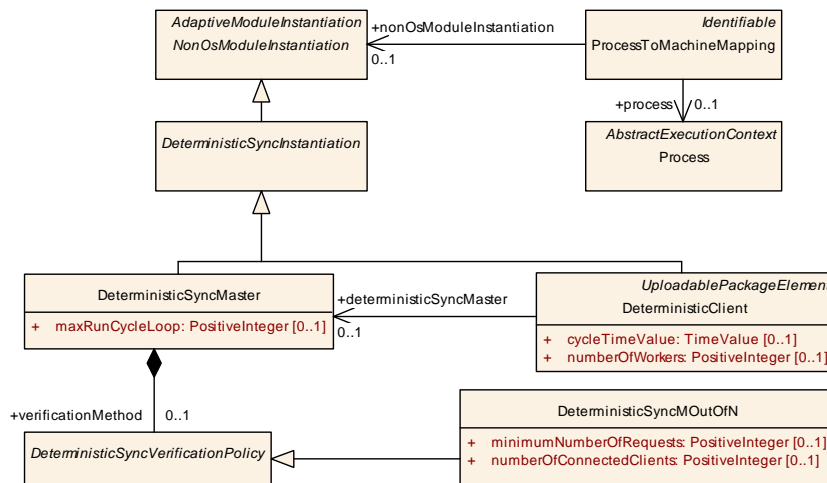


Figure 10.66: Modeling of support for *DeterministicSyncInstantiation* in the deployment

Class	<i>DeterministicSyncInstantiation</i> (abstract)
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::DeterministicSync
Note	This abstract meta class serves as a base class for deterministic sync module instantiations. Tags:atp.Status=draft





Class	DeterministicSyncInstantiation (abstract)			
Base	ARObject, AdaptiveModuleInstantiation, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, NonOsModuleInstantiation, Referrable			
Subclasses	DeterministicClient, DeterministicSyncMaster			
Aggregated by	AtpClassifier.atpFeature, Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.137: DeterministicSyncInstantiation

10.15.2 Deterministic Synchronization Client

[TPS_MANI_01203]{DRAFT} **Semantics of DeterministicClient** [The existence of [DeterministicClient](#) means that the [Process](#) referenced by a [ProcessToMachineMapping](#) that also references the [DeterministicClient](#) implements the concept of a .] ([RS_MANI_00050](#))

The support for the concept of a [Deterministic Client](#) consists of two aspects. The *design aspect* has already been explained in section 3.21.1 while the *deployment aspect* is discussed in this chapter.

Class	DeterministicClient			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::DeterministicSync			
Note	The meta-class DeterministicClient provides the ability to support the deterministic execution of one or more processes with specific configuration parameters for DeterministicClient library functions. Tags: atp.Status=draft atp.recommendedPackage=DeterministicClients			
Base	ARElement, ARObject, AdaptiveModuleInstantiation, AtpClassifier, AtpFeature, AtpStructureElement, CollectableElement, DeterministicSyncInstantiation, Identifiable, MultilanguageReferrable, NonOsModuleInstantiation, PackageableElement, Referrable, UploadablePackageElement			
Aggregated by	ARPackage.element, AtpClassifier.atpFeature, Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
cycleTimeValue	TimeValue	0..1	attr	This attribute represents the cycle time for execution of a DeterministicClient activation cycle. Tags: atp.Status=draft
deterministic SyncMaster	DeterministicSync Master	0..1	ref	This reference identifies the applicable DeterministicSync Master. Tags: atp.Status=draft
numberOf Workers	PositiveInteger	0..1	attr	Number of independent workers that process data-sets. Size of the worker pool shall be decided based on availability of resources like processor cores or memory. Tags: atp.Status=draft

Table 10.138: DeterministicClient

10.15.3 Deterministic Synchronization Master

Meta-class `DeterministicSyncMaster` represents the counterpart to the `DeterministicClient`.

[TPS_MANI_01406]{DRAFT} Semantics of `DeterministicSyncMaster` [The existence of `DeterministicSyncMaster` means that the Process referenced by a `ProcessToMachineMapping` that also references the `DeterministicSyncMaster` implements the concept of a Deterministic Sync Master. The latter orchestrates the execution of a given number of `DeterministicClients`.] (*RS_MANI_00050*)

Please note that there is intentionally no design-level configuration for `DeterministicSyncMaster`, i.e. there is no equivalent to the `DeterministicClientResourceNeeds` for the `Deterministic Sync Master`.

Class	<code>DeterministicSyncMaster</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::DeterministicSync			
Note	The meta-class <code>DeterministicSyncMaster</code> provides the synchronization ability to support the deterministic execution of one or more processes with specific configuration parameters for <code>DeterministicSyncMaster</code> library functions Tags: atp.Status=draft			
Base	<code>ARObject</code> , <code>AdaptiveModuleInstantiation</code> , <code>AtpClassifier</code> , <code>AtpFeature</code> , <code>AtpStructureElement</code> , <code>DeterministicSyncInstantiation</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>NonOsModuleInstantiation</code> , <code>Referrable</code>			
Aggregated by	<code>AtpClassifier.atpFeature</code> , <code>Machine.moduleInstantiation</code>			
Attribute	Type	Mult.	Kind	Note
maxRunCycle Loop	PositiveInteger	0..1	attr	The maximum number of loops of the kRun cycle. Tags: atp.Status=draft
verification Method	<code>DeterministicSyncVerificationPolicy</code>	0..1	aggr	This aggregation is used to configure the applicable verification method implemented in the <code>DeterministicSyncMaster</code> . Tags: atp.Status=draft

Table 10.139: DeterministicSyncMaster

The orchestration of `DeterministicClients` requires a verification in terms of whether the clients are still in lock-step. A possible verification policy is the check whether M requests out of a possible collection of N clients request synchronization within a run cycle.

The configuration of this approach can be done by means of meta-class `DeterministicSyncMOutOfN`, modeled as a sub-class of abstract class `DeterministicSyncVerificationPolicy`.

[TPS_MANI_01407]{DRAFT} Semantics of abstract base class `DeterministicSyncVerificationPolicy` [The aggregation of `DeterministicSyncVerificationPolicy` in the role `DeterministicSyncMaster.verificationMethod` allows for the utilization of a concrete sub-class of `DeterministicSyncVerificationPolicy` for the purpose of verifying a sync request.

This way, the structure of the modeling remains unchanged, independently of the sub-class of [DeterministicSyncVerificationPolicy](#) that is actually aggregated.] ([RS_MANI_00050](#))

Please note that, for the time being, there is only support for one sub-class of [DeterministicSyncVerificationPolicy](#): [DeterministicSyncMOutOfN](#). In the future, further verification methods may be added.

Class	DeterministicSyncVerificationPolicy (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::DeterministicSync			
Note	This meta-class acts as an abstract base class for the configuration of concrete verification methods for the deterministic sync master. Tags: atp.Status=draft			
Base	ARObject			
Subclasses	DeterministicSyncMOutOfN			
Aggregated by	DeterministicSyncMaster.verificationMethod			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 10.140: DeterministicSyncVerificationPolicy

Class	DeterministicSyncMOutOfN			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::DeterministicSync			
Note	This meta-class has the ability to configure an N-out-of-M verification in the context of a deterministic sync master. Tags: atp.Status=draft			
Base	ARObject , DeterministicSyncVerificationPolicy			
Aggregated by	DeterministicSyncMaster.verificationMethod			
Attribute	Type	Mult.	Kind	Note
minimumNumberOfRequests	PositiveInteger	0..1	attr	The minimum number of received requests that is sufficient to continue the calculation of next cycle. This attribute represents the M in the M-out-of-N verification method. Tags: atp.Status=draft
numberOfConnectedClients	PositiveInteger	0..1	attr	This attribute represents the number of deterministic clients that are connected to the deterministic sync master. this attribute represents the N in the M-out-of-N verification method. Tags: atp.Status=draft

Table 10.141: DeterministicSyncMOutOfN

[constr_10406]{DRAFT} Existence of [DeterministicSyncMOutOfN.numberOfConnectedClients](#) [For each [DeterministicSyncMOutOfN](#), attribute [numberOfConnectedClients](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10407]{DRAFT} Existence of [DeterministicSyncMOutOfN.minimumNumberOfRequests](#) [For each [DeterministicSyncMOutOfN](#), attribute [minimumNumberOfRequests](#) shall exist **at the time when the creation of the manifest is finished.**]()

[TPS_MANI_01408]{DRAFT} **Semantics of reference `DeterministicClient.deterministicSyncMaster`** [The creation of the collection of the `Deterministic Clients` that are served by one `Deterministic Sync Master` is created by means of the reference from `DeterministicClient` to `DeterministicSyncMaster` in the role `deterministicSyncMaster`.] (*RS_MANI_00050*)

11 Service Instance Manifest

11.1 ApplicationEndpoint

[TPS_MANI_03280]{DRAFT} **Semantics of [ApApplicationEndpoint](#)** [The [ApApplicationEndpoint](#) defines a UDP or TCP Port on a [EthernetCommunicationConnector](#) and defines together with the [NetworkEndpoint](#) that is referenced by the same [EthernetCommunicationConnector](#) in the role [unicastNetworkEndpoint](#) a local endpoint of a network communication path, i.e. a Socket.] ([RS_MANI_00014](#))

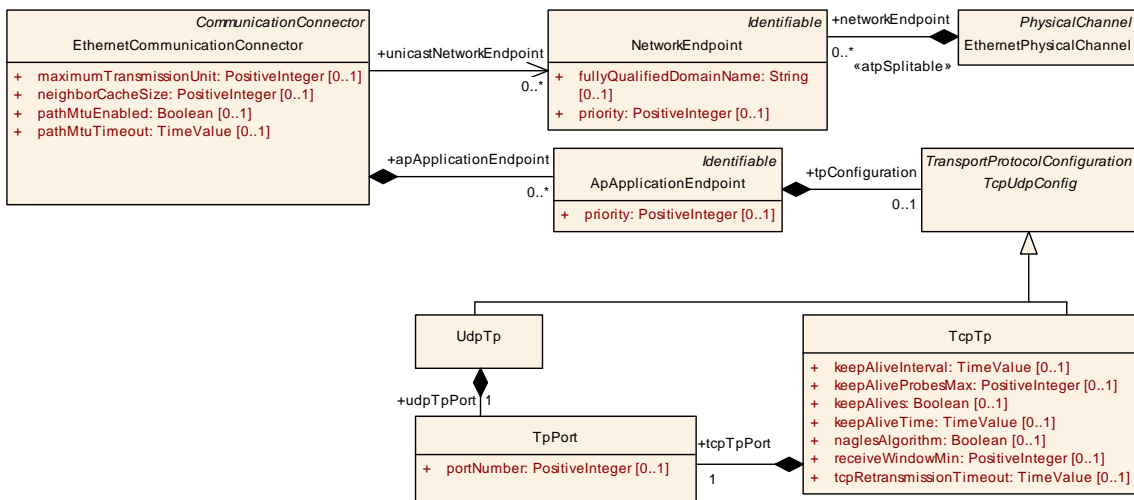


Figure 11.1: ApApplicationEndpoint definition

Class	ApApplicationEndpoint			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::APApplicationEndpoint			
Note	An application endpoint is the endpoint on an Ecu in terms of application addressing (e.g. UDP or TCP Port).			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	EthernetCommunicationConnector.apApplicationEndpoint			
Attribute	Type	Mult.	Kind	Note
priority	PositiveInteger	0..1	attr	This attribute defines the VLAN frame priority where values from 0 (best effort) to 7 (highest) are allowed.
tpConfiguration	TcpUdpConfig	0..1	aggr	Configuration of the used transport protocol.

Table 11.1: ApApplicationEndpoint

Class	TcpUdpConfig (abstract)
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology
Note	Tcp or Udp Transport Protocol Configuration.
Base	ARObject, TransportProtocolConfiguration
Subclasses	TcpTp, UdpTp





Class	<i>TcpUdpConfig</i> (abstract)			
Aggregated by	ApApplicationEndpoint.tpConfiguration , ApplicationEndpoint.tpConfiguration, RtpTp.tcpUdpConfig			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 11.2: TcpUdpConfig

Class	UdpTp			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Content Model for UDP configuration.			
Base	<i>ARObject</i> , TcpUdpConfig , <i>TransportProtocolConfiguration</i>			
Aggregated by	ApApplicationEndpoint.tpConfiguration , ApplicationEndpoint.tpConfiguration, RtpTp.tcpUdpConfig			
Attribute	Type	Mult.	Kind	Note
udpTpPort	TpPort	1	aggr	Udp Port configuration.

Table 11.3: UdpTp

Class	TcpTp			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Content Model for TCP configuration.			
Base	<i>ARObject</i> , TcpUdpConfig , <i>TransportProtocolConfiguration</i>			
Aggregated by	ApApplicationEndpoint.tpConfiguration , ApplicationEndpoint.tpConfiguration, HttpTp.tcpTpConfig, RtpTp.tcpUdpConfig			
Attribute	Type	Mult.	Kind	Note
keepAliveInterval	TimeValue	0..1	attr	Specifies the interval in seconds between subsequent keepalive probes.
keepAliveProbesMax	PositiveInteger	0..1	attr	Maximum number of times that TCP retransmits an individual data segment before aborting the connection.
keepAlives	Boolean	0..1	attr	Indicates if Keep-Alive messages are sent.
keepAliveTime	TimeValue	0..1	attr	Specifies the time in seconds between the last data packet sent and the first keepalive probe.
naglesAlgorithm	Boolean	0..1	attr	Indicates if Nagle's Algorithm is used.
receiveWindowMin	PositiveInteger	0..1	attr	Minimum size of the TCP receive window in bytes.
tcpRetransmissionTimeout	TimeValue	0..1	attr	Defines the timeout in seconds before an unacknowledged TCP segment is sent again. If the tcpRetransmissionTimeout is not defined or set to "INF", no TCP segments shall be re-transmitted.
tcpTpPort	TpPort	1	aggr	TCP Port configuration.

Table 11.4: TcpTp

[TPS_MANI_03281]{DRAFT} Port specific TCP configuration settings [The configuration settings in the [TcpTp](#) element of an [ApApplicationEndpoint](#) overwrite potential TCP settings that are available in [TcpProps](#) referenced by the [MachineDesign](#) that aggregates the [EthernetCommunicationConnector](#) that in turn contains the [ApApplicationEndpoint](#).] ([RS_MANI_00014](#))

Class	TpPort			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Dynamic or direct assignment of a PortNumber.			
Base	ARObject			
Aggregated by	TcpTp.tcpTpPort, UdpTp.udpTpPort			
Attribute	Type	Mult.	Kind	Note
portNumber	PositiveInteger	0..1	attr	Port Number.

Table 11.5: TpPort

11.1.1 VLAN Priority

The `priority` is a 3-bit field which refers to the IEEE 802.1Q priority. It indicates the frame priority level. Values are from 0 (best effort) to 7 (highest); These values can be used to prioritize different classes of traffic (voice, video, data, etc.). The priority is contained in the Ethernet Header together with the `vlanIdentifier`.

The priority can be defined on different levels and can overwrite the `defaultPriority` on the VLAN:

1. `NetworkEndpoint` (for network traffic over the IP Address)
2. `ApApplicationEndpoint` (for TCP Port and/or UDP Port network traffic)
3. `ProvidedSomeipServiceInstance` (for network traffic resulting from the Service Instance)

The following table shows an example for the usage of the priority.

Port (Default Priority)	NetworkEndpoint (e.g. IP Address)	ApApplicationEndpoint (e.g. Tcp Port)
CouplingPort1: Prio. 0	NEP1.1: Prio. —	AEP 1.1.1: Prio. —
		AEP 1.1.2: Prio. 1
	NEP1.2: Prio. 0	AEP 1.2.1: Prio. —
		AEP 1.2.2: Prio. 1
CouplingPort2: Prio. 0	NEP2.1: Prio. 1	AEP 2.1.1: Prio. 2
		AEP 2.1.2: Prio. 3
	NEP2.2: Prio. 2	AEP 2.2.1: Prio. 1
		AEP 2.2.2: Prio. 0

Table 11.6: VLAN Priority Example

Two `CouplingPorts` are defined and both have a reference to VLAN (`EthernetPhysicalChannel`) that defines two `NetworkEndpoints`. The `CouplingPort` defines the default priority. This default priority can be overwritten on the `NetworkEndpoint` level, and again on the `ApApplicationEndpoint` level.

For `NetworkEndpoint` NEP1.1 no priority is defined. But since on `ApApplicationEndpoint` AEP 1.1.2 a priority is defined, all messages on CouplingPort1 have the

Priority 0 ("best effort"), except for messages that are going over AEP 1.1.2. These messages have the priority 1 (higher priority).

On `CouplingPort2`, the priority is overwritten on several levels. Please note that `ApApplicationEndpoints` AEP 2.2.1 and AEP 2.2.2 are reducing the priority that is defined on the `NetworkEndpoint` NEP2.2.

Please note that the definition of the `priority` in the `SomeipSdServerServiceInstanceConfig` can be used to define priorities for SD messages like `Service Offer` and `SubscribeEventGroupAck` that are resulting from `ProvidedSomeipServiceInstances` that are referencing the `SomeipSdServerServiceInstanceConfig` in the role `sdServerConfig`.

To prioritize SD messages that are sent from the service consumer to the service provider like `FindService` or `SubscribeEventGroup`, the `priority` in the `SomeipSdClientServiceInstanceConfig` can be used.

The SD messages are communicated over a UDP Port that is defined in `SomeipServiceDiscovery.someipServiceDiscoveryPort` and over a IP Multicast Address that is defined by `SomeipServiceDiscovery.multicastSdIpAddress`. In other words, the priority in the `SomeipSdServerServiceInstanceConfig` and `SomeipSdClientServiceInstanceConfig` can be used to prioritize network traffic that results from specific `ServiceInstances` on SD level.

11.2 Service Interface Deployment

The different meta-class specializations of `ServiceInterfaceDeployment` define a binding of a `ServiceInterface` to a middleware transport layer.

This chapter describes the usage of the `ServiceInterfaceDeployment` in different bindings that are supported by AUTOSAR.

[TPS_MANI_03036]{DRAFT} `ServiceInterface` deployment to a middleware transport layer [The `ServiceInterfaceDeployment` meta-class provides the ability to map a `ServiceInterface` to a middleware transport layer that is represented by a concrete class that is derived from the abstract `ServiceInterfaceDeployment` meta-class.] (*RS_MANI_00008*)

The association between the `ServiceInterfaceDeployment` and the `ServiceInterface` implicitly also defines the relation between the technology specific version number of the service on the `ServiceInterfaceDeployment` and the service version of the `ServiceInterface` (defined by `ServiceInterface.majorVersion` and `ServiceInterface.minorVersion`)

[TPS_MANI_03617]{DRAFT} Version mapping between `ServiceInterface` and `ServiceInterfaceDeployment` [The contract version of a `ServiceInterface` (`majorVersion`, `minorVersion`) shall be mapped to a version of the `ServiceInterfaceDeployment` for each transport layer.

This version mapping may lead to different version numbers for different `ServiceInterfaceDeployments` that refer to the same `ServiceInterface`. This allows to define different version numbers, on the same network or on different networks (e.g. VLANs).] (*RS_MANI_00065*)

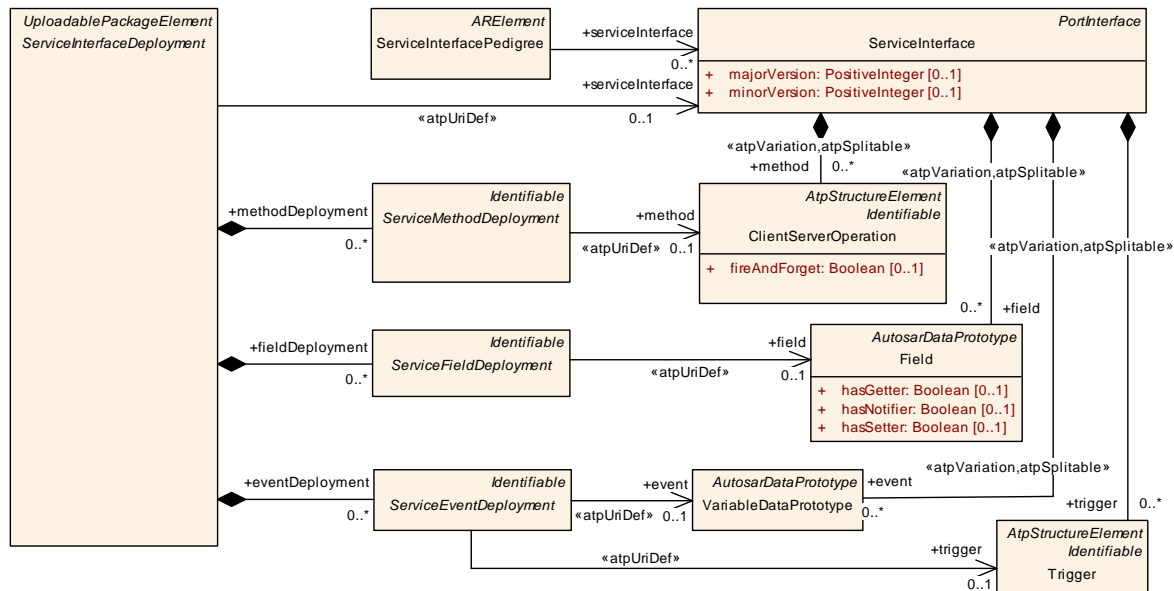


Figure 11.2: Deployment-related modeling of ServiceInterface

Note that transport layer specific constraints on the uniqueness of protocol credentials still have to be respected, e.g. [*constr_1723*].

In figure 11.3, the use-case of having one `PPortPrototype` typed by one `ServiceInterface` and having several `ProvidedSomeipServiceInstances` on several VLANs is illustrated.

It is possible to have different `serviceInterfaceId`, `serviceInstanceId`, and `majorVersion` values on each individual VLAN. But also the use-case of providing both service instances on the same VLAN would be supported, as long as their SOME/IP credentials are unique (see [*constr_1723*]).

On different VLANs the service instance may also use the same SOME/IP credentials. But only in case that all service instance specific configuration settings (e.g. IP Multicast Address, SD Timing Properties) are exactly the same on both VLANs the same `AdaptivePlatformServiceInstance` can be used to model the communication on both VLANs.

If, for example, the `serviceInterfaceId`, `serviceInstanceId`, and `majorVersion` values of a service instance on each VLAN are the same, but different IP Multicast Addresses are used on the different VLANs for the EventGroup transmission, then an individual VLAN specific modeling of `AdaptivePlatformServiceInstance` is necessary as shown in figure 11.3.

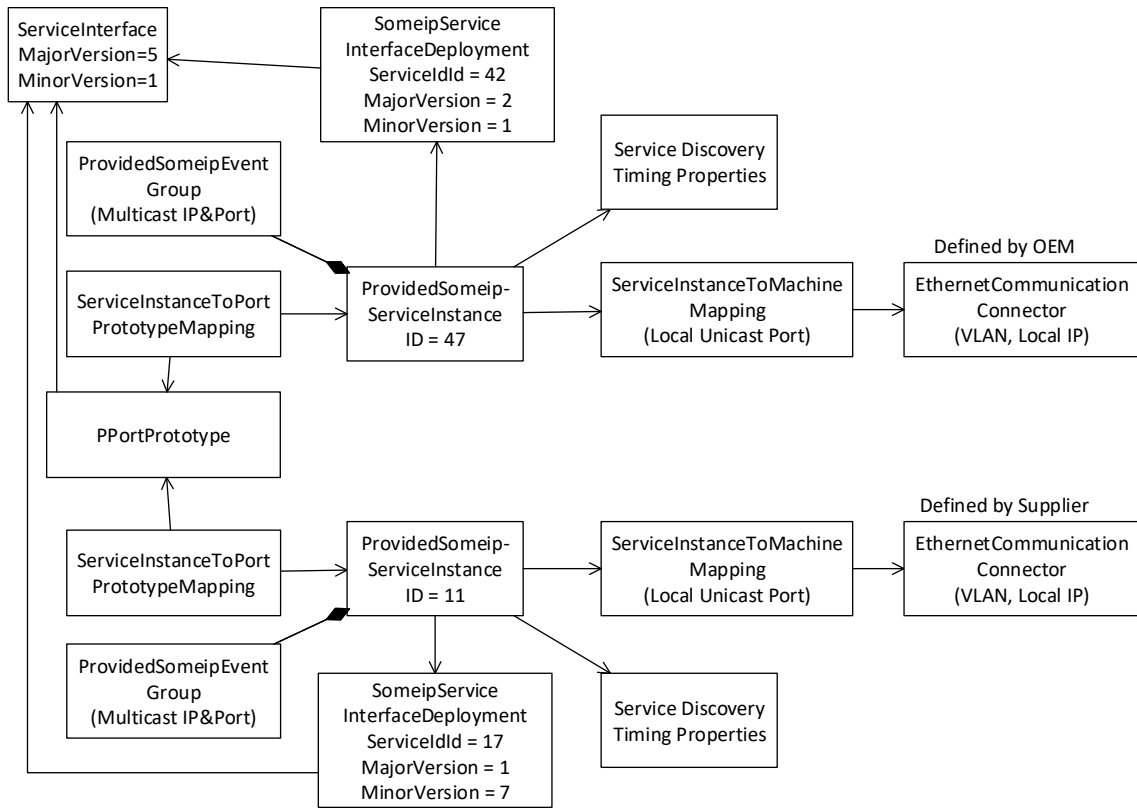


Figure 11.3: Example of 1 PPortPrototype mapped to 2 VLANs

Class	ServiceInterfaceDeployment (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	Middleware transport layer specific configuration settings for the ServiceInterface and all contained ServiceInterface elements.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Subclasses	DdsServiceInterfaceDeployment , SomeipServiceInterfaceDeployment , UserDefinedServiceInterfaceDeployment			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
event Deployment	ServiceEventDeployment	*	aggr	Middleware transport layer specific configuration settings for an Event that is defined in the ServiceInterface.
fieldDeployment	ServiceFieldDeployment	*	aggr	Middleware transport layer specific configuration settings for a Field that is defined in the ServiceInterface.
method Deployment	ServiceMethodDeployment	*	aggr	Middleware transport layer specific configuration settings for a method that is defined in the ServiceInterface.
serviceInterface	ServiceInterface	0..1	ref	Reference to a ServiceInterface that is deployed to a middleware transport layer. Stereotypes: atpUriDef

Table 11.7: ServiceInterfaceDeployment

[TPS_MANI_03037]{DRAFT} **Purpose of `ServiceMethodDeployment`** [The `ServiceMethodDeployment` meta-class provides the ability to define middleware transport layer specific configuration settings relevant for a `method` that is defined in the context of a `ServiceInterface`.] (*RS_MANI_00008*)

[constr_3300]{DRAFT} **Allowed `ServiceMethodDeployment.method` references** [The `ClientServerOperation` that is referenced by `ServiceMethodDeployment` in the role `method` shall be defined in the context of a `ServiceInterface` that is referenced by the `ServiceInterfaceDeployment` in the role `serviceInterface` that contains the `ServiceMethodDeployment`.] ()

[TPS_MANI_03038]{DRAFT} **Purpose of `ServiceEventDeployment`** [The `ServiceEventDeployment` meta-class provides the ability to define middleware transport layer specific configuration settings relevant for an `event` or `trigger` that is defined in the context of a `ServiceInterface`.] (*RS_MANI_00008*)

[constr_3301]{DRAFT} **Allowed `ServiceEventDeployment.event` references** [The `VariableDataPrototype` that is referenced by `ServiceEventDeployment` in the role `event` shall be defined in the context of a `ServiceInterface` that is referenced by the `ServiceInterfaceDeployment` in the role `serviceInterface` that contains the `ServiceEventDeployment`.] ()

[constr_5316]{DRAFT} **Allowed `ServiceEventDeployment.trigger` references** [The `Trigger` that is referenced by `ServiceEventDeployment` in the role `trigger` shall be defined in the context of a `ServiceInterface` that is referenced by the `ServiceInterfaceDeployment` in the role `serviceInterface` that contains the `ServiceEventDeployment`.] ()

[constr_5317]{DRAFT} **`ServiceEventDeployment` not allowed to reference an `event` and a `trigger` at the same time** [The `ServiceEventDeployment` element shall reference either:

- a `VariableDataPrototype` in the role `event` or
- a `Trigger` in the role `trigger`,

but not both at the same time.] ()

[TPS_MANI_03039]{DRAFT} **Purpose of `ServiceFieldDeployment`** [The `ServiceFieldDeployment` meta-class provides the ability to define middleware transport layer specific configuration settings relevant for a `field` that is defined in the context of a `ServiceInterface`.] (*RS_MANI_00008*)

[constr_3302]{DRAFT} **Allowed `ServiceFieldDeployment.field` references** [The `Field` that is referenced by `ServiceFieldDeployment` in the role `field` shall be defined in the context of a `ServiceInterface` that is referenced by the `ServiceInterfaceDeployment` in the role `serviceInterface` that contains the `ServiceFieldDeployment`.] ()

Please note that a partial `ServiceInterfaceDeployment` that only covers certain parts of the corresponding `ServiceInterfaceDeployment` is not supported. This understanding is formalized in [constr_10029]

[constr_10029]{DRAFT} `ServiceInterfaceDeployment` shall cover all elements of the corresponding `ServiceInterface` [If a `ServiceInterfaceDeployment` references a `ServiceInterface` in the role `serviceInterface`, then all `methods`, `fields`, `triggers`, and `events` defined in the context of the referenced `ServiceInterface` shall be referenced by respective `methodDeployments`, `fieldDeployments`, and `eventDeployments` owned by the referencing `ServiceInterfaceDeployment`.]()

[constr_3715]{DRAFT} Reference in the role `SomeipEventGroup.event` [In the context of a given `SomeipServiceInterfaceDeployment`, all aggregated `SomeipEventDeployments` shall be referenced at least once in the role `event` by `SomeipEventGroups` that in turn are aggregated at the same `SomeipServiceInterfaceDeployment` at the time when the creation of the manifest is finished.]()

Class	ServiceMethodDeployment (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	This abstract meta-class represents the ability to specify a deployment of a Method to a middleware transport layer.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Subclasses	SomeipMethodDeployment , UserDefinedMethodDeployment			
Aggregated by	ServiceInterfaceDeployment.methodDeployment			
Attribute	Type	Mult.	Kind	Note
method	ClientServerOperation	0..1	ref	Reference to a method that is deployed to a middleware transport layer. Stereotypes: atpUriDef

Table 11.8: ServiceMethodDeployment

Class	ServiceEventDeployment (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	This abstract meta-class represents the ability to specify a deployment of an Event to a middleware transport layer.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Subclasses	DdsEventDeployment , SomeipEventDeployment , UserDefinedEventDeployment			
Aggregated by	ServiceInterfaceDeployment.eventDeployment			
Attribute	Type	Mult.	Kind	Note
event	VariableDataPrototype	0..1	ref	Reference to an Event that is deployed to a middleware transport layer. Stereotypes: atpUriDef
trigger	Trigger	0..1	ref	Reference to a Trigger that is deployed to a middleware transport layer. Stereotypes: atpUriDef

Table 11.9: ServiceEventDeployment

Class	<i>ServiceFieldDeployment</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	This abstract meta-class represents the ability to specify a deployment of a Field to a middleware transport layer.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	DdsFieldDeployment, SomeipFieldDeployment, UserDefinedFieldDeployment			
Aggregated by	ServiceInterfaceDeployment.fieldDeployment			
Attribute	Type	Mult.	Kind	Note
field	Field	0..1	ref	Reference to a Field that is deployed to a middleware transport layer. Stereotypes: atpUriDef

Table 11.10: ServiceFieldDeployment

[constr_10251]{DRAFT} Multiplicity of the reference in the role `ServiceFieldDeployment.field` [For each `ServiceFieldDeployment`, the reference in the role `field` shall exist **at the time when the creation of the manifest is finished.**]()

11.2.1 SOME/IP Service Interface Deployment

This chapter describes the SOME/IP deployment of a `ServiceInterface`.

[TPS_MANI_03040]{DRAFT} SOME/IP ServiceInterface binding [The `SomeipServiceInterfaceDeployment` meta-class provides the ability to bind a `ServiceInterface` to SOME/IP and to assign a SOME/IP Service identifier to the `ServiceInterface` with the `serviceInterfaceId` attribute.](*RS_MANI_00024*)

The idea behind the `SomeipServiceInterfaceDeployment` is the definition of a common configuration set that is shared between the server that provides the `ServiceInterface` and all clients that are consuming the `ServiceInterface`. So it contains all relevant SOME/IP settings used for identification of the `ServiceInterface` and its content in messages on the network.

[constr_3410]{DRAFT} Value range of `SomeipServiceInterfaceDeployment.serviceInterfaceId` [The value of `serviceInterfaceId` shall be in the range of 0..65535.]()

Please note that the SOME/IP MessageId that is 32 Bit long contains a 16 Bit `serviceInterfaceId`, a single bit that defines whether the message transports a method or an event and a 15 Bit `eventId` or `methodId`.

Please also consider [PRS_SOMEIPSD_00515] in [30] that defines special and reserved `serviceInterfaceIds` for SOME/IP and SOME/IP-SD.

[TPS_MANI_03041]{DRAFT} Definition of SOME/IP EventGroups [The `SomeipServiceInterfaceDeployment.eventGroup` allows to define SOME/IP

EventGroups that are included in the SOME/IP Service and provide a logical grouping of events and notification events used for publish/subscribe handling. (RS_MANI_00024)

[constr_3304]{DRAFT} Value of attribute `SomeipEventGroup.eventGroupId` shall be unique [The value of attribute `eventGroupId` shall be unique in the context of the enclosing `SomeipServiceInterfaceDeployment`.]()

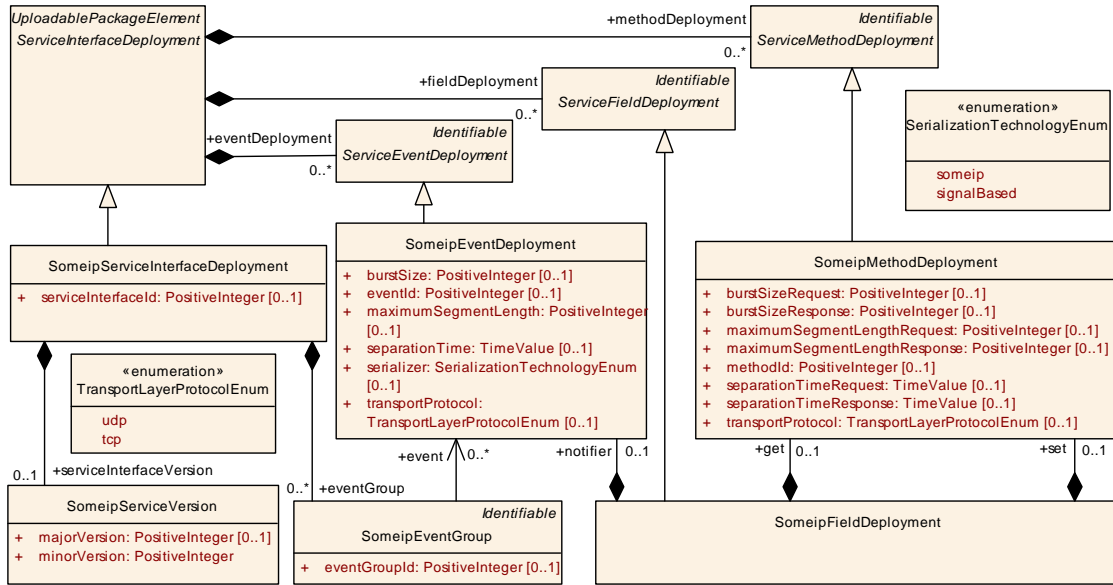


Figure 11.4: SOME/IP deployment of ServiceInterface

[TPS_MANI_03042]{DRAFT} Definition of SOME/IP Service Version [The `SomeipServiceInterfaceDeployment.serviceInterfaceVersion` allows to define a major and a minor version for the SOME/IP Service.] (RS_MANI_00024)

[constr_3557]{DRAFT} Mandatory `majorVersion` at `SomeipServiceInterfaceDeployment.serviceInterfaceVersion` [If the `SomeipServiceVersion` is aggregated at the `SomeipServiceInterfaceDeployment` in the role `serviceInterfaceVersion` then the attribute `SomeipServiceVersion.majorVersion` shall be defined.]()

Class	SomeipServiceInterfaceDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	SOME/IP configuration settings for a ServiceInterface. Tags: atp.recommendedPackage=ServiceInterfaceDeployments			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, ServiceInterfaceDeployment, UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
eventGroup	SomeipEventGroup	*	aggr	SOME/IP EventGroups that are defined within the SOME/IP ServiceClass.





Class	SomeipServiceInterfaceDeployment			
serviceInterfaceId	PositiveInteger	0..1	attr	Unique Identifier that identifies the ServiceInterface in SOME/IP. This Identifier is sent as Service ID in SOME/IP Service Discovery messages.
serviceInterfaceVersion	SomeipServiceVersion	0..1	aggr	The SOME/IP major and minor Version of the Service.

Table 11.11: SomeipServiceInterfaceDeployment

[constr_10212]{DRAFT} Multiplicity of attribute [SomeipServiceInterfaceDeployment.serviceInterfaceId](#) [For each [SomeipServiceInterfaceDeployment](#), the attribute [serviceInterfaceId](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10213]{DRAFT} Multiplicity of attribute [SomeipServiceInterfaceDeployment.serviceInterfaceVersion](#) [For each [SomeipServiceInterfaceDeployment](#), the attribute [serviceInterfaceVersion](#) shall exist **at the time when the creation of the manifest is finished.**]()

Class	SomeipEventGroup			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	Grouping of events and notification events inside a ServiceInterface in order to allow subscriptions.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	SomeipServiceInterfaceDeployment.eventGroup			
Attribute	Type	Mult.	Kind	Note
event	SomeipEventDeployment	*	ref	Reference to an event that is part of the EventGroup.
eventGroupId	PositiveInteger	0..1	attr	Unique Identifier that identifies the EventGroup in SOME/IP. This Identifier is sent as Eventgroup ID in SOME/IP Service Discovery messages.

Table 11.12: SomeipEventGroup

[constr_10214]{DRAFT} Multiplicity of attribute [SomeipEventGroup.eventGroupId](#) [For each [SomeipEventGroup](#), the attribute [eventGroupId](#) shall exist **at the time when the creation of the manifest is finished.**]()

[TPS_MANI_03043]{DRAFT} SOME/IP [VariableDataPrototype](#) binding [The [SomeipEventDeployment](#) meta-class provides the ability to bind a [VariableDataPrototype](#) to SOME/IP and to assign a SOME/IP Event identifier to the [event](#) with the [eventId](#) attribute.]([RS_MANI_00024](#))

[constr_3305]{DRAFT} Value of attribute [SomeipEventDeployment.eventId](#) shall be unique [The value of [eventId](#) shall be unique in the context of the enclosing [SomeipServiceInterfaceDeployment](#), unless [SomeipEventDeployment.serializer](#) is set to [SerializationTechnologyEnum.signalBased](#).]()

For [service-signal-translation](#) according to [\[TPS_MANI_03667\]](#) special semantics applies as defined in [\[TPS_MANI_03666\]](#).

[constr_3408]{DRAFT} Value range of `SomeipEventDeployment.eventId` [The value of `eventId` shall be in the range of 0..32767.]()

Please note that [PRS_SOMEIPSD_00517] in [30] defines special and reserved EVENT-IDs for SOME/IP and SOME/IP-SD that result in the `eventId` values of 0 and 32767.

[TPS_MANI_03050]{DRAFT} Usage of `SomeipEventDeployment.transportProtocol` [The value of `SomeipEventDeployment.transportProtocol` defines over which Transport Layer Protocol the `SomeipEventDeployment.event` is provided.](*RS_MANI_00024*)

[constr_5156]{DRAFT} `SomeipEventDeployment.transportProtocol` setting to `udp` and the impact on `ProvidedSomeipServiceInstances` [If `SomeipEventDeployment.transportProtocol` is set to `udp` then each `ProvidedSomeipServiceInstance` that refers the `SomeipServiceInterfaceDeployment` in the role `serviceInterfaceDeployment` shall only be mapped to a `MachineDesign` with a `SomeipServiceInstanceToMachineMapping` with a configured `udpPort`.]()

[constr_3308]{DRAFT} `SomeipEventDeployment.transportProtocol` setting to `tcp` and the impact on `ProvidedSomeipServiceInstances` [If `SomeipEventDeployment.transportProtocol` is set to `tcp` then each `ProvidedSomeipServiceInstance` that refers the `SomeipServiceInterfaceDeployment` in the role `serviceInterfaceDeployment` shall only be mapped to a `MachineDesign` with a `SomeipServiceInstanceToMachineMapping` with a configured `tcpPort`.]()

[TPS_MANI_03067]{DRAFT} SOME/IP segmentation of `udp SomeipEventDeployments` [If the `maximumSegmentLength` is set to a value and the data length is larger than `maximumSegmentLength` then SOME/IP shall segment the `SomeipEventDeployment` into several packets and transmit them over the network.

The sender shall wait the `separationTime` between the transmissions of segments. On the reception side, SOME/IP re-assembles the received SOME/IP segments to the original `SomeipEventDeployment`.](*RS_MANI_00024*)

[constr_3351]{DRAFT} SOME/IP segmentation allowed for `udp SomeipEventDeployments` [Attribute `SomeipEventDeployment.maximumSegmentLength` shall only be used if the value of attribute `SomeipEventDeployment.transportProtocol` is set to `udp`.]()

As the `SomeipServiceInterfaceDeployment` is also used for the deployment of signal-based `Pdus` on `Ethernet` the attribute `SomeipEventDeployment.serializer` defines whether the `someip` or the `signalBased` serialization shall be used for a specific `event`.

[TPS_MANI_03615]{DRAFT} `SomeipEventDeployment.serializer` equals `someip` [If the attribute `SomeipEventDeployment.serializer` is not defined or

is set to the value `someip` then the `event` shall be serialized/de-serialized using the SOME/IP serializer.】(*RS_MANI_00063*)

[TPS_MANI_03591]{DRAFT} `SomeipEventDeployment.serializer` equals `signalBased` [If the attribute `SomeipEventDeployment.serializer` is set to the value `signalBased` then the `event` shall be serialized/de-serialized using the signal-based approach.】(*RS_MANI_00063*)

This aspect is described in chapter 13.

Class	SomeipEventDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	SOME/IP configuration settings for an Event.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable, ServiceEventDeployment			
Aggregated by	ServiceInterfaceDeployment.eventDeployment, SomeipFieldDeployment.notifier			
Attribute	Type	Mult.	Kind	Note
burstSize	PositiveInteger	0..1	attr	Specifies the number of segments that shall be transmitted in a burst ignoring separationTime. SeparationTime will then only be applied between bursts. If not configured, SeparationTime will be applied between all frames.
eventId	PositiveInteger	0..1	attr	Unique Identifier within a ServiceInterface that identifies the Event in SOME/IP. This Identifier is sent as part of the Message ID in SOME/IP messages.
maximumSegmentLength	PositiveInteger	0..1	attr	This attribute describes the length in bytes of the SOME/IP segment. This includes 8 bytes for the Request ID, Protocol Version, Interface Version, Message Type and Return Code and 4 additional SOME/IP TP bytes. If this attribute is set to a value and the data length is larger than maximumSegmentLength then the corresponding SOME/IP message will be segmented into smaller parts that are transmitted over the network.
separationTime	TimeValue	0..1	attr	Sets the duration of the minimum time in seconds SOME/IP shall wait between the transmissions of segments.
serializer	SerializationTechnologyEnum	0..1	attr	Defines which serialization technology shall be used.
transportProtocol	TransportLayerProtocolEnum	0..1	attr	This attribute defines over which Transport Layer Protocol this event is intended to be sent.

Table 11.13: SomeipEventDeployment

[constr_10215]{DRAFT} Multiplicity of attribute `SomeipEventDeployment.eventId` [For each `SomeipEventDeployment`, the attribute `eventId` shall exist **at the time when the creation of the manifest is finished.**】()

[constr_10216]{DRAFT} Multiplicity of attribute `SomeipEventDeployment.transportProtocol` [For each `SomeipEventDeployment`, the attribute `transportProtocol` shall exist **at the time when the creation of the manifest is finished.**】()

Enumeration	SerializationTechnologyEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment
Note	This enumeration allows to choose a Serialization Technology.
Aggregated by	SomeipEventDeployment.serializer
Literal	Description
signalBased	Signal-Based serializer. Tags: atp.EnumerationLiteralIndex=1
someip	SOME/IP Serializer Tags: atp.EnumerationLiteralIndex=0

Table 11.14: SerializationTechnologyEnum

[TPS_MANI_03044]{DRAFT} SOME/IP ClientServerOperation binding
 [The [SomeipMethodDeployment](#) meta-class provides the ability to bind a [ClientServerOperation](#) to SOME/IP and to assign a SOME/IP Method identifier to the `method` with the `methodId` attribute.] ([RS_MANI_00024](#))

[constr_3306]{DRAFT} Value of attribute `methodId` shall be unique per [SomeipServiceInterfaceDeployment](#)
 [The value of `methodId` shall be unique in the context of the enclosing [SomeipServiceInterfaceDeployment](#).] ()

[constr_3409]{DRAFT} Value range of [SomeipMethodDeployment.methodId](#)
 [The value of `methodId` shall be in the range of 0..32767.] ()

Please note that [PRS_SOMEIPSD_00517] in [30] defines special and reserved METHOD-IDs for SOME/IP and SOME/IP-SD that result in the `methodId` values of 0 and 32767.

[TPS_MANI_03051]{DRAFT} Usage of [SomeipMethodDeployment.transportProtocol](#)
 [The value of [SomeipMethodDeployment.transportProtocol](#) defines over which Transport Layer Protocol this method is provided.] ([RS_MANI_00024](#))

[constr_3309]{DRAFT} [SomeipMethodDeployment.transportProtocol](#) setting to `udp` and the impact on [ProvidedSomeipServiceInstances](#)
 [If [SomeipMethodDeployment.transportProtocol](#) is set to `udp` then each [ProvidedSomeipServiceInstance](#) that refers the [SomeipServiceInterfaceDeployment](#) in the role `serviceInterfaceDeployment` shall only be mapped to a [MachineDesign](#) with a [SomeipServiceInstanceToMachineMapping](#) with a configured `udpPort`.] ()

[constr_3310]{DRAFT} [SomeipMethodDeployment.transportProtocol](#) setting to `tcp` and the impact on [ProvidedSomeipServiceInstances](#)
 [If [SomeipMethodDeployment.transportProtocol](#) is set to `tcp` then each [ProvidedSomeipServiceInstance](#) that refers the [SomeipServiceInterfaceDeployment](#) in the role `serviceInterfaceDeployment` shall only be mapped to a [MachineDesign](#) with a [SomeipServiceInstanceToMachineMapping](#) with a configured `tcpPort`.] ()

[TPS_MANI_03068]{DRAFT} SOME/IP segmentation of [SomeipMethodDeployment](#) Calls
 [If the `maximumSegmentLengthRequest` is set to a value and the data

length is larger than `maximumSegmentLengthRequest` then SOME/IP shall segment the `SomeipMethodDeployment` Call-Message into several packets and transmit them over the network.

The sender shall wait the `separationTimeRequest` between the transmissions of segments. On the reception side, SOME/IP re-assembles the received SOME/IP segments to the original `SomeipMethodDeployment` Call-Message. *(RS_MANI_00024)*

[TPS_MANI_03069]{DRAFT} SOME/IP segmentation of `SomeipMethodDeployment` Responses [If the `maximumSegmentLengthResponse` is set to a value and the data length is larger than `maximumSegmentLengthResponse` then SOME/IP shall segment the `SomeipMethodDeployment` Response-Message into several packets and transmit them over the network.

The sender shall wait the `separationTimeResponse` between the transmissions of segments. On the reception side, SOME/IP re-assembles the received SOME/IP segments to the original `SomeipMethodDeployment` Response-Message. *(RS_MANI_00024)*

[constr_3352]{DRAFT} SOME/IP segmentation allowed for udp `SomeipMethodDeployments` [`SomeipMethodDeployment.maximumSegmentLengthRequest` and `SomeipMethodDeployment.maximumSegmentLengthResponse` shall only be used if `SomeipMethodDeployment.transportProtocol` is set to `udp`.] *()*

Class	SomeipMethodDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	SOME/IP configuration settings for a Method.			
Base	<i>ARObject, Identifiable, MultilanguageReferrable, Referrable, ServiceMethodDeployment</i>			
Aggregated by	<i>ServiceInterfaceDeployment.methodDeployment, SomeipFieldDeployment.get, SomeipFieldDeployment.set</i>			
Attribute	Type	Mult.	Kind	Note
burstSize Request	PositiveInteger	0..1	attr	Specifies the number of segments for the Method Call that shall be transmitted in a burst ignoring separation Time. SeparationTime will then only be applied between bursts. If not configured, SeparationTime will be applied between all frames.
burstSize Response	PositiveInteger	0..1	attr	Specifies the number of segments for the Method Response that shall be transmitted in a burst ignoring separationTime. SeparationTime will then only be applied between bursts. If not configured, SeparationTime will be applied between all frames.
maximum SegmentLength Request	PositiveInteger	0..1	attr	This attribute describes the length in bytes of one SOME/IP segment into which the Method Call Message will be divided. This length field includes 8 bytes for the Request ID, Protocol Version, Interface Version, Message Type and Return Code and 4 additional SOME/IP TP bytes. If this attribute is set to a value and the data length is larger than <code>maximumSegmentLengthRequest</code> then the corresponding SOME/IP message will be segmented into smaller parts that are transmitted over the network.





Class	SomeipMethodDeployment			
maximumSegmentLengthResponse	PositiveInteger	0..1	attr	This attribute describes the length in bytes of one SOME/IP segment into which the Method Return Message will be divided. This length field includes 8 bytes for the Request ID, Protocol Version, Interface Version, Message Type and Return Code and 4 additional SOME/IP TP bytes. If this attribute is set to a value and the data length is larger than maximumSegmentLengthResponse then the corresponding SOME/IP message will be segmented into smaller parts that are transmitted over the network.
methodId	PositiveInteger	0..1	attr	Unique Identifier within a ServiceInterface that identifies the Method in SOME/IP. This Identifier is sent as part of the Message ID in SOME/IP messages.
separationTimeRequest	TimeValue	0..1	attr	Sets the duration of the minimum time in seconds SOME/IP shall wait between the transmissions of segments into which the Method Call Message will be divided.
separationTimeResponse	TimeValue	0..1	attr	Sets the duration of the minimum time in seconds SOME/IP shall wait between the transmissions of segments into which the Method Return Message will be divided.
transportProtocol	TransportLayerProtocolEnum	0..1	attr	This attribute defines over which Transport Layer Protocol this method is intended to be sent.

Table 11.15: SomeipMethodDeployment

Class	SomeipServiceInstanceToMachineMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceMapping			
Note	This meta-class allows to map SomeipServiceInstances to a CommunicationConnector of a Machine. In this step the network configuration (IP Address, Transport Protocol, Port Number) for the ServiceInstance is defined. Tags: atp.recommendedPackage=ServiceInstanceToMachineMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , ServiceInstanceToMachineMapping , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
remoteMulticastConfig	SomeipRemoteMulticastConfig	*	ref	This reference defines a remote multicast Address (IP Address, Port) that is used in a static configuration to setup the communication path between a service provider and service consumer. This reference shall ONLY be used if the remote address is determined from the configuration and not at runtime from the Service Discovery. Tags: atp.Status=candidate
remoteUnicastConfig	SomeipRemoteUnicastConfig	*	ref	In case that a static service connection is used and a single peer exists this element is used to statically configure the remote peer's address. Tags: atp.Status=candidate
tcpPort	ApApplicationEndpoint	0..1	ref	local TcpPort that will be used by the ServiceInstance for the communication.
udpCollectionBufferSizeThreshold	PositiveInteger	0..1	attr	Specifies the amount of data in bytes that shall be buffered for data transmission over the udp connection specified by this SomeipServiceInstanceToMachine Mapping in case data collection is enabled.
udpPort	ApApplicationEndpoint	0..1	ref	local UdpPort that will be used by the ServiceInstance for the communication.

Table 11.16: SomeipServiceInstanceToMachineMapping

[TPS_MANI_03057]{DRAFT} SOME/IP Field binding [The `SomeipFieldDeployment` meta-class provides the ability to bind a `Field` to SOME/IP.

If the `Field` contains a notifier (`hasNotifier = true`), it is possible to assign a SOME/IP notifier identifier to the `field` by setting the value of attribute `SomeipFieldDeployment.notifier.eventId`.

If the `Field` contains a getter method (`hasGetter = true`), it is possible to assign a SOME/IP method identifier to the `field` by setting the value of attribute `SomeipFieldDeployment.get.methodId`.

If the `Field` contains a setter method (`hasSetter = true`), it is possible to assign a SOME/IP method identifier to the `field` by setting the value of attribute `SomeipFieldDeployment.set.methodId`] (*RS_MANI_00024*)

Please note that each `methodId` and each `eventId` of a `SomeipFieldDeployment` shall be unique in the context of a `ServiceInterface` as defined in [constr_3306] and [constr_3305].

Class	SomeipFieldDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	SOME/IP configuration settings for a Field.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i> , <i>ServiceFieldDeployment</i>			
Aggregated by	<i>ServiceInterfaceDeployment.fieldDeployment</i>			
Attribute	Type	Mult.	Kind	Note
get	SomeipMethodDeployment	0..1	aggr	This aggregation represents the setting of the get method.
notifier	SomeipEventDeployment	0..1	aggr	This aggregation represents the settings of the notifier.
set	SomeipMethodDeployment	0..1	aggr	This aggregation represents the settings of the set method

Table 11.17: SomeipFieldDeployment

[constr_3362]{DRAFT} SomeipEventDeployments aggregated by a SomeipFieldDeployment [A `SomeipEventDeployment` that is aggregated by a `SomeipFieldDeployment` in the role `notifier` shall not reference a `VariableDataPrototype` in the role `event`.]()

[constr_3363]{DRAFT} SomeipMethodDeployments aggregated by a SomeipFieldDeployment [A `SomeipMethodDeployment` that is aggregated by a `SomeipFieldDeployment` in the role `get` or `set` shall not reference a `ClientServerOperation` in the role `method`.]()

[TPS_MANI_03227]{DRAFT} Usage of ephemeral ports [Ephemeral ports are short-lived transport protocol ports that are allocated automatically by the communication middleware. In case the port number in the `ApApplicationEndpoint` (`TpPort.portNumber`) is configured to 0, an *ephemeral* port shall be used. If the port number is configured to a value different from 0, exactly that value shall be used.] (*RS_MANI_00024*)

11.2.2 DDS Service Interface Deployment

This chapter describes the DDS [31] deployment of a `ServiceInterface`.

[TPS_MANI_03525]{DRAFT} **DDS ServiceInterface binding** [The `DdsServiceInterfaceDeployment` meta-class provides the ability to bind a `ServiceInterface` to DDS and to assign a DDS Service identifier to the `ServiceInterface` with the `serviceInterfaceId` attribute.] (RS_MANI_00038)

[constr_3690]{DRAFT} **DdsServiceInterfaceDeployment.serviceInterfaceId value shall not conflict with topic-based service discovery** [The value "discovery" for `DdsServiceInterfaceDeployment.serviceInterfaceId` is reserved and shall not be used for modeled `DdsServiceInterfaceDeployments`.] ()

[constr_3690] is defined according to [SWS_CM_90508] of [9].

[TPS_MANI_03556]{DRAFT} **DDS-RPC Service Binding** [The `DdsServiceInterfaceDeployment` meta-class provides the ability to configure the name of the DDS Request and Reply Topics associated with a DDS-RPC Service with the `methodRequestTopicName` and `methodReplyTopicName` attributes, respectively. DDS-RPC Services are the mechanisms specified in the OMG RPC over DDS specification (DDS-RPC [32]) to handle method calls with DDS.

The `methodRequestTopicName` and `methodReplyTopicName` attributes are optional, if unspecified they shall be configured as specified in the DDS-RPC specification.] (RS_MANI_00038)

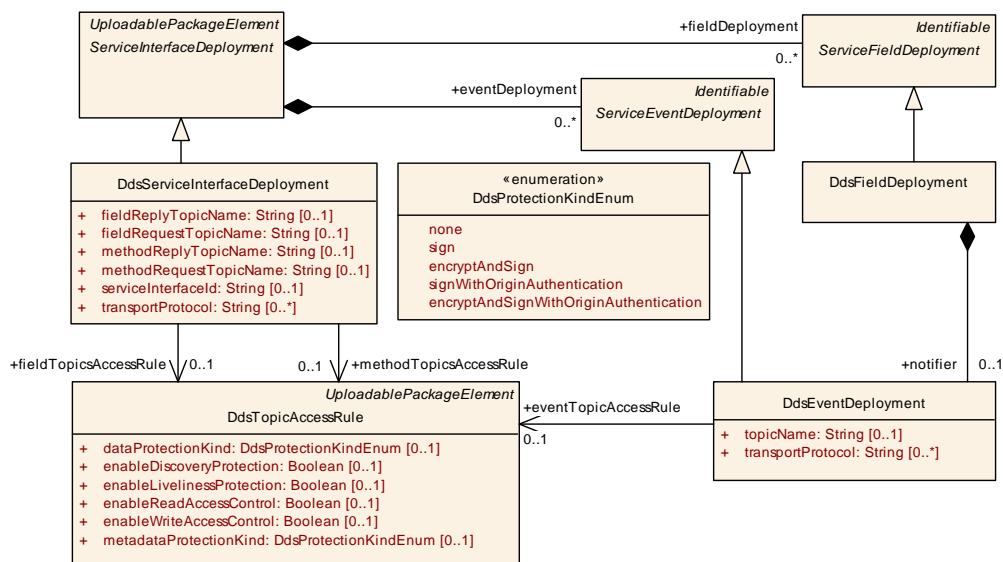


Figure 11.5: DDS deployment of ServiceInterface

[TPS_MANI_03526]{DRAFT} **DDS VariableDataPrototype binding** [The `DdsEventDeployment` meta-class provides the ability to bind a `VariableDataPrototype` to DDS and to assign a DDS Topic to the `event` with the `topicName` attribute.

Moreover, the meta-class provides the ability to configure the `transportProtocols` over which the `VariableDataPrototype` may be accessed. [\(RS_MANI_00038\)](#)

Class	DdsServiceInterfaceDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	DDS configuration settings for a ServiceInterface. Tags: atp.recommendedPackage=ServiceInterfaceDeployments			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , ServiceInterfaceDeployment , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
fieldReplyTopicName	String	0..1	attr	Name of the DDS Reply Topic associated with the Field.
fieldRequestTopicName	String	0..1	attr	Name of the DDS Request Topic associated with the Field.
fieldTopicsAccessRule	DdsTopicAccessRule	0..1	ref	DDS Security access rule applicable to the DDS Topics used for service interface field access methods (Get, Set).
methodReplyTopicName	String	0..1	attr	Name of the DDS Reply Topic associated with the Method.
methodRequestTopicName	String	0..1	attr	Name of the DDS Request Topic associated with the Method.
methodTopicsAccessRule	DdsTopicAccessRule	0..1	ref	DDS Security access rule applicable to the DDS Topics used for service interface methods.
serviceInterfaceId	String	0..1	attr	Unique Identifier that identifies the ServiceInterface in DDS. This Identifier is encoded in the USER_DATA QoS of the DomainParticipant associated with the Service Instance and its value is propagated by DDS Discovery messages.
transportProtocol	String	*	attr	This attribute defines over which Transport Layer Protocol(s) this Method is intended to be sent.

Table 11.18: DdsServiceInterfaceDeployment

[constr_10217]{DRAFT} Multiplicity of the attribute `DdsServiceInterfaceDeployment.serviceInterfaceId` [For each `DdsServiceInterfaceDeployment`, the attribute `serviceInterfaceId` shall exist **at the time when the creation of the manifest is finished.** [\(\)](#)

Class	DdsEventDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	DDS configuration settings for an Event.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable , ServiceEventDeployment			
Aggregated by	DdsFieldDeployment.notifier , ServiceInterfaceDeployment.eventDeployment			
Attribute	Type	Mult.	Kind	Note
eventTopicAccessRule	DdsTopicAccessRule	0..1	ref	DDS Security access rule applicable to the DDS Topics used for the service interface event.
topicName	String	0..1	attr	Name of the DDS Topic associated with the Event.
transportProtocol	String	*	attr	This attribute defines over which Transport Layer Protocol(s) this event is intended to be sent.

Table 11.19: DdsEventDeployment

[TPS_MANI_03557]{DRAFT} **DDS ClientServerOperation Binding** [There exists no concrete subclass of `ServiceMethodDeployment` to bind a `ClientServerOperation` to DDS. This binding is done with the `DdsServiceInterfaceDeployment` (see [TPS_MANI_03556]).] (*RS_MANI_00038*)

[TPS_MANI_03558]{DRAFT} **DDS Field Binding** [The `DdsFieldDeployment` meta-class provides the ability to bind a `Field` to DDS.

To bind the `Field`'s notification event the `notifier` is used to define a DDS Topic. To assign the get/set `Field` methods the `fieldRequestTopicName` and `fieldReplyTopicName` are used to define a DDS Topic.

The `fieldRequestTopicName` and `fieldReplyTopicName` attributes are optional, if unspecified they shall be configured as specified in the DDS-RPC specification.] (*RS_MANI_00038*)

[TPS_MANI_03622]{DRAFT} **DDS Transport Protocols are up to the stack implementer** [Underlying transports below the RTPS protocol are not part of the DDS OMG standard (QoS APIs [31]) or (XML schema [33]). It is up to each DDS implementation vendor to decide which transports are supported and how those are expressed in APIs and XML.] (*RS_MANI_00038*)

Class	<code>DdsFieldDeployment</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	DDS configuration settings for a Field.			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code> , <code>ServiceFieldDeployment</code>			
Aggregated by	<code>ServiceInterfaceDeployment.fieldDeployment</code>			
Attribute	Type	Mult.	Kind	Note
notifier	<code>DdsEventDeployment</code>	0..1	aggr	This aggregation represents the settings of the notifier.

Table 11.20: DdsFieldDeployment

[constr_3563]{DRAFT} **Mandatory topic name values** [The attributes `methodRequestTopicName`, `methodReplyTopicName`, `fieldRequestTopicName`, `fieldReplyTopicName`, `topicName` shall specify string values, each of them unique within the service interface.] ()

[TPS_MANI_03662]{DRAFT} **Configuration of Topic access rules** [The `DdsTopicAccessRule` meta-class defines rules generally applicable to DDS Topics defined by Service Interface deployments, determining the protection mechanisms applicable for discovery, liveliness, access control, metadata and user data.

The `enableReadAccessControl` and `enableWriteAccessControl` attributes are not meant to interfere with or duplicate `ComGrant`-based access rules. These are just an additional mechanisms for integrators to fully disable access control for an specific topic at Service Interface Deployment level, in case that is desirable for an specific deployment scenario.] (*RS_MANI_00038*)

Class	DdsTopicAccessRule			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	DDS Topic access rule definition. Tags: atp.recommendedPackage=DdsTopicAccessRules			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataProtectionKind	DdsProtectionKindEnum	0..1	attr	Defines the data protection policy applicable to metadata related to the DDS Topic(s).
enableDiscoveryProtection	Boolean	0..1	attr	Defines whether discovery protection mechanisms should apply to the DDS Topic(s).
enableLivelinessProtection	Boolean	0..1	attr	Defines whether liveliness protection mechanisms should apply to the DDS Topic(s).
enableReadAccessControl	Boolean	0..1	attr	Defines whether read access control mechanisms should apply to the DDS Topic(s).
enableWriteAccessControl	Boolean	0..1	attr	Defines whether write access control mechanisms should apply to the DDS Topic(s).
metadataProtectionKind	DdsProtectionKindEnum	0..1	attr	Defines the data protection policy applicable to metadata related to the DDS Topic(s).

Table 11.21: DdsTopicAccessRule

[constr_3680]{DRAFT} Existence of attributes for [DdsTopicAccessRule](#) [The following attributes of [DdsTopicAccessRule](#) shall exist **at the time when the creation of the manifest is finished**

- [enableDiscoveryProtection](#)
- [enableLivelinessProtection](#)
- [enableReadAccessControl](#)
- [enableWriteAccessControl](#)
- [metadataProtectionKind](#)
- [dataProtectionKind](#)

]()

[constr_3681]{DRAFT} Supported values of [DdsTopicAccessRule.dataProtectionKind](#) [Only values [none](#), [sign](#), or [encryptAndSign](#) from [DdsProtectionKindEnum](#) shall be used when setting [DdsTopicAccessRule.dataProtectionKind](#) **at the time when the creation of the manifest is finished.**]()

[constr_3683]{DRAFT} Attributes referencing [DdsTopicAccessRule](#) [[DdsServiceInterfaceDeployment.fieldTopicsAccessRule](#), [DdsServiceInterfaceDeployment.methodTopicsAccessRule](#), and [DdsEventDeployment.eventTopicAccessRule](#) shall be set if the Service Interface Deployment is to

be used by Service Instances relying in DDS Security (meaning `DdsServiceInstanceToMachineMapping.secureComPropsForDds` is defined) **at the time when the creation of the manifest is finished.**](/)

11.2.3 User Defined Service Interface Deployment

This chapter describes a user defined deployment of a `ServiceInterface` to a middleware technology that is not standardized by AUTOSAR. Such `UserDefinedServiceInterfaceDeployment` can for example also be used to describe a machine local IPC communication.

[TPS_MANI_03045]{DRAFT} UserDefined `ServiceInterface` binding [The `UserDefinedServiceInterfaceDeployment` meta-class provides the ability to bind a `ServiceInterface` that is referenced in the role `serviceInterface` to a middleware technology that is not standardized by AUTOSAR.]([RS_MANI_00014](#))

Please note that `UserDefinedServiceInterfaceDeployment` is `Identifiable` and therefore it is able to describe special data (sdg) which is not represented by the standard model.

Class	<code>UserDefinedServiceInterfaceDeployment</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	UserDefined configuration settings for a ServiceInterface. Tags: atp.recommendedPackage=ServiceInterfaceDeployments			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , ServiceInterfaceDeployment , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 11.22: UserDefinedServiceInterfaceDeployment

[TPS_MANI_01165]{DRAFT} Standardized value of `UserDefinedServiceInterfaceDeployment.category` [The AUTOSAR Standard reserves the following value for attribute `UserDefinedServiceInterfaceDeployment.category`:

- `SERVICE_INTERFACE_DEPLOYMENT_IPC`

It is possible to use a custom, non-standardized value for the attribute `UserDefinedServiceInterfaceDeployment.category` but this option comes with the obligation to use a value that is guaranteed to not clash with possible future extensions of the collection of standardized values.]([RS_MANI_00014](#))

IPC communication may or may not require configuration settings that nevertheless aren't standardized by AUTOSAR. The best support that the AUTOSAR standard can deliver is the provision of meta-classes that can be taken as the basis to define configuration settings by means of the definition of `Sdg`.

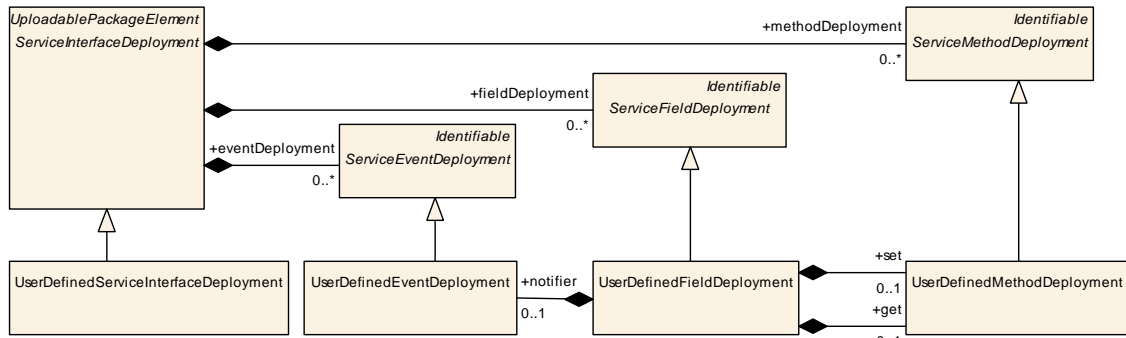


Figure 11.6: User defined deployment of ServiceInterface

[constr_1570]{DRAFT} **Restriction for UserDefinedServiceInterfaceDeployment of category SERVICE_INTERFACE_DEPLOYMENT_IPC** [An AdaptivePlatformServiceInstance that references a UserDefinedServiceInterfaceDeployment of category SERVICE_INTERFACE_DEPLOYMENT_IPC shall **only** be referenced by a UserDefinedServiceInstanceToMachineMapping in the role serviceInstance that in turn references a UserDefinedCommunicationConnector.]()

Class	UserDefinedServiceInstanceToMachineMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceMapping			
Note	This meta-class allows to map UserDefinedServiceInstances to a CommunicationConnector of a Machine. Tags: atp.recommendedPackage=ServiceInstanceToMachineMappings			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, ServiceInstanceToMachineMapping, UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 11.23: UserDefinedServiceInstanceToMachineMapping

Rationale for [constr_1570]: for a local IPC binding it is sometimes necessary to define properties of the IPC system. And for this purpose the UserDefinedCommunicationConnector mapped to an AdaptivePlatformServiceInstance can be used to define global properties (e.g. for service discovery) of a given "IPC-Domain".

In other words, each defined UserDefinedCommunicationConnector may represent such an "IPC-Domain" that requires a dedicated configuration on the basis of the definition of Sdgs.

Class	UserDefinedCommunicationConnector			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::CddSupport			
Note	This element allows the modeling of arbitrary Communication Connectors.			
Base	ARObject, CommunicationConnector, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	EcuInstance.connector, MachineDesign.communicationConnector			





Class	UserDefinedCommunicationConnector			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 11.24: UserDefinedCommunicationConnector

[TPS_MANI_03046]{DRAFT} **User defined [VariableDataPrototype](#) binding**
 [The [UserDefinedEventDeployment](#) meta-class provides the ability to bind a [VariableDataPrototype](#) that is referenced in the role *event* to a middleware technology that is not standardized by AUTOSAR.] ([RS_MANI_00014](#))

Please note that [UserDefinedEventDeployment](#) is [Identifiable](#) and therefore it is able to describe special data (sdg) which is not represented by the standard model.

Class	UserDefinedEventDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	UserDefined configuration settings for an Event.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable , ServiceEventDeployment			
Aggregated by	ServiceInterfaceDeployment.eventDeployment , UserDefinedFieldDeployment.notifier			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 11.25: UserDefinedEventDeployment

[TPS_MANI_03047]{DRAFT} **User defined [ClientServerOperation](#) binding**
 [The [UserDefinedMethodDeployment](#) meta-class provides the ability to bind a [ClientServerOperation](#) that is referenced in the role *method* to a middleware technology that is not standardized by AUTOSAR.] ([RS_MANI_00014](#))

Please note that [UserDefinedMethodDeployment](#) is [Identifiable](#) and therefore it is able to describe special data (sdg) which is not represented by the standard model.

Class	UserDefinedMethodDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	UserDefined configuration settings for a Method.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable , ServiceMethodDeployment			
Aggregated by	ServiceInterfaceDeployment.methodDeployment , UserDefinedFieldDeployment.get , UserDefinedFieldDeployment.set			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 11.26: UserDefinedMethodDeployment

[TPS_MANI_03048]{DRAFT} **User defined [Field](#) binding** [The [UserDefinedFieldDeployment](#) meta-class provides the ability to bind a [Field](#) that is referenced in the role *field* to a middleware technology that is not standardized by AUTOSAR.] ([RS_MANI_00014](#))

Please note that `UserDefinedFieldDeployment` is `Identifiable` and therefore it is able to describe special data (sdg) which is not represented by the standard model.

Class	UserDefinedFieldDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInterfaceDeployment			
Note	UserDefined configuration settings for a Field.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable , ServiceFieldDeployment			
Aggregated by	ServiceInterfaceDeployment.fieldDeployment			
Attribute	Type	Mult.	Kind	Note
get	UserDefinedMethodDeployment	0..1	aggr	This aggregation represents the settings of the get method
notifier	UserDefinedEventDeployment	0..1	aggr	This aggregation represents the settings of the notifier.
set	UserDefinedMethodDeployment	0..1	aggr	This aggregation represents the settings of the set method

Table 11.27: UserDefinedFieldDeployment

[constr_3417]{DRAFT} UserDefinedEventDeployments aggregated by a UserDefinedFieldDeployment [A `UserDefinedEventDeployment` that is aggregated by a `UserDefinedFieldDeployment` in the role `notifier` shall not reference a `VariableDataPrototype` in the role `event`.]()

[constr_3418]{DRAFT} UserDefinedMethodDeployments aggregated by a UserDefinedFieldDeployment [A `UserDefinedMethodDeployment` that is aggregated by a `UserDefinedFieldDeployment` in the role `get` or `set` shall not reference a `ClientServerOperation` in the role `method`.]()

11.3 Service Instance Deployment

An `AdaptivePlatformServiceInstance` makes the functionality of a `ServiceInterface` available on the *AUTOSAR adaptive platform*. Several `AdaptivePlatformServiceInstances` may be set up for the same `ServiceInterface`. They deliver the same functionality, but for different purposes and/or to different users.

The `ProvidedApServiceInstance` represents a provider that offers the functionality of a `ServiceInterface` with particular properties. Clients that are represented by the `RequiredApServiceInstance` observe offers and choose a provider with respect to service properties.

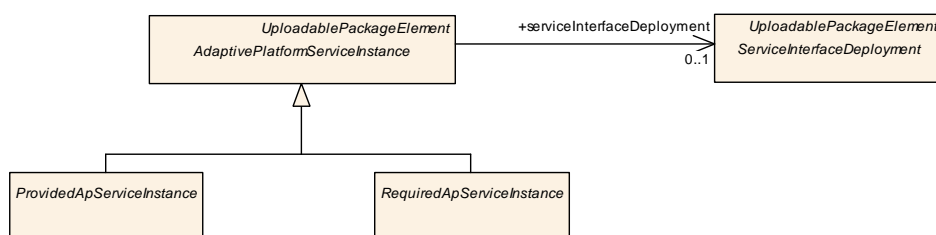


Figure 11.7: Modeling of the AdaptivePlatformServiceInstance

Note that the abstract meta-class `AdaptivePlatformServiceInstance` is derived from `ARElement`. This means that all meta-classes derived from `AdaptivePlatformServiceInstance` can be declared on the M1 level as part of an `ARPackage` and thus can be used in several Manifest descriptions.

Class	AdaptivePlatformServiceInstance (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class represents the ability to describe the existence and configuration of a service instance in an abstract way.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Subclasses	ProvidedApServiceInstance , RequiredApServiceInstance			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
e2eEvent ProtectionProps	End2EndEvent ProtectionProps	*	aggr	This aggregation allows to protect an event or a field notifier that is defined inside of the ServiceInterface that is referenced by the ServiceInstance in the role service interface.
e2eMethod ProtectionProps	End2EndMethod ProtectionProps	*	aggr	This aggregation allows to protect a method or a field getter or a field setter that is defined inside of the ServiceInterface that is referenced by the ServiceInstance in the role service interface
secureCom Config	ServiceInterface ElementSecureCom Config	*	aggr	Configuration settings to secure the communication of ServiceInterface elements.
serviceInterface Deployment	ServiceInterface Deployment	0..1	ref	Reference to a ServiceInterfaceDeployment that identifies the ServiceInterface that is represented by the Service Instance.

Table 11.28: AdaptivePlatformServiceInstance

Class	RequiredApServiceInstance (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class represents the ability to describe the existence and configuration of a required service instance in an abstract way.			
Base	ARElement , ARObject , AdaptivePlatformServiceInstance , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Subclasses	DdsRequiredServiceInstance , RequiredSomeipServiceInstance , RequiredUserDefinedServiceInstance			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 11.29: RequiredApServiceInstance

Class	ProvidedApServiceInstance (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class represents the ability to describe the existence and configuration of a provided service instance in an abstract way.			
Base	ARElement , ARObject , AdaptivePlatformServiceInstance , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Subclasses	DdsProvidedServiceInstance , ProvidedSomeipServiceInstance , ProvidedUserDefinedServiceInstance			





Class	<i>ProvidedApServiceInstance</i> (abstract)			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 11.30: ProvidedApServiceInstance

There are two alternative ways to relate an [AdaptivePlatformServiceInstance](#) with a [MachineDesign](#) as described in [TPS_MANI_03000] and [TPS_MANI_03001]. Figure [Figure 11.8](#) shows both approaches in an example.

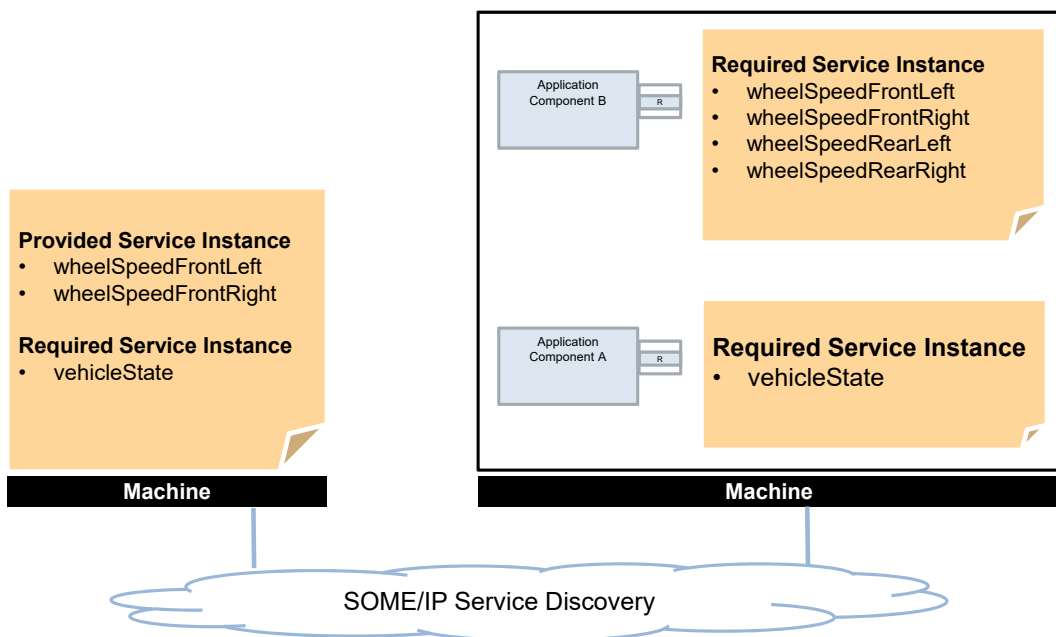


Figure 11.8: Different approaches for ServiceInstanceMapping

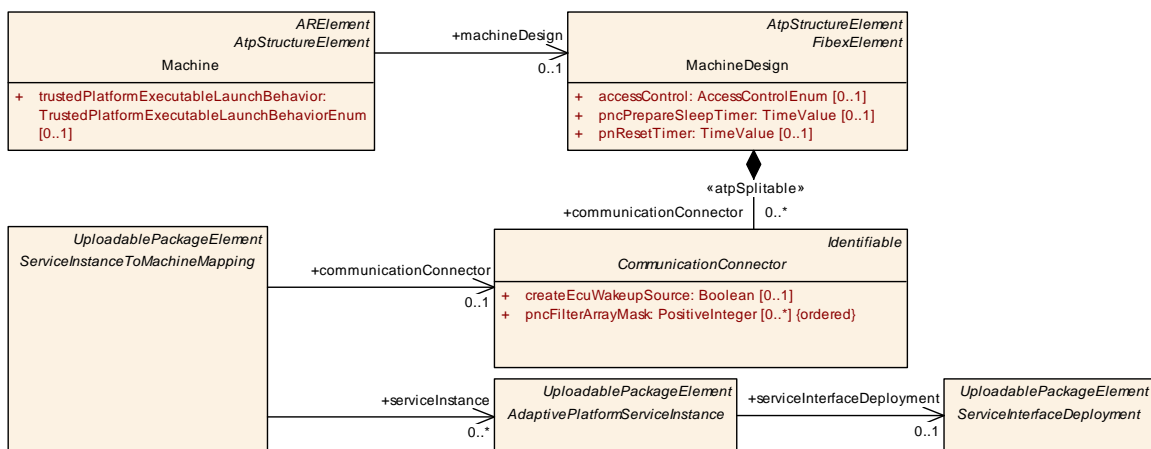


Figure 11.9: ServiceInstanceToMachineMapping

[TPS_MANI_03001]{DRAFT} **Mapping of AdaptivePlatformServiceInstance to a MachineDesign** [ServiceInstanceToMachineMapping is used to assign one or several AdaptivePlatformServiceInstances to (via a CommunicationConnector) a MachineDesign. This allows to define a “black box” machine view without any assumption on the application software but with all necessary information to configure the communication (e.g. SOME/IP).] (RS_MANI_00009)

Class	<i>ServiceInstanceToMachineMapping</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceMapping			
Note	This meta-class represents the ability to map one or several AdaptivePlatformServiceInstances to a CommunicationConnector of a Machine.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Subclasses	DdsServiceInstanceToMachineMapping , SomeipServiceInstanceToMachineMapping , UserDefinedServiceInstanceToMachineMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
communicationConnector	CommunicationConnector	0..1	ref	Reference to the Machine to which the ServiceInstance is mapped.
secOcComPropsForMulticast	SecOcSecureComProps	*	ref	Reference to communication security configuration settings that are valid for the udp multicast endpoint (Port + Multicast IP Address) defined by the ServiceInstanceToMachineMapping.
secureComPropsForTcp	SecureComProps	0..1	ref	Reference to communication security configuration settings that are valid for the tcp unicast endpoint (Tcp Port + Unicast IP Address) defined by the ServiceInstanceToMachineMapping.
secureComPropsForUdp	SecureComProps	0..1	ref	Reference to communication security configuration settings that are valid for the udp unicast endpoint (Udp Port + Unicast IP Address) defined by the ServiceInstanceToMachineMapping.
serviceInstance	AdaptivePlatformServiceInstance	*	ref	Reference to a ServiceInstance that is mapped to the Machine.

Table 11.31: ServiceInstanceToMachineMapping

[constr_5155]{DRAFT} **SomeipServiceInstanceToMachineMapping only supports a single Address Family** [A [SomeipServiceInstanceToMachineMapping](#) shall only support a single Address Family, i.e. either IPv4 or IPv6. If IPv4 is defined for IP unicast communication according to [constr_3288] then the [Someip-ProvidedEventGroups](#) in [ProvidedSomeipServiceInstances](#) that are referenced by the [SomeipServiceInstanceToMachineMapping](#) shall only define an [ipv4MulticastIpAddress](#).

If IPv6 is defined for IP unicast communication according to [constr_3288] then the [SomeipProvidedEventGroups](#) in [ProvidedSomeipServiceInstances](#) that are referenced by the [SomeipServiceInstanceToMachineMapping](#) shall only define an [ipv6MulticastIpAddress](#).]()

[TPS_MANI_03292]{DRAFT} **Semantic of SomeipServiceInstanceToMachineMapping.tcpPort** [The [SomeipServiceInstanceToMachineMapping.tcpPort](#) defines a TCP-Port number that will be used in the following way:

- In case of a `ProvidedSomeipServiceInstance`, the value of attribute `tcpPort` will be transmitted in the SD-Offer message to the client and this port number will be used in the following way:
 - Method communication: over this port the `ProvidedSomeipServiceInstance` will receive the method call messages from the clients and over the same port the `ProvidedSomeipServiceInstance` will send the responses to the service consumers.
 - Event communication: over this port the `ProvidedSomeipServiceInstance` will transmit the event messages to the subscribed client in IP-Unicast case.
- In case of a `RequiredSomeipServiceInstance`, the value of attribute `tcpPort` will be transmitted in the SD-SubscribeEventGroup message to the server and this port number will be used in the following way:
 - Method communication: over this port the `RequiredSomeipServiceInstance` will send the method call messages to the `ProvidedSomeipServiceInstance` and over the same port the `RequiredSomeipServiceInstance` will receive the responses from the service provider.
 - Event communication: over this port the `RequiredSomeipServiceInstance` will receive the event messages in IP-Unicast case.

]([RS_MANI_00009](#))

[TPS_MANI_03293]{DRAFT} **Semantic of `SomeipServiceInstanceToMachineMapping.udpPort`** [The `SomeipServiceInstanceToMachineMapping.udpPort` defines a UDP-Port number that will be used in the following way:

- In case of a `ProvidedSomeipServiceInstance`, the value of attribute `udpPort` will be transmitted in the SD-Offer message to the client and this port number will be used in the following way:
 - Method communication: over this port the `ProvidedSomeipServiceInstance` will receive the method call messages from the clients and over the same port the `ProvidedSomeipServiceInstance` will send the responses to the service consumers.
 - Event communication: over this port the `ProvidedSomeipServiceInstance` will transmit the event messages to the subscribed client in IP-Unicast case.
- In case of a `RequiredSomeipServiceInstance`, the value of attribute `udpPort` will be transmitted in the SD-SubscribeEventGroup message to the server and this port number will be used in the following way:
 - Method communication: over this port the `RequiredSomeipServiceInstance` will send the method call messages to the `ProvidedSomeipServiceInstance` and over the same port the `RequiredSomeipServiceInstance` will receive the responses from the service provider.

- Event communication: over this port the `RequiredSomeipServiceInstance` will receive the event messages in IP-Unicast case.

]([RS_MANI_00009](#))

[constr_3487]{DRAFT} TCP endpoint can only serve provided or required service instances exclusively [`ServiceInstanceToMachineMapping` is not allowed to refer to a `ProvidedApServiceInstance` and at the same time a `RequiredApServiceInstance` in the role `serviceInstance` if

- the `ServiceInterfaceDeployment` that is referenced by the `ProvidedApServiceInstance` in the role `serviceInterfaceDeployment` and
- the `ServiceInterfaceDeployment` that is referenced by the `RequiredApServiceInstance` in the role `serviceInterfaceDeployment`

both contain defined tcp content that is described by the `transportProtocol` attribute in the deployment elements of SOME/IP or DDS.

In other words a TCP endpoint can only serve provided or required service instances exclusively.]([\(\)](#))

The reason for [[constr_3487](#)] is that the POSIX Socket API does not support the binding of several TCP sockets onto the same tuple <local IP address, local port>. But this would be necessary if a service is provided and consumed over the same TCP Endpoint.

[TPS_MANI_03000]{DRAFT} Mapping of `AdaptivePlatformServiceInstance` to `PortPrototypes` [`ServiceInstanceToPortPrototypeMapping` is used to assign an `AdaptivePlatformServiceInstance` to a `PortPrototype` of a `SwComponentType`. This allows to define how specific `PortPrototypes` of a Software Component are represented in the middleware in terms of the service configuration.]([RS_MANI_00011](#))

In other words, the “outside” appearance of a `PortPrototype` from the middleware point of view is the `AdaptivePlatformServiceInstance`, or the concrete subclasses `RequiredApServiceInstance` and `ProvidedApServiceInstance`.

Meta-classes `ProvidedApServiceInstance` and `RequiredApServiceInstance` are abstract and this allows for using specific derived classes that fit the underlying middleware (e.g. SOME/IP). The following sub-chapters will detail the supported specializations.

[TPS_MANI_01316]{DRAFT} Existence of `ServiceInstanceToPortPrototypeMapping.processDesign` [The reference `ServiceInstanceToPortPrototypeMapping.processDesign` shall only be used in a design-level modeling scenario where a pre-assignment of a given `ServiceInstanceToPortPrototypeMapping` to a specific `ProcessDesign` is intended.

By this means it is possible to express that one `Executable` is foreseen to be executed in multiple instances and it is also possible to assign service instances to each

of the foreseen `ProcessDesigns` that represent instances of `Executable` at design time.) ([RS_MANI_00009](#))

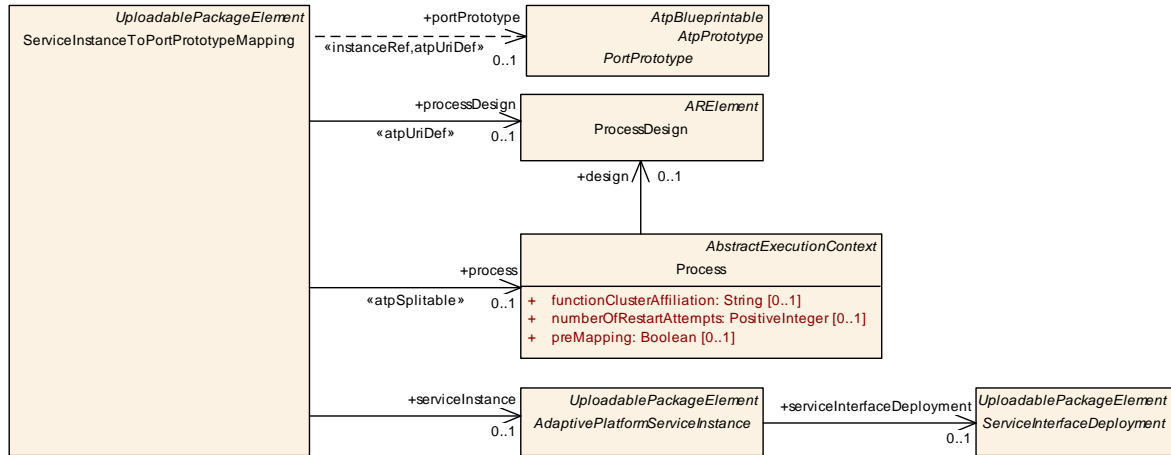


Figure 11.10: ServiceInstanceToPortPrototypeMapping

Class	ServiceInstanceToPortPrototypeMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceMapping			
Note	This meta-class represents the ability to assign a transport layer dependent ServiceInstance to a Port Prototype. With this mapping it is possible to define how specific PortPrototypes are represented in the middleware in terms of service configuration. Tags: atp.recommendedPackage=ServiceInstanceToPortPrototypeMappings			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
portPrototype	PortPrototype	0..1	iref	Reference to a specific PortPrototype that represents the ServiceInstance. Stereotypes: atpUriDefInstanceRef implemented by: PortPrototypeInExecutableInstanceRef
process	Process	0..1	ref	Reference to the Process in which the enclosing Service InstanceToPortPrototypeMapping is executed. Stereotypes: atpSplittable Tags: atp.Splitkey=process
processDesign	ProcessDesign	0..1	ref	Reference to the ProcessDesign in which the Executable that contains the SoftwareComponent and the referenced PortPrototype is executed. Stereotypes: atpUriDef
serviceInstance	AdaptivePlatformServiceInstance	0..1	ref	Reference to a ServiceInstance that is represented in the Software Component by the mapped group of Port Prototypes.

Table 11.32: ServiceInstanceToPortPrototypeMapping

[TPS_MANI_01317]{DRAFT} **Existence of `ServiceInstanceToPortPrototypeMapping.process`** [The reference `ServiceInstanceToPortPrototypeMapping.process` shall be only used in a deployment-level modeling where the integration of a `SoftwareCluster` is created. The reference has the role to identify the actual `Process` used in the execution manifest.

This reference overwrites a potentially existing reference to a `ProcessDesign` in the context of the enclosing `ServiceInstanceToPortPrototypeMapping`] ([RS_MANI_00009](#))

Please note that if both `ServiceInstanceToPortPrototypeMapping.processDesign` and `process` exist, the latter gets the higher significance because it is created by an integrator who may overrule design decisions on the basis of superior knowledge about the context.

In such a case it is acceptable that the `Process` references a different `ProcessDesign` than the one referenced in the role `ServiceInstanceToPortPrototypeMapping.processDesign`. This is just the result of superior knowledge of the integrator over the designer.

11.3.1 SOME/IP Service Instance Deployment

In the case of SOME/IP used as the middleware the derived meta-classes are `ProvidedSomeipServiceInstance` or `RequiredSomeipServiceInstance`. These meta-classes also carry attributes that apply for the service discovery on SOME/IP.

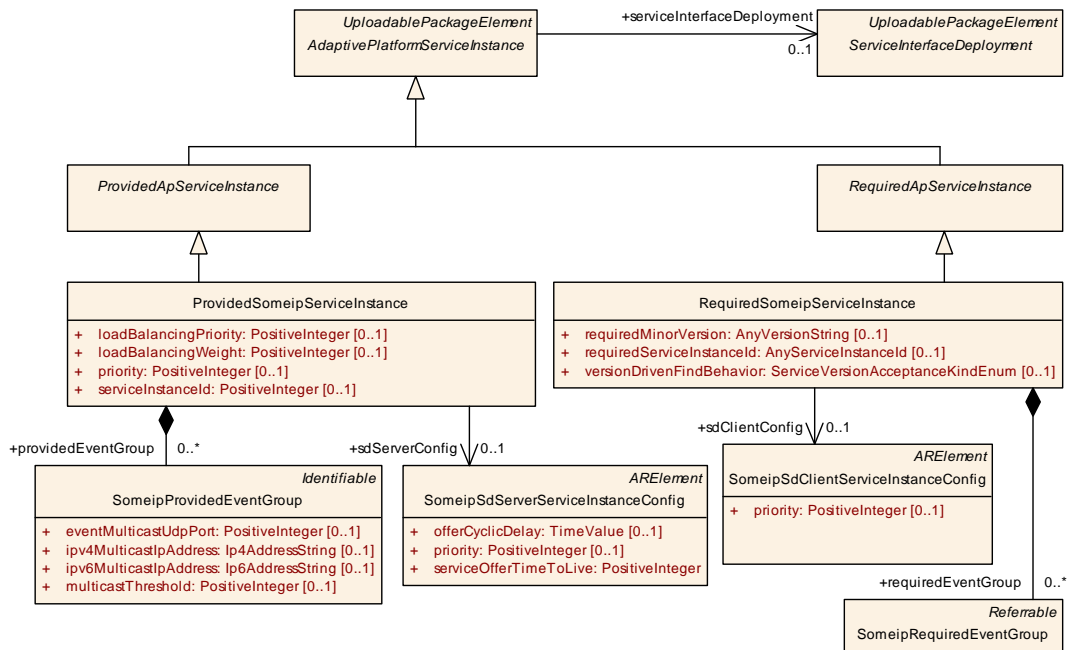


Figure 11.11: SOME/IP Service Instances

Primitive	AnyServiceInstanceId
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::PrimitiveTypes
Note	<p>This is a positive integer or the literal ALL (the value ANY is technically supported but deprecated) which can be denoted in decimal, octal and hexadecimal. The value is between 0 and 65535.</p> <p>Tags: xml.xsd.customType=ANY-SERVICE-INSTANCE-ID xml.xsd.pattern=[1-9][0-9]*[0[xX]][0-9a-fA-F]+ 0[0-7]*[0[bB]][0-1]+ ANY ALL xml.xsd.type=string</p>

Table 11.33: AnyServiceInstanceId

11.3.1.1 Provided Service Instance

The [ProvidedSomeipServiceInstance](#) defines the [serviceInstanceId](#) for the Service Instance of the [SomeipServiceInterfaceDeployment](#) that is referenced with the [serviceInterfaceDeployment](#) reference.

It means that the Server on which the [ProvidedSomeipServiceInstance](#) is deployed offers the Service Instance over SOME/IP with the [serviceInstanceId](#) and [serviceInterfaceId](#).

Class	ProvidedSomeipServiceInstance			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	<p>This meta-class represents the ability to describe the existence and configuration of a provided service instance in a concrete implementation on top of SOME/IP.</p> <p>Tags:atp.recommendedPackage=ServiceInstances</p>			
Base	ARElement , ARObject , AdaptivePlatformServiceInstance , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , ProvidedApServiceInstance , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
capability Record (ordered)	TagWithOptionalValue	*	aggr	A sequence of records to store arbitrary name/value pairs conveying additional information about the named service.
eventProps	SomeipEventProps	*	aggr	Configuration settings for individual events that are provided by the ServiceInstance.
loadBalancing Priority	PositiveInteger	0..1	attr	<p>This attribute is used to specify the priority in the load balancing option of SOME/IP that is added to the Offer Service.</p> <p>When a client searches for all service instances of a service, the client shall choose the service instance with highest priority if one is defined.</p>
loadBalancing Weight	PositiveInteger	0..1	attr	<p>This attribute is used to specify the weight in the load balancing option of SOME/IP that is added to the Offer Service.</p> <p>When a client searches for all service instances of a service, the client shall choose the service instance with highest priority if one is defined. If several service instances exist with the highest priority the service instance shall be chosen based on the weights of the service instances.</p>





Class	ProvidedSomeipServiceInstance			
methodResponseProps	SomeipMethodProps	*	aggr	Configuration settings for individual methods that are provided by the ServiceInstance.
priority	PositiveInteger	0..1	attr	This attribute defines the VLAN frame priority for SOME/IP messages that are resulting from this ProvidedSomeipServiceInstance (Method and Event communication). Values from 0 (best effort) to 7 (highest) are allowed.
providedEventGroup	SomeipProvidedEventGroup	*	aggr	List of EventGroups that are provided by the Service Instance.
sdServerConfig	SomeipSdServerServiceInstanceConfig	0..1	ref	Server specific configuration settings relevant for the SOME/IP service discovery.
serviceInstanceId	PositiveInteger	0..1	attr	Identification number that is used by SOME/IP service discovery to identify the instance of the service. The value 65535 for service instance id is reserved and should not be used.

Table 11.34: ProvidedSomeipServiceInstance

[constr_10218]{DRAFT} **Multiplicity of reference in the role [ProvidedSomeipServiceInstance.sdServerConfig](#)** [For each [ProvidedSomeipServiceInstance](#), the reference in the role [sdServerConfig](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10219]{DRAFT} **Multiplicity of attribute [ProvidedSomeipServiceInstance.serviceInstanceId](#)** [For each [ProvidedSomeipServiceInstance](#), the attribute [serviceInstanceId](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_3287]{DRAFT} **Mandatory information of a [ProvidedSomeipServiceInstance](#)** [The [ProvidedSomeipServiceInstance](#) shall always define the [serviceInstanceId](#).]()

[constr_1770]{DRAFT} **Value of [ProvidedSomeipServiceInstance.serviceInstanceId](#)** [For each [ProvidedSomeipServiceInstance.serviceInstanceId](#), the value shall be in the range 0..65534.]()

Rationale for [constr_1770]: on protocol level, the value 65535 represents the "ALL" semantics that can only be used in find messages.

In addition to the service identification properties a SOME/IP offer message contains so called endpoint options that define how the service instance is reachable by clients.

[constr_5338]{DRAFT} **[ProvidedSomeipServiceInstance](#) shall offer all [SomeipEventGroups](#) for subscription** [In the scope of a [ProvidedSomeipServiceInstance](#), [SomeipProvidedEventGroups](#) shall be defined such that

- every aggregated [ProvidedSomeipServiceInstance.providedEventGroup](#) references a [SomeipEventGroup](#) in the context of the [SomeipServiceInterfaceDeployment](#) referenced from the enclosing [ProvidedSomeipServiceInstance](#) in the role [serviceInterfaceDeployment](#)

- each `SomeipEventGroup` defined in the scope of the `SomeipServiceInterfaceDeployment` referenced from the enclosing `ProvidedSomeipServiceInstance` in the role `serviceInterfaceDeployment` shall be referenced from exactly one `SomeipProvidedEventGroup` aggregated in the role `providedEventGroup` in the scope of the enclosing `ProvidedSomeipServiceInstance`.

]()

In other words each `ProvidedSomeipServiceInstance` shall offer all `SomeipEventGroups` for subscription that are defined in the `SomeipServiceInterfaceDeployment` and there shall not be two or more `SomeipProvidedEventGroups` in the `ProvidedSomeipServiceInstance` that are referencing to the same `SomeipEventGroup` in the `SomeipServiceInterfaceDeployment`.

[constr_5339]{DRAFT} SomeipEventGroups of a SomeipServiceInterfaceDeployment shall be referenced at most once from a RequiredSomeipServiceInstance that instantiates the SomeipServiceInterfaceDeployment [Each `SomeipEventGroup` that is defined in a `SomeipServiceInterfaceDeployment` shall be referenced at most once from a `SomeipRequiredEventGroup` that is aggregated by the `RequiredSomeipServiceInstance` that is referencing the `SomeipServiceInterfaceDeployment` in the role `serviceInterfaceDeployment`.]()

In other words there shall not be two or more `SomeipRequiredEventGroups` in the `RequiredSomeipServiceInstance` that are referencing to the same `SomeipEventGroup` in the `SomeipServiceInterfaceDeployment`.

[TPS_MANI_03168]{DRAFT} Configuration of the SOME/IP load balancing option [The SOME/IP load balancing option is configurable per `ProvidedSomeipServiceInstance` with the two attributes `loadBalancingPriority` and `loadBalancingWeight`.] (*RS_MANI_00024*)

The SOME/IP load balancing option is used to prioritize different `ProvidedSomeipServiceInstances` that point to the same `SomeipServiceInterfaceDeployment`, so that a client chooses the service instance based on these settings. This option is attached to SOME/IP Offer Service entries.

[constr_3415]{DRAFT} Value range of loadBalancingPriority [The value of `loadBalancingPriority` shall be in the range of 0..65535.]()

Please note that according to SOME/IP a lower value means higher priority.

[constr_3416]{DRAFT} Value range of loadBalancingWeight [The value of `loadBalancingWeight` shall be in the range of 0..65535.]()

Please note that according to SOME/IP a higher value means higher probability to be chosen.

[constr_1723]{DRAFT} ProvidedSomeipServiceInstance shall be unique in respect of serviceInstanceId, serviceInterfaceId and majorVersion on

a **VLAN** [On a VLAN, each `ProvidedSomeipServiceInstance` shall have a different `serviceInstanceId`, `serviceInterfaceId` and `majorVersion` value combination.

In other words, no two `ProvidedSomeipServiceInstances` shall have the same `serviceInstanceId`, `serviceInterfaceId` and `majorVersion` value combination during runtime on the same VLAN.]()

The following figure shows that different SOME/IP `ServiceInstances` with the same `serviceInstanceId`, `serviceInterfaceId` and `majorVersion` are provided on different VLANs. This is a valid setup according to [constr_1723].

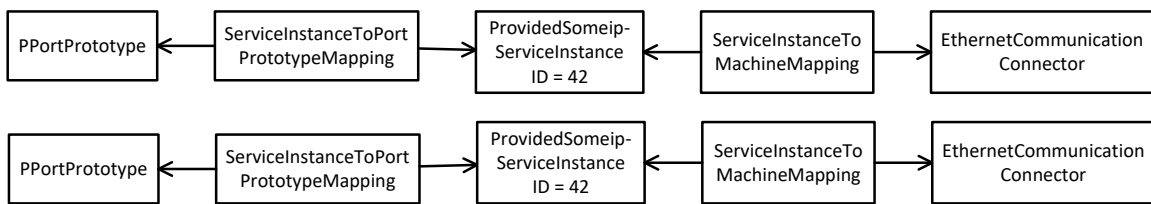


Figure 11.12: Scenario in which two `ProvidedSomeipServiceInstances` with the same credentials are provided on two VLANs

In the following example where the same `ProvidedSomeipServiceInstance` is mapped to different `PPortPrototypes` and is provided on different VLANs the specification item [TPS_MANI_03236] applies. This means that only one of the `PPortPrototypes` is active at runtime at the same time and offers the `ServiceInstance` on two different VLANs.

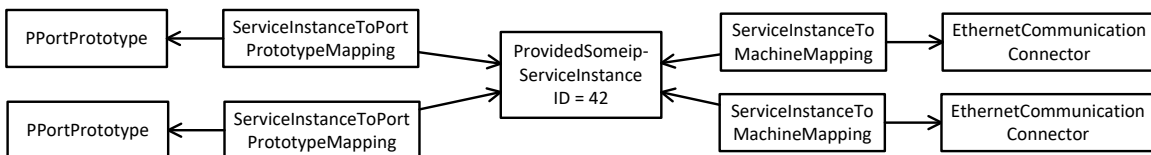


Figure 11.13: Scenario in which a `ProvidedSomeipServiceInstance` is provided on two VLANs and is mapped to different `PPortPrototypes` from which latest at runtime only one is operational

[TPS_MANI_03236]{DRAFT} **Mapping of `ProvidedSomeipServiceInstance` to different `PPortPrototypes`** [In case that the same `ProvidedSomeipServiceInstance` is mapped by several `ServiceInstanceToPortPrototypeMappings` to different `PPortPrototypes` it shall be ensured (latest at runtime) that only one of these mapped `PPortPrototypes` is actually operational at any given point in time.] (*RS_MANI_00009*)

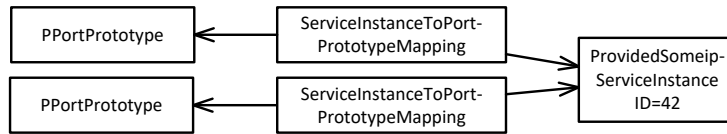


Figure 11.14: Static setup in which a **ProvidedSomeipServiceInstance** is mapped to two **PPortPrototypes** from which latest at runtime only one is operational

Please note that two **ProvidedSomeipServiceInstance** elements with the same credentials according to [constr_1723] may exist that both are mapped to different **PPortPrototypes** and the **ProvidedSomeipServiceInstances** are mapped by **ServiceInstanceToMachineMappings** to the same VLAN. At runtime only one of these **PPortPrototypes** shall be operational at any given point in time.

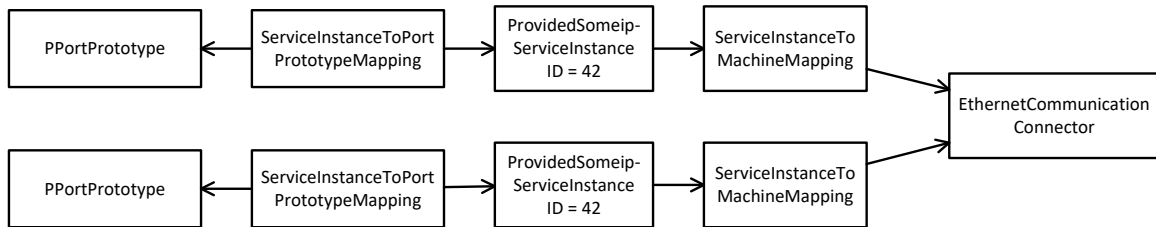


Figure 11.15: Static setup in which **ProvidedSomeipServiceInstances** with the same credentials provided on the same VLAN are mapped to two different **PPortPrototypes** from which latest at runtime only one is operational

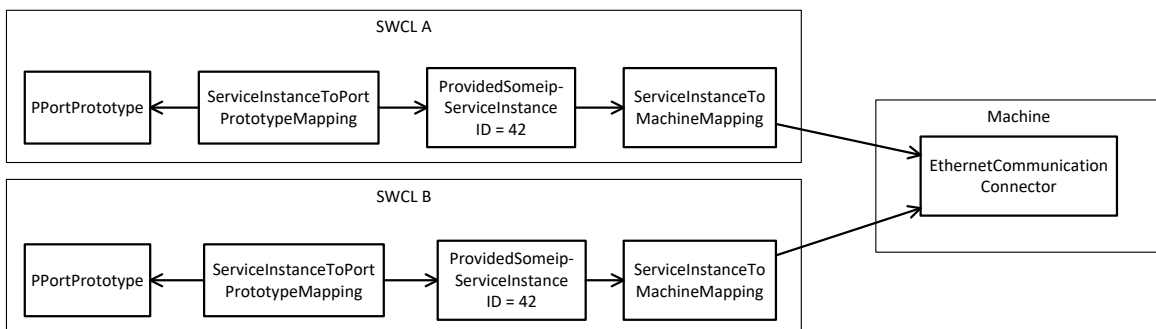


Figure 11.16: **SoftwareCluster** scenario in which **ProvidedSomeipServiceInstances** with the same credentials provided on the same VLAN exist

Such a scenario may be created by the installation of two separate **SoftwareClusters** as shown in the following figure. It is not possible to check such a setup since the **SoftwareClusters** may be developed, integrated, and deployed independent from each other.

11.3.1.1.1 IP Configuration

In SOME/IP the Offer service entry references IPv4 or IPv6 Endpoint options to indicate to the client where the server accepts the method calls and where the server sends the event messages.

Such an Endpoint contains the IP address of the sender. The IP address configuration is described in this chapter.

[TPS_MANI_03002]{DRAFT} IP configuration for a `ProvidedSomeipServiceInstance` [A `ProvidedSomeipServiceInstance` can be mapped to a `CommunicationConnector` of a `MachineDesign` with the `SomeipServiceInstanceToMachineMapping`.

With this mapping an assignment of the `ProvidedSomeipServiceInstance` to a unicast IP Address is established since the `EthernetCommunicationConnector` refers to a `NetworkEndpoint` in the role `unicastNetworkEndpoint`.] (*RS_MANI_00009, RS_MANI_00024*)

[TPS_MANI_03003]{DRAFT} `ProvidedSomeipServiceInstance` Fanout [It is allowed to map the same `ProvidedSomeipServiceInstance` to different `CommunicationConnectors` of a `MachineDesign`. In such a case, several `SomeipServiceInstanceToMachineMappings` shall be defined.

This allows for offering the same `ProvidedSomeipServiceInstance` on different VLANs or even on different `CommunicationClusters`.] (*RS_MANI_00009, RS_MANI_00024*)

[constr_3538]{DRAFT} Only one `ServiceInstanceToMachineMapping` per technology and `CommunicationConnector` [Each `AdaptivePlatformServiceInstance` shall only be referenced up to once by a specific `ServiceInstanceToMachineMapping` subclass in the role `serviceInstance` where the `ServiceInstanceToMachineMapping` refer to the same `CommunicationConnector`.] ()

In other words, it is not allowed to define for the same service instance two `ServiceInstanceToMachineMapping` of the same kind (e.g. `SomeipServiceInstanceToMachineMapping`) which refer to the same `CommunicationConnector`.

[TPS_MANI_03554]{DRAFT} Several `SomeipServiceInstanceToMachineMappings` with equal settings [If

- one `SomeipServiceInstanceToMachineMapping` refers to several service instances in the role `serviceInstance`
- several `SomeipServiceInstanceToMachineMappings` with equal settings refer to several service instances in the role `serviceInstance`
- the combination of the two above applies

then for all the referenced service instances the same network connection (i.e. Ethernet socket) will be used.] (*RS_MANI_00009, RS_MANI_00024*)

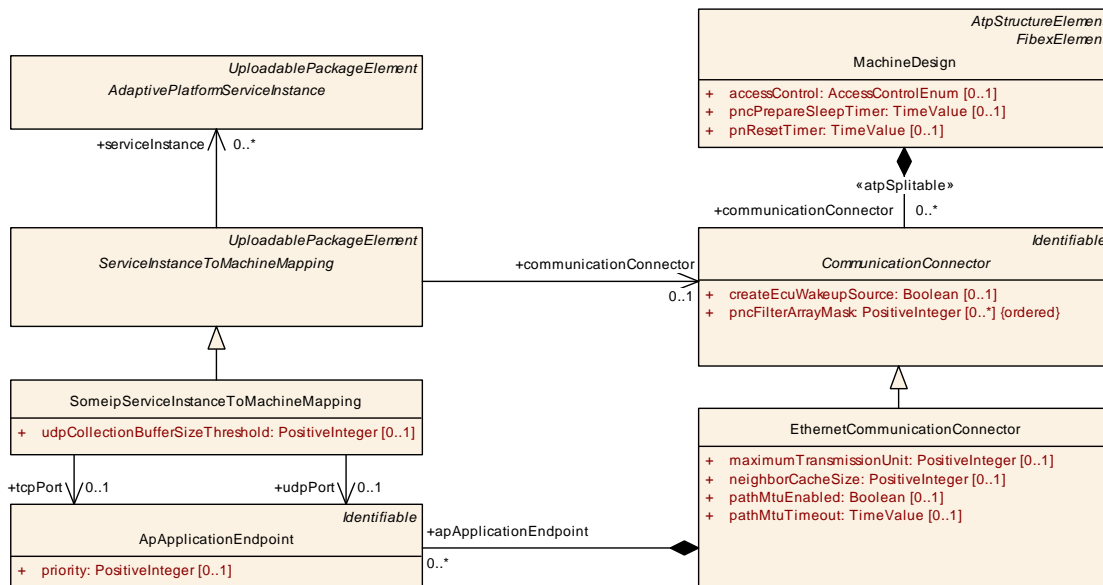


Figure 11.17: SomeipServiceInstanceToMachineMapping with TP and IP configuration

[constr_5052]{DRAFT} ProvidedSomeipServiceInstances of the same serviceInterface on one Machine [ProvidedSomeipServiceInstances that are referring to the same SomeipServiceInterfaceDeployment shall not be mapped to the same combination of:

- IP address that is assigned by the SomeipServiceInstanceToMachineMapping with the reference to the EthernetCommunicationConnector that in turn references the NetworkEndpoint and
- UDP Port or TCP Port number that are defined by the SomeipServiceInstanceToMachineMapping.udpPort and SomeipServiceInstanceToMachineMapping.tcpPort references to the ApApplicationEndpoint.

]()

The reason for this restriction is that the Instance IDs are only used for Service Discovery but are not contained in the SOME/IP header. So if for example two ProvidedSomeipServiceInstances of the same ServiceInterface are provided on the same machine and a client wants to call a method of one of these ProvidedSomeipServiceInstances the only possibility for the client to distinguish the ProvidedSomeipServiceInstances is the port number over which the individual ProvidedSomeipServiceInstances are provided.

[TPS_MANI_03555]{DRAFT} Mix of SomeipServiceInstanceToMachineMapping and signal-based communication [SomeipServiceInstanceToMachineMapping defines service instance communication on a specific Ethernet socket and the same socket may also be used for signal-based communication at the same time.] (RS_MANI_00009, RS_MANI_00024)

Please note that the signal-based communication is described in section 13.

Via the definition of respective [ISignalTriggering](#), [PduTriggering](#), and [SocketConnection](#) for signal-based communication, the same values for Ethernet address and port may be defined as used at the [SomeipServiceInstanceToMachineMapping](#).

Class	<<atpVariation>> CommunicationCluster (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreTopology			
Note	<p>The CommunicationCluster is the main element to describe the topological connection of communicating ECUs.</p> <p>A cluster describes the ensemble of ECUs, which are linked by a communication medium of arbitrary topology (bus, star, ring, ...). The nodes within the cluster share the same communication protocol, which may be event-triggered, time-triggered or a combination of both.</p> <p>A CommunicationCluster aggregates one or more physical channels.</p> <p>Tags:vh.latestBindingTime=postBuild</p>			
Base	ARObject , CollectableElement , FibexElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	AbstractCanCluster , EthernetCluster , FlexrayCluster , LinCluster , UserDefinedCluster			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
baudrate	PositiveUnlimitedInteger	0..1	attr	Channels speed in bits/s.
physical Channel	PhysicalChannel	1..*	aggr	<p>This relationship defines which channel element belongs to which cluster. A channel shall be assigned to exactly one cluster, whereas a cluster may have one or more channels.</p> <p>Note: This atpSplittable property has no atp.Splitkey due to atpVariation (PropertySetPattern).</p> <p>Stereotypes: atpSplittable; atpVariation</p> <p>Tags:vh.latestBindingTime=systemDesignTime</p>
protocolName	String	0..1	attr	The name of the protocol used.
protocolVersion	String	0..1	attr	The version of the protocol used.

Table 11.35: CommunicationCluster

Class	CommunicationConnector (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreTopology			
Note	<p>The connection between the referencing ECU and the referenced channel via the referenced controller. Connectors are used to describe the bus interfaces of the ECUs and to specify the sending/receiving behavior. Each CommunicationConnector has a reference to exactly one communicationController.</p> <p>Note: Several CommunicationConnectors can be assigned to one PhysicalChannel in the scope of one ECU Instance.</p>			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	AbstractCanCommunicationConnector , EthernetCommunicationConnector , FlexrayCommunicationConnector , UserDefinedCommunicationConnector			
Aggregated by	EcuInstance.connector , MachineDesign.communicationConnector			
Attribute	Type	Mult.	Kind	Note
createEcu WakeupSource	Boolean	0..1	attr	If this parameter is available and set to true then a channel wakeup source shall be created for the Physical Channel referencing this CommunicationConnector.





Class	CommunicationConnector (abstract)			
pncFilterArray Mask (ordered)	PositiveInteger	*	attr	Bit mask for NM-Pdu Payload used to configure the NM filter mask for the Network Management. Tags: atp.Status=draft

Table 11.36: CommunicationConnector

Class	EthernetCommunicationConnector			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Ethernet specific attributes to the CommunicationConnector.			
Base	ARObject, CommunicationConnector, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	EcuInstance.connector, MachineDesign.communicationConnector			
Attribute	Type	Mult.	Kind	Note
apApplication Endpoint	ApApplicationEndpoint	*	aggr	Collection of Application Addresses that are used on the CommunicationConnector. Tags: atp.Status=draft
canXIProps	CanXIProps	*	ref	If the Ethernet frames handled by this Ethernet CommunicationConnector are tunneled through CAN XL, then this reference shall refer the CanXIProps which contains the specific configuration parameters of the CAN XL controller of the physical CAN XL connection to be used for tunneling. Tags: atp.Status=draft
maximum Transmission Unit	PositiveInteger	0..1	attr	This attribute specifies the maximum transmission unit in bytes.
neighborCache Size	PositiveInteger	0..1	attr	This attribute specifies the size of neighbor cache or ARP table in units of entries.
pathMtu Enabled	Boolean	0..1	attr	If enabled the IPv4/IPv6 processes incoming ICMP "Packet Too Big" messages and stores a MTU value for each destination address.
pathMtuTimeout	TimeValue	0..1	attr	If this value is >0 the IPv4/IPv6 will reset the MTU value stored for each destination after n seconds.
unicastNetwork Endpoint	NetworkEndpoint	*	ref	Network Endpoint that defines the IPAddress of the machine. Tags: atp.Status=draft

Table 11.37: EthernetCommunicationConnector

[constr_3721]{DRAFT} Upper multiplicity of reference in the role EthernetCommunicationConnector.unicastNetworkEndpoint [In the context of EthernetCommunicationConnector, the reference in the role unicastNetworkEndpoint shall exist at most once **at the time when the system design is complete.**]()

[constr_3722]{DRAFT} Upper multiplicity of reference in the role EthernetCommunicationConnector.canXIProps [In the context of EthernetCommunicationConnector, the reference in the role canXIProps shall exist at most once **at the time when the system design is complete.**]()

[constr_3288]{DRAFT} IP configuration restriction for unicastNetworkEndpoints [A *NetworkEndpoint* that is referenced by a *EthernetCommunicationConnector* in the role *unicastNetworkEndpoint* shall have either

- one *Ipv4Configuration* or
- one *Ipv6Configuration*

as *networkEndpointAddress* that is defined in the unicast IP range according to the rules defined in [TPS_MANI_03005] and [TPS_MANI_03006].] ()

In SOME/IP, a server that offers a *ProvidedSomeipServiceInstance* is able to send events and notification events to an IP-Multicast address.

As the server needs to inform the client to which Multicast IP address the event messages will be sent, the *Subscribe Eventgroup Acknowledgement Entry* contains a reference to an IPv4 Multicast Option and/or an IPv6 Multicast Option.

[TPS_MANI_03004]{DRAFT} IPv4 Multicast event destination address [Meta-class *SomeipProvidedEventGroup* defines the multicast IPv4 address to which the events and notification events of the *SomeipProvidedEventGroup* are sent to with the attribute *ipv4MulticastIpAddress*.] (*RS_MANI_00009*, *RS_MANI_00024*)

[TPS_MANI_03061]{DRAFT} IPv6 Multicast event destination address [Meta-class *SomeipProvidedEventGroup* defines the multicast IPv6 address to which the events and notification events of the *SomeipProvidedEventGroup* are sent to with the attribute *ipv6MulticastIpAddress*.] (*RS_MANI_00009*, *RS_MANI_00024*)

[TPS_MANI_03005]{DRAFT} IPv4 Multicast address range [The IPv4 addresses reserved for multicast communication are in the range 224.0.0.0 through 239.255.255.255. Addresses between 0.0.0.0 and 223.255.255.255 are reserved for unicast communication.] (*RS_MANI_00009*, *RS_MANI_00024*)

Please note that the endpoint 224.0.0.251:5353 is reserved by IANA [27] [28] for the utilization of mDNS (only relevant if SOVD is used).

[TPS_MANI_03006]{DRAFT} IPv6 Multicast address range [IPv6 multicast addresses are distinguished from unicast addresses by the value of the high-order octet of the addresses: a value of 0xFF (binary 11111111) identifies an address as an address reserved for multicast communication; any other value identifies an address as a unicast address.] (*RS_MANI_00009*, *RS_MANI_00024*)

Please note that the endpoint [FF02::FB]:5353 is reserved by IANA [29] [28] for the utilization of mDNS (only relevant if SOVD is used).

Class	<i>NetworkEndpointAddress</i> (abstract)
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology
Note	To build a valid network endpoint address there has to be either one MAC multicast group reference or an ipv4 configuration or an ipv6 configuration.
Base	<i>ARObject</i>





Class	<i>NetworkEndpointAddress</i> (abstract)			
Subclasses	Ipv4Configuration , Ipv6Configuration , MacMulticastConfiguration			
Aggregated by	NetworkEndpoint.networkEndpointAddress			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 11.38: NetworkEndpointAddress

11.3.1.1.2 TP Configuration

The IPv4 or IPv6 Endpoint option that is referenced in the SOME/IP Offer message contains besides the IP address the transport layer protocol (e.g. UDP or TCP), and the port number of the sender.

With the [SomeipServiceInstanceToMachineMapping](#) the Transport Layer configuration attributes are assigned to the [ProvidedSomeipServiceInstance](#).

The same element contains the Transport Layer configuration attributes for the IPv4/IPv6 Multicast Option that may be used in the SOME/IP [SubscribeEvent-GroupAck](#) message.

[TPS_MANI_03007]{DRAFT} Udp Transport Protocol Configuration for [ProvidedSomeipServiceInstance](#) [The reference [SomeipServiceInstanceToMachineMapping.udpPort](#) to the [ApApplicationEndpoint](#) defines the Transport Protocol for a UDP communication.

This setting is used in an IPv4 or IPv6 Endpoint Option that is referenced by an [OfferService](#) entry.]([RS_MANI_00009](#), [RS_MANI_00024](#))

[TPS_MANI_03008]{DRAFT} Tcp Transport Protocol Configuration for [ProvidedSomeipServiceInstance](#) [The reference [SomeipServiceInstanceToMachineMapping.tcpPort](#) to the [ApApplicationEndpoint](#) defines the Transport Protocol for a TCP communication.

This setting is used in an IPv4 or IPv6 Endpoint Option that is referenced by an [OfferService](#) entry.]([RS_MANI_00009](#), [RS_MANI_00024](#))

[TPS_MANI_03009]{DRAFT} Tcp and Udp Transport Protocol Configuration for [ProvidedSomeipServiceInstance](#) [It is allowed to set [tcpPort](#) and [udpPort](#) in the same [SomeipServiceInstanceToMachineMapping](#).

Such a setting shall be used to indicate that one UDP endpoint and one TCP endpoint are referenced in the [OfferService](#) entry. It means that the Server provides the [ProvidedSomeipServiceInstance](#) over both Transport Protocols.]([RS_MANI_00009](#), [RS_MANI_00024](#))

If a [Tcp and Udp Transport Protocol Configuration](#) is defined for a [ProvidedSomeipServiceInstance](#) as described in [\[TPS_MANI_03009\]](#) then the SOME/IP

`ServiceInterfaceDeployment` settings decide which content of the `ProvidedSomeipServiceInstance` is transported over `udp` and which content is transported over `tcp`.

This is described in [TPS_MANI_03050] and [TPS_MANI_03051].

[TPS_MANI_03010]{DRAFT} Udp Transport Protocol Configuration in case of IP-Multicast [The `SomeipProvidedEventGroup.eventMulticastUdpPort` defines the Transport Protocol Port Number for a UDP event communication in case IP-Multicast is used.

This setting is used in an IPv4 or IPv6 Multicast Option that is referenced by a `SubscribeEventGroupAck Service` entry.] (*RS_MANI_00009*, *RS_MANI_00024*)

[constr_3290]{DRAFT} Transport Protocol attributes defined for a ProvidedSomeipServiceInstance [Each `SomeipServiceInstanceToMachineMapping` that is defined for a `ProvidedSomeipServiceInstance` shall define either

- a `udpPort` or
- a `tcpPort` or
- a `udpPort` and a `tcpPort`.

]()

[TPS_MANI_03157]{DRAFT} Enabling of data collection for UDP data transmission [The setting of the attribute `SomeipServiceInstanceToMachineMapping.udpCollectionBufferSizeThreshold` to a value enables the data collection for data transmission over the `udpPort` and `unicastNetworkEndpoint` defined on the `EthernetCommunicationConnector` that is referenced by the `SomeipServiceInstanceToMachineMapping`. In this case all event and method messages that are configured for data collection will be collected in the buffer until a transmission trigger arrives and the data transmission starts.] (*RS_MANI_00024*)

For configuration of transmission triggers please see [TPS_MANI_03158] and [TPS_MANI_03159].

11.3.1.1.3 Service Discovery Server Configuration

The multicast messages of the SOME/IP Service Discovery come with the risk of overflowing `Machines` with too many messages. Therefore, the Service Discovery can be configured with a suitable message sending behavior.

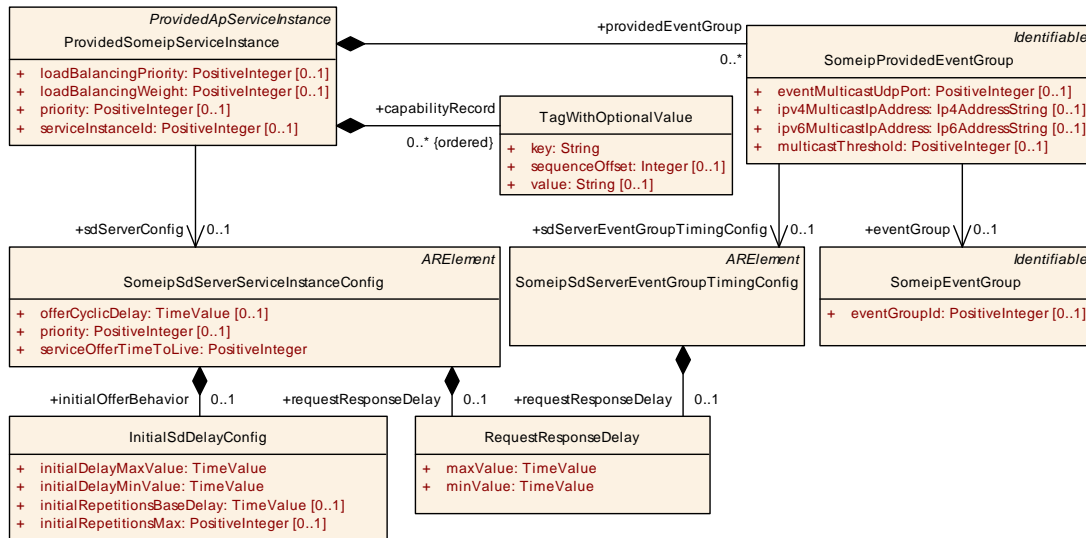


Figure 11.18: SOME/IP Service Discovery Server configuration settings

For every `ProvidedSomeipServiceInstance` on a Server different phases are existing:

- Down
- Available
 - Initial Wait Phase
 - Repetition Phase
 - Main Phase

[TPS_MANI_03011]{DRAFT} Server Timing configuration for a `ProvidedSomeipServiceInstance` [The Server Timing is configurable with `SomeipSdServerServiceInstanceConfig` that is referenced in the role `sdServerConfig` by the `ProvidedSomeipServiceInstance` for which the Timing is valid.] (*RS_MANI_00024*)

The number of `SomeipSdServerServiceInstanceConfig` elements determine how many timers shall actually be used by the middleware to keep the randomized times. Via the reference `ProvidedSomeipServiceInstance.sdServerConfig` each `ProvidedSomeipServiceInstance` defines to which timer it is assigned.

If several `ProvidedSomeipServiceInstances` share the same timer then the expiration of that timer will lead a combined sending of service discovery messages.

Note that it is possible to define several `SomeipSdServerServiceInstanceConfig` elements with identical timing specification values in order to request several timer handling in the middleware.

[TPS_MANI_03230]{DRAFT} Sharing timers for `ProvidedSomeipServiceInstance` [If several `ProvidedSomeipServiceInstances` point to the same `SomeipSdServerServiceInstanceConfig` in the role `sdServerConfig` then all

of these `ProvidedSomeipServiceInstances` will share the same timers for their timing behavior. This will lead to combining several service discovery entries in one service discovery message. [\(RS_MANI_00024\)](#)

Class	SomeipSdServerServiceInstanceConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	Server specific settings that are relevant for the configuration of SOME/IP Service-Discovery. Tags: atp.recommendedPackage=SomeipSdTimingConfigs			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
initialOfferBehavior	InitialSdDelayConfig	0..1	aggr	Controls offer behavior of the server.
offerCyclicDelay	TimeValue	0..1	attr	Optional attribute to define cyclic offers. Cyclic offer is active, if the delay is set (in seconds) and greater then 0.
priority	PositiveInteger	0..1	attr	This attribute defines the VLAN frame priority for Service Discovery messages that result from <code>ProvidedSomeipServiceInstances</code> that are referencing the <code>SomeipSdServerServiceInstanceConfig</code> (<code>OfferService</code> , <code>StopOfferService</code> , <code>SubscribeEventGroupAck</code>). Values from 0 (best effort) to 7 (highest) are allowed.
requestResponseDelay	RequestResponseDelay	0..1	aggr	Maximum/Minimum allowable response delay to entries received by multicast in seconds. The Service Discovery shall delay answers to entries that were transported in a multicast SOME/IP-SD message (e.g. <code>FindService</code>).
serviceOfferTimeToLive	PositiveInteger	1	attr	Defines the time in seconds the service offer is valid.

Table 11.39: SomeipSdServerServiceInstanceConfig

[TPS_MANI_03012]{DRAFT} Initial Wait Phase configuration for a `ProvidedSomeipServiceInstance` [The Initial Wait Phase for a `ProvidedSomeipServiceInstance` is configured with the `initialOfferBehavior` and the two attributes `initialDelayMinValue` and `initialDelayMaxValue`.

When a calculated random timer based on these min and max values expires the first `OfferService` entry will be sent out. [\(RS_MANI_00024\)](#)

When the calculated random timer expires, the Repetition Phase will be entered.

[TPS_MANI_03013]{DRAFT} Repetition Phase configuration for a `ProvidedSomeipServiceInstance` [The Repetition Phase for a `ProvidedSomeipServiceInstance` is configured with the `initialOfferBehavior` and the two attributes `initialRepetitionsMax` and `initialRepetitionsBaseDelay`.] [\(RS_MANI_00024\)](#)

If the Repetition Phase is entered the Service Discovery waits for the `initialRepetitionsBaseDelay` and then sends an `OfferService` entry. If the amount of sent `OfferService` entries reaches `initialRepetitionsMax`, the Main Phase will be entered.

[TPS_MANI_03014]{DRAFT} **Main Phase configuration for a [ProvidedSomeipServiceInstance](#)** [The Main Phase for a [ProvidedSomeipServiceInstance](#) is configured with the [offerCyclicDelay](#) attribute of [SomeipSdServerServiceInstanceConfig](#).

The [OfferService](#) entry will be sent cyclically with an interval that is defined by the value of attribute [offerCyclicDelay](#), if the value is greater than 0.] ([RS_MANI_00024](#))

Class	InitialSdDelayConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	This element is used to configure the offer behavior of the server and the find behavior on the client.			
Base	<i>ARObject</i>			
Aggregated by	SdClientConfig.initialFindBehavior , SdServerConfig.initialOfferBehavior , SomeipSdClientServiceInstanceConfig.initialFindBehavior , SomeipSdServerServiceInstanceConfig.initialOfferBehavior			
Attribute	Type	Mult.	Kind	Note
initialDelayMax Value	TimeValue	1	attr	Max Value in seconds to delay randomly the first offer (if aggregated in role initialOfferBehavior by SomeipSdServerServiceInstanceConfig) or the transmission of a find message (if aggregated in role initialFindBehavior by SomeipSdClientServiceInstanceConfig).
initialDelayMin Value	TimeValue	1	attr	Min Value in seconds to delay randomly the first offer (if aggregated in role initialOfferBehavior by SomeipSdServerServiceInstanceConfig) or the transmission of a find message (if aggregated in role initialFindBehavior by SomeipSdClientServiceInstanceConfig).
initial Repetitions BaseDelay	TimeValue	0..1	attr	The base delay for offer repetitions (if aggregated in role initialOfferBehavior by SomeipSdServerServiceInstanceConfig) or find repetitions (if aggregated in role initialFindBehavior by SomeipSdClientServiceInstanceConfig). Successive find messages have an exponential back off delay.
initial RepetitionsMax	PositiveInteger	0..1	attr	Describes the maximum amount of offer repetitions (if aggregated in role initialOfferBehavior by SomeipSdServerServiceInstanceConfig) or the maximum amount of find repetitions (if aggregated in role initialFindBehavior by SomeipSdClientServiceInstanceConfig).

Table 11.40: InitialSdDelayConfig

[TPS_MANI_03015]{DRAFT} **TTL for Offer Service Entries** [The lifetime of a [ProvidedSomeipServiceInstance](#) is configurable with the [serviceOfferTimeToLive](#) attribute of [SomeipSdServerServiceInstanceConfig](#).

If the time that is configured by [serviceOfferTimeToLive](#) expires, the [ProvidedSomeipServiceInstance](#) is no longer offered.

If the [offerCyclicDelay](#) attribute of [SomeipSdServerServiceInstanceConfig](#) is not configured, or the configured value of [offerCyclicDelay](#) is 0, the configured value of [serviceOfferTimeToLive](#) shall be ignored, and the infinite value (0xFFFF) shall be used instead.] ([RS_MANI_00024](#))

[TPS_MANI_03016]{DRAFT} **Servers RequestResponseDelay for received FindService entries** [The Server will delay the OfferService answer to a received multicast FindService entry by the configured SomeipSdServerServiceInstanceConfig.requestResponseDelay.

The actual delay will be randomly chosen between the `maxValue` and `minValue`.] (RS_MANI_00024)

Class	RequestResponseDelay			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	Time to wait before answering the query.			
Base	ARObject			
Aggregated by	SdClientConfig.requestResponseDelay, SdServerConfig.requestResponseDelay, SomeipSdClientEventGroupTimingConfig.requestResponseDelay, SomeipSdServerEventGroupTimingConfig.requestResponseDelay, SomeipSdServerServiceInstanceConfig.requestResponseDelay			
Attribute	Type	Mult.	Kind	Note
maxValue	TimeValue	1	attr	Maximum allowable response delay to entries received by multicast in seconds.
minValue	TimeValue	1	attr	Minimum allowable response delay to entries received by multicast in seconds.

Table 11.41: RequestResponseDelay

Figure 11.19 shows an example of the different SOME/IP phases on the Server side.

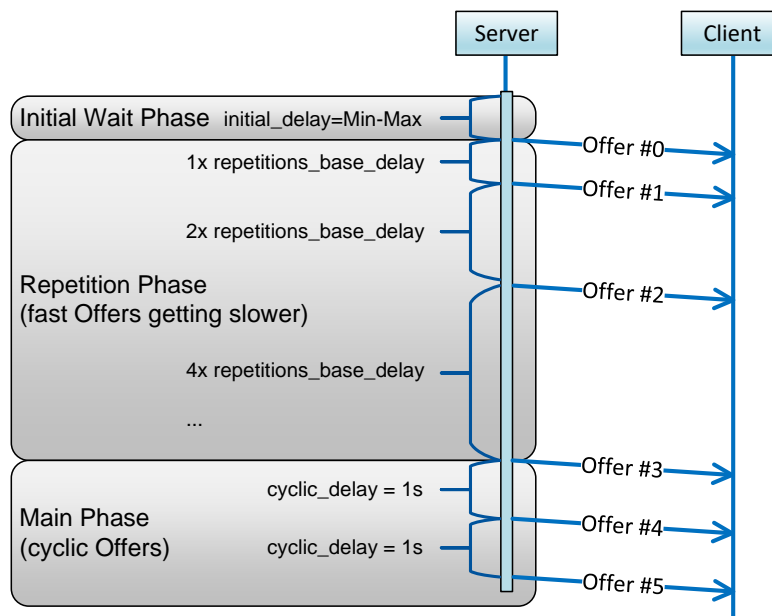


Figure 11.19: SOME/IP Server Timing example

SOME/IP allows for the specification of additional information about the `ProvidedSomeipServiceInstance` with the Capability Record that allows to transport arbitrary configuration strings (key/value pairs). This allows to encode additional information like the name of a service or its configuration.

[TPS_MANI_03017]{DRAFT} **Server Capability Records** [A Capability Record (key/-value pair) on the Server side is configurable with the `capabilityRecord` and the two attributes `key` and `value`.] (*RS_MANI_00024*)

Class	TagWithOptionalValue			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::TagWithOptionalValue			
Note	A tagged value is a combination of a tag (key) and a value that gives supplementary information that is attached to a model element. Please note that keys without a value are allowed.			
Base	ARObject			
Aggregated by	AbstractServiceInstance.capabilityRecord, Machine.environmentVariable, ProvidedSomeipServiceInstance.capabilityRecord, RequiredSomeipServiceInstance.capabilityRecord, SdClientConfig.capabilityRecord, SdServerConfig.capabilityRecord, StartupConfig.environmentVariable			
Attribute	Type	Mult.	Kind	Note
key	String	1	attr	Defines a key.
sequenceOffset	Integer	0..1	attr	The sequenceOffset attribute supports the use case where TagWithOptionalValue is aggregated as splittable. If multiple aggregations define the same value of attribute key then the order in which the value collection is merged might be significant. As an example consider the modeling of the \$PATH environment variable by means of a meta class TagWithOptionalValue. The sequenceOffset describes the relative position of each contribution in the concatenated value. The contributions are sorted in increasing integer order.
value	String	0..1	attr	Defines the corresponding value.

Table 11.42: TagWithOptionalValue

[constr_10037]{DRAFT} **Existence of attribute `TagWithOptionalValue.sequenceOffset` in the context of attribute `capabilityRecord` owned by `ProvidedSomeipServiceInstance`, `RequiredSomeipServiceInstance`, `SdServerConfig`, `SdClientConfig`, or `AbstractServiceInstance`** [For all `capabilityRecord` modeled in the context of `ProvidedSomeipServiceInstance`, `RequiredSomeipServiceInstance`, `SdServerConfig`, `SdClientConfig`, or `AbstractServiceInstance`, attribute `TagWithOptionalValue.sequenceOffset` shall not exist.] ()

11.3.1.1.4 Provided Event Group

The `ProvidedSomeipServiceInstance` aggregates a `SomeipProvidedEventGroup` in the role `providedEventGroup` that allows to define service instance specific configuration settings for a `SomeipEventGroup`.

Class	SomeipProvidedEventGroup
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment
Note	The meta-class represents the ability to configure ServiceInstance related communication settings on the provided side for each EventGroup separately.
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable





Class	SomeipProvidedEventGroup			
Aggregated by	ProvidedSomeipServiceInstance.providedEventGroup			
Attribute	Type	Mult.	Kind	Note
eventGroup	SomeipEventGroup	0..1	ref	Reference to the SomeipEventGroup in the System Manifest for which the ServiceInstance related Event Group settings are valid.
eventMulticast UdpPort	PositiveInteger	0..1	attr	UdpPort configuration that is used for Event communication in the IP-Multicast case. During SOME/IP Service Discovery: Send in the SD-SubscribeEventGroupAck Message to client (answer to SD-SubscribeEventGroup). Event: This is the destination-port where the server sends the multicast event messages if the multicastThreshold is exceeded.
ipv4MulticastIp Address	Ip4AddressString	0..1	attr	Multicast IPv4 Address that is transmitted in the Event GroupSubscribeAck message.
ipv6MulticastIp Address	Ip6AddressString	0..1	attr	Multicast IPv6 Address that is transmitted in the Event GroupSubscribeAck message.
multicast Threshold	PositiveInteger	0..1	attr	Specifies the number of subscribed clients that trigger the server to change the transmission of events to multicast. Example: If configured to 0 only unicast will be used. If configured to 1 the first client will be already served by multicast. If configured to 2 the first client will be served with unicast and as soon as the 2nd client arrives both will be served by multicast. This does not influence the handling of initial events, which are served using unicast only.
sdServerEvent GroupTiming Config	SomeipSdServerEvent GroupTimingConfig	0..1	ref	Server Timing configuration settings that are EventGroup specific.

Table 11.43: SomeipProvidedEventGroup

[constr_10220]{DRAFT} Multiplicity of attribute [SomeipProvidedEventGroup.multicastThreshold](#) [For each [SomeipProvidedEventGroup](#), the attribute [multicastThreshold](#) shall exist **at the time when the creation of the manifest is finished.**](/)

[TPS_MANI_03018]{DRAFT} Usage of [SomeipProvidedEventGroup.multicastThreshold](#) [The switching between IP-Unicast and IP-Multicast is guided by the server with the [SomeipProvidedEventGroup.multicastThreshold](#) attribute and by the number of subscribed clients to the [SomeipProvidedEventGroup](#).

The Server will change the transmission of events to Multicast if the [multicastThreshold](#) of the corresponding [SomeipProvidedEventGroup](#) is reached by the number of subscribed clients. If the number of subscribed clients is smaller than the configured [multicastThreshold](#), the transmission of events takes place via unicast communication.]([RS_MANI_00024](#))

The following example shows the effect of the [multicastThreshold](#) in relation to the number of subscribed clients to the transmission of the SOME/IP event to the unicast or multicast destination address:

- If `multicastThreshold` is configured to 0, only the unicast IP address and the port will be used as destination address.
- If `multicastThreshold` is configured to 1, the first client will be served by multicast.
- If `multicastThreshold` is configured to 2, the first client will be served with unicast and as soon as the second client arrives both will be served by multicast, etc.

[constr_5332]{DRAFT} Mandatory multicast endpoint in case of multicastThreshold different from 0 [If `SomeipProvidedEventGroup.multicastThreshold` is configured to a value different from 0, then

- `SomeipProvidedEventGroup.eventMulticastUdpPort`

and either

- `SomeipProvidedEventGroup.ipv4MulticastIpAddress` or
- `SomeipProvidedEventGroup.ipv6MulticastIpAddress`

shall exist.]()

[constr_5333]{DRAFT} No multicast in case of TCP [If a `SomeipProvidedEventGroup` references only `SomeipEventDeployments` that have the attribute `transportProtocol` set to `tcp` (via `SomeipProvidedEventGroup.eventGroup.event`) then this `SomeipProvidedEventGroup` shall not have a `SomeipProvidedEventGroup.multicastThreshold` attribute or shall have the `SomeipProvidedEventGroup.multicastThreshold` set to 0.]()

[TPS_MANI_03020]{DRAFT} Servers RequestResponseDelay for received SubscribeEventGroup entries [The Server will delay the `SubscribeEventGroupAck` answer to a received `SubscribeEventGroup` message that was triggered by a multicast `ServiceOffer` by the configured `SomeipSdClientEventGroupTimingConfig.requestResponseDelay`.

The actual delay will be randomly chosen between the `maxValue` and `minValue`.] (*RS_MANI_00024*)

Class	SomeipSdServerEventGroupTimingConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	EventGroup specific timing configuration settings. Tags: atp.recommendedPackage=SomeipSdTimingConfigs			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	SomeipSdServerEventGroupTimingConfig			
request ResponseDelay	RequestResponseDelay	0..1	aggr	The Service Discovery shall delay answers to unicast messages triggered by multicast messages (e.g. Subscribe Eventgroup after Offer Service).

Table 11.44: SomeipSdServerEventGroupTimingConfig

11.3.1.1.5 ProvidedSomeipServiceInstance related event and method properties

[TPS_MANI_03154]{DRAFT} **ProvidedSomeipServiceInstance related configuration settings for events** [The class [SomeipEventProps](#) that is aggregated by the [ProvidedSomeipServiceInstance](#) in the role [eventProps](#) allows for specifying [ProvidedSomeipServiceInstance](#) related configuration settings for events that are defined in the [SomeipServiceInterfaceDeployment](#) referenced by the [ProvidedSomeipServiceInstance](#) in the role [serviceInterfaceDeployment](#).] ([RS_MANI_00024](#))

[TPS_MANI_03155]{DRAFT} **ProvidedSomeipServiceInstance related configuration settings for methods** [The class [SomeipMethodProps](#) that is aggregated by the [ProvidedSomeipServiceInstance](#) in the role [methodResponseProps](#) allows for specifying [ProvidedSomeipServiceInstance](#) related configuration settings for a method response message. The method is defined in the [SomeipServiceInterfaceDeployment](#) referenced by the [ProvidedSomeipServiceInstance](#) in the role [serviceInterfaceDeployment](#).] ([RS_MANI_00024](#))

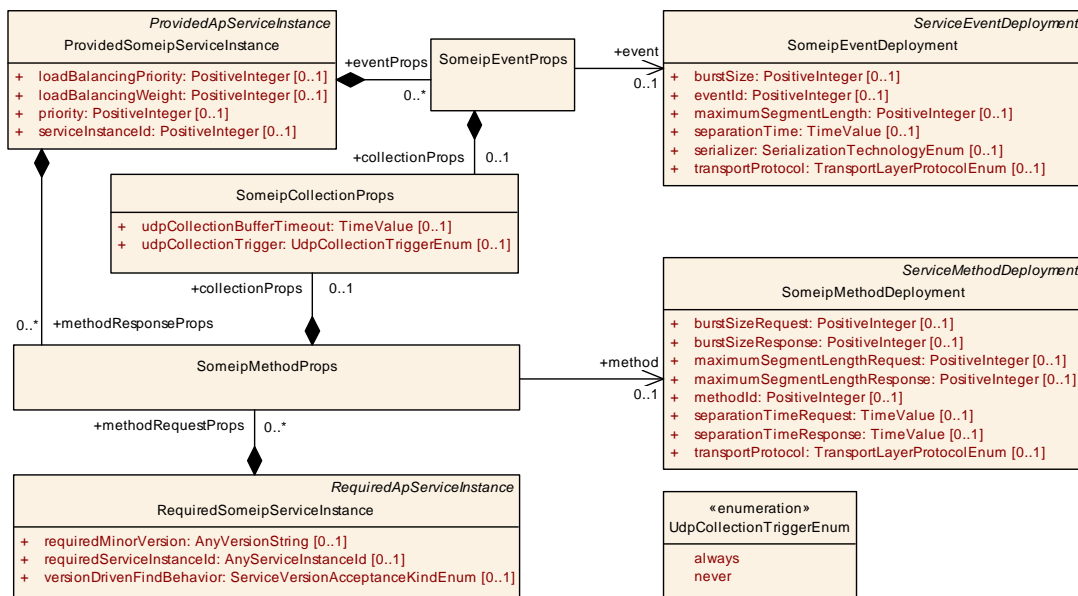


Figure 11.20: ProvidedSomeipServiceInstance related event and method properties

Class	SomeipEventProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class allows to set configuration options for an event in the provided service instance.			
Base	ARObject			
Aggregated by	ProvidedSomeipServiceInstance.eventProps			
Attribute	Type	Mult.	Kind	Note
collectionProps	SomeipCollectionProps	0..1	aggr	Collection of timing attributes configurable for an event that is provided by a Service Instance.
event	SomeipEvent Deployment	0..1	ref	Reference to the event for which the SomeipEventProps are applicable.

Table 11.45: SomeipEventProps

Class	SomeipMethodProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class allows to set configuration options for a method in the service instance.			
Base	ARObject			
Aggregated by	ProvidedSomeipServiceInstance.methodResponseProps , RequiredSomeipServiceInstance.method RequestProps			
Attribute	Type	Mult.	Kind	Note
collectionProps	SomeipCollectionProps	0..1	aggr	Collection of timing attributes configurable for a method that is provided or requested by a Service Instance.
method	SomeipMethod Deployment	0..1	ref	Reference to the method for which the SomeipMethod Props are applicable.

Table 11.46: SomeipMethodProps

Class	SomeipCollectionProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	Collection of attributes that are configurable for an event that is provided by a ServiceInstance or for a method that is provided or requested by a ServiceInstance.			
Base	ARObject			
Aggregated by	SomeipEventProps.collectionProps , SomeipMethodProps.collectionProps			
Attribute	Type	Mult.	Kind	Note
udpCollection BufferTimeout	TimeValue	0..1	attr	Maximum time, an outgoing message (event, method call or method response) may be delayed, due to data collection.
udpCollection Trigger	UdpCollectionTrigger Enum	0..1	attr	Defines whether the ServiceInterface element (event or method) contributes to the triggering of the udp data transmission if data collection is enabled.

Table 11.47: SomeipCollectionProps

Enumeration	UdpCollectionTriggerEnum			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	Defines whether the ServiceInterface element (event or method) contributes to the triggering of the udp data transmission if data collection is enabled.			
Aggregated by	SomeipCollectionProps.udpCollectionTrigger			
Literal	Description			





Enumeration	UdpCollectionTriggerEnum
always	ServiceInterface element will trigger the transmission of the data. Tags: atp.EnumerationLiteralIndex=0
never	ServiceInterface element will be buffered and will not trigger the transmission of the data. Tags: atp.EnumerationLiteralIndex=1

Table 11.48: UdpCollectionTriggerEnum

[TPS_MANI_03158]{DRAFT} **Configuration of a data collection on a [ProvidedServiceInstance](#) for transmission over udp** [The attributes [udpCollectionBufferTimeout](#) and [udpCollectionTrigger](#) support the configuration of a data collection of several messages for transmission over Udp.

In the [ProvidedServiceInstance](#) all [method](#) responses and [events](#) for which the [udpCollectionTrigger](#) is set to [never](#) will be collected in a buffer until a trigger arrives that starts the data transmission.

The following trigger options are supported:

- a message needs to be transmitted for which the [udpCollectionTrigger](#) is set to [always](#).
- the [udpCollectionBufferTimeout](#) is reached for a message.
- the buffer size defined by the attribute [udpCollectionBufferSizeThreshold](#) is reached.

]([RS_MANI_00024](#))

11.3.1.2 Required Service Instance

[TPS_MANI_03059]{DRAFT} **RequiredSomeipServiceInstance.requiredServiceInstanceId** [The [RequiredSomeipServiceInstance](#) defines the [requiredServiceInstanceId](#) of a [SomeipServiceInterfaceDeployment](#) that the client searches.

The client may search for a specific [requiredServiceInstanceId](#) or for ALL [requiredServiceInstanceId](#) of the [serviceInterfaceDeployment](#).]([RS_MANI_00024](#))

[constr_10070]{DRAFT} **Value of [RequiredSomeipServiceInstance.requiredServiceInstanceId](#)** [For each [RequiredSomeipServiceInstance](#), [requiredServiceInstanceId](#), the value shall be in the range 0..65534 or ALL.]
()

Class	RequiredSomeipServiceInstance			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class represents the ability to describe the existence and configuration of a required service instance in a concrete implementation on top of SOME/IP. Tags: atp.recommendedPackage=ServiceInstances			
Base	ARElement , ARObject , AdaptivePlatformServiceInstance , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , RequiredApServiceInstance , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
blocklistedVersion	SomeipServiceVersion	*	aggr	Collection of blocklisted versions.
capabilityRecord (ordered)	TagWithOptionalValue	*	aggr	A sequence of records to store arbitrary name/value pairs conveying additional information about the named service.
methodRequestProps	SomeipMethodProps	*	aggr	Configuration settings for individual methods that are requested by the ServiceInstance.
requiredEventGroup	SomeipRequiredEventGroup	*	aggr	List of EventGroups that are used by the RequiredServiceInstance.
requiredMinorVersion	AnyVersionString	0..1	attr	This attribute is used to configure for which minor version of the Someip ServiceInterface the Service Discovery will search. Value can be set to a number that represents the Minor Version of the searched service or to ANY.
requiredServiceInstanceid	AnyServiceInstanceid	0..1	attr	This attribute represents the ability to describe the required service instance ID.
sdClientConfig	SomeipSdClientServiceInstanceConfig	0..1	ref	Client specific configuration settings relevant for the SOME/IP service discovery.
versionDrivenFindBehavior	ServiceVersionAcceptanceKindEnum	0..1	attr	Defines the service discovery find behavior.

Table 11.49: RequiredSomeipServiceInstance

[constr_10221]{DRAFT} Multiplicity of reference in the role [RequiredSomeipServiceInstance.sdClientConfig](#) [For each [RequiredSomeipServiceInstance](#), the reference in the role [sdClientConfig](#) shall exist **at the time when the creation of the manifest is finished.**]()

Class	SomeipServiceVersion			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	This meta-class represents the ability to describe a version of a SOME/IP Service.			
Base	ARObject			
Aggregated by	ConsumedServiceInstance.blocklistedVersion , RequiredSomeipServiceInstance.blocklistedVersion , SomeipServiceInterfaceDeployment.serviceInterfaceVersion			
Attribute	Type	Mult.	Kind	Note
majorVersion	PositiveInteger	0..1	attr	Major Version of the ServiceInterface. Tags: xml.sequenceOffset=10
minorVersion	PositiveInteger	1	attr	Minor Version of the ServiceInterface. Tags: xml.sequenceOffset=20

Table 11.50: SomeipServiceVersion

Enumeration	ServiceVersionAcceptanceKindEnum
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances
Note	Defined the possible acceptance kinds for required service instances.
Aggregated by	ConsumedServiceInstance.versionDrivenFindBehavior, RequiredSomeipServiceInstance.versionDrivenFindBehavior
Literal	Description
exactOrAnyMinorVersion	Search for ANY or specific minor version service instance and select either ALL returned service instances (in case of ANY) or exactly the specific minor version service instances defined in required MinorVersion. Tags: atp.EnumerationLiteralIndex=0
minimumMinorVersion	Search for ANY minor version service instance and select only those service instances which have an equal or greater minor version than given in requiredMinorVersion. Tags: atp.EnumerationLiteralIndex=1

Table 11.51: ServiceVersionAcceptanceKindEnum

[TPS_MANI_03021]{DRAFT} Requirements on the searched minor version from the client's point of view [The meta-class [RequiredSomeipServiceInstance](#) is able to make further specifications regarding the version of the service from the client's point of view.

For this purpose, the attribute [RequiredSomeipServiceInstance.requiredMinorVersion](#) exists and provides the ability to define the required minor version ([SomeipServiceVersion.minorVersion](#)).] ([RS_MANI_00024](#))

Please note that the major version that the client searches for is already defined by the [SomeipServiceVersion.majorVersion](#) in the [SomeipServiceInterfaceDeployment](#). It is therefore not possible to search for ANY major version, so the client looks always for a specific major version.

The minor version that may be defined by [SomeipServiceVersion.minorVersion](#) in the [SomeipServiceInterfaceDeployment](#) is irrelevant for the client and the service search and shall be ignored.

[TPS_MANI_03619]{DRAFT} SOME/IP Service search for [requiredMinorVersion](#) [A [RequiredSomeipServiceInstance](#) is searching for a SOME/IP Service Instance [requiredMinorVersion](#):

- in case [versionDrivenFindBehavior](#) = [exactOrAnyMinorVersion](#): Service minor version that matches the value set in [requiredMinorVersion](#) or ANY minor version of the Service Instance in case the [requiredMinorVersion](#) is set to ANY
- in case [versionDrivenFindBehavior](#) = [minimumMinorVersion](#): Service minor version that matches at least the value set in [requiredMinorVersion](#) or is higher

] ([RS_MANI_00009](#))

[constr_3561]{DRAFT} minimumMinorVersion and RequiredSomeipServiceInstance.requiredMinorVersion value [The `RequiredSomeipServiceInstance.requiredMinorVersion` shall not have the value `ANY` if `versionDrivenFindBehavior = minimumMinorVersion`.]()

[TPS_MANI_03618]{DRAFT} Usage of RequiredSomeipServiceInstance.blocklistedVersion [A service connection of a `RequiredSomeipServiceInstance` to a `ProvidedSomeipServiceInstance` is not considered for service discovery if the `SomeipServiceVersion.minorVersion` of the enclosing `SomeipServiceInterfaceDeployment` that is referenced by the `ProvidedSomeipServiceInstance` exists in the collection of `SomeipServiceVersions` aggregated at the `RequiredSomeipServiceInstance` in the role `blocklistedVersion`.]([RS_MANI_00066](#))

A typical scenario for using a blocklist may be: For a certain `RequiredSomeipServiceInstance` a certain compatible provider service version inside a system may not work which may have been identified after the design phase.

In order to keep the system running this certain provider version won't be considered in the service search if it has been blocklisted. Therefore, the `RequiredSomeipServiceInstance` may connect only to `ProvidedSomeipServiceInstances` that fulfill the search criteria and are not blocklisted.

[constr_3558]{DRAFT} RequiredSomeipServiceInstance.blocklistedVersion is restricted to the usage of minorVersion [The `majorVersion` attribute shall not be used in the `SomeipServiceVersion` that is aggregated by the `RequiredSomeipServiceInstance` in the role `blocklistedVersion`.]()

[constr_5115]{DRAFT} Search for a specific SOME/IP ServiceInstance and for all SOME/IP ServiceInstances over the same RPortPrototype [A `RequiredSomeipServiceInstance` that configures the search for a specific `ServiceInstance` on SOME/IP (with concrete `requiredServiceInstanceId`) and a `RequiredSomeipServiceInstance` that configures the search for ALL `ServiceInstances` on SOME/IP (with `requiredServiceInstanceId = ALL`) that are mapped using `ServiceInstanceToMachineMapping` to the same `EthernetCommunicationConnector` (and therefore are searching for SOME/IP `ServiceInstances` on the same VLAN) are not allowed to be mapped by `ServiceInstanceToPortPrototypeMappings` to the same `RPortPrototype`.]()

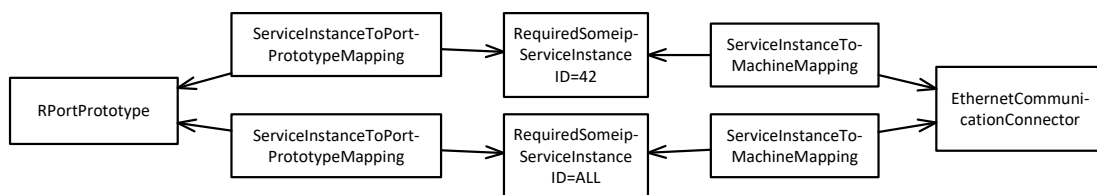


Figure 11.21: Depiction of not-allowed scenario

Please note that the depicted scenario in Figure 11.21 is covered by [\[constr_5115\]](#).

In other words the middleware is allowed to search for a concrete SOME/IP `ServiceInstance` on one VLAN and for ALL SOME/IP `ServiceInstances` on a different VLAN via a single `RPortPrototype`. But the middleware is only able to search for either ALL SOME/IP `ServiceInstances` or for one concrete SOME/IP `ServiceInstance` on the same VLAN via a single `RPortPrototype`.

Please note that the depicted scenario in Figure 11.22 is covered by [constr_5115].

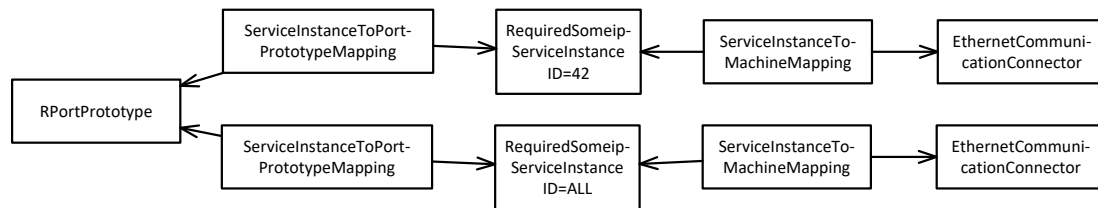


Figure 11.22: Depiction of allowed scenario

11.3.1.2.1 IP Configuration

In SOME/IP, the `SubscribeEventGroup` entry references IPv4 or IPv6 Endpoint options to indicate to the server where the client wants to receive the events of the `SomeipEventGroup`. Such an Endpoint contains the IP address of the client.

[TPS_MANI_03022]{DRAFT} Context of `RequiredSomeipServiceInstance` [A `RequiredSomeipServiceInstance` can be mapped to a `CommunicationConnector` of a `MachineDesign` with the `SomeipServiceInstanceToMachineMapping`.

With this mapping an assignment of the `RequiredSomeipServiceInstance` to a unicast IP Address is established since the `EthernetCommunicationConnector` refers to a `NetworkEndpoint` in the role `unicastNetworkEndpoint`. The `unicastNetworkEndpoint` defines the local IP address of the client. (RS_MANI_0009, RS_MANI_0024)

11.3.1.2.2 TP Configuration

The IPv4 or IPv6 Endpoint option that is referenced in the SOME/IP `SubscribeEventGroup` message contains besides the IP address the transport layer protocol (e.g. UDP or TCP), and the port number of the client.

With the `SomeipServiceInstanceToMachineMapping` the Transport Layer configuration attributes are assigned to the `RequiredSomeipServiceInstance`.

The Transport Layer (TCP/UDP) configuration attributes for the `SubscribeEventGroup` entry are directly available in the `SomeipServiceInstanceToMachineMapping` element.

The `SomeipServiceInstanceToMachineMapping` defines also the source-port where the client sends the method call messages to the server and the destination-port where the client receives the method responses from the server.

The modeling of the `SomeipServiceInstanceToMachineMapping` with TP and IP configuration is depicted in Figure C.1.

[TPS_MANI_03023]{DRAFT} Udp Transport Protocol Configuration for RequiredSomeipServiceInstance [The `SomeipServiceInstanceToMachineMapping.udpPort` defines the Transport Protocol for a UDP communication in case that the server provides `ServiceInterface` content over UDP and the client wants to use it.](*RS_MANI_00009, RS_MANI_00024*)

[TPS_MANI_03024]{DRAFT} Tcp Transport Protocol Configuration for RequiredSomeipServiceInstance [The `SomeipServiceInstanceToMachineMapping.tcpPort` defines the Transport Protocol for a TCP communication in case that the server provides `ServiceInterface` content over TCP and the client wants to use it.](*RS_MANI_00009, RS_MANI_00024*)

[TPS_MANI_03049]{DRAFT} Tcp and Udp Transport Protocol Configuration for RequiredSomeipServiceInstance [It is allowed to set `tcpPort` and `udpPort` in the same `SomeipServiceInstanceToMachineMapping`. Such a setting shall be used in case that the server provides `ServiceInterface` content over Udp and Tcp and the client wants to use it.](*RS_MANI_00009, RS_MANI_00024*)

[TPS_MANI_03237]{DRAFT} Transport Protocol attributes defined for a RequiredSomeipServiceInstance [Each `SomeipServiceInstanceToMachineMapping` that is defined for a `RequiredSomeipServiceInstance` is allowed to have:

- a configured `udpPort` or
- a configured `tcpPort` or
- a configured `udpPort` and a `tcpPort` or
- no configured `udpPort` and `tcpPort`.

](*RS_MANI_00009, RS_MANI_00024*)

A `RequiredSomeipServiceInstance` that is mapped by a `SomeipServiceInstanceToMachineMapping` that does not contain a `udpPort` and `tcpPort` is allowed to receive events over IP Multicast only.

In this case, it is not required for a client to have a unicast socket prepared if the server will always use the multicast transport. In such a case, the `SubscribeEventGroup SOME/IP SD` message that is sent from the `ServiceConsumer` to the `ServiceProvider` will not contain any `Unicast Endpoint` options.

In addition, the corresponding `ServiceInterface` is not allowed to have any Methods defined since the Request/Response communication pattern is restricted to IP Unicast only.

An additional prerequisite for such a setup is that the `ProvidedSomeipServiceInstance` is configured for IP multicast transmission only. In other words, the value of attribute `multicastThreshold` for all `SomeipProvidedEventGroups` needs to be set to 1.

[constr_5161]{DRAFT} RequiredSomeipServiceInstance that is mapped by a **SomeipServiceInstanceToMachineMapping** without a configured `tcpPort` and `udpPort` [A `RequiredSomeipServiceInstance` that is mapped to a `EthernetCommunicationConnector` by a `SomeipServiceInstanceToMachineMapping` that does not have neither a `udpPort` nor a `tcpPort` is not allowed to reference a `SomeipServiceInterfaceDeployment` that includes `SomeipMethodDeployments` (directly or indirectly via `ServiceFieldDeployment`).]()

If a `Tcp` and `Udp` Transport Protocol Configuration is defined for a `RequiredSomeipServiceInstance` as described in [TPS_MANI_03049] then the `SOME/IPServiceInterfaceDeployment` settings decide which content of the `ProvidedSomeipServiceInstance` is transported over `udp` and which content is transported over `tcp`. This is described in [TPS_MANI_03050] and [TPS_MANI_03051].

11.3.1.2.3 Service Discovery Client Configuration

Service Discovery phases on the Client side allow minimizing the number of Service Discovery messages and allow a fast synchronization upon ECU start.

For every `RequiredSomeipServiceInstance` on a Client different phases are existing:

- Down
- Requested
 - Initial Wait Phase
 - Repetition Phase
 - Main Phase

[TPS_MANI_03025]{DRAFT} Client Timing configuration for a RequiredSomeipServiceInstance [The Client Timing is configurable with `SomeipSdClientServiceInstanceConfig` that is referenced in the role `sdClientConfig` by the `RequiredSomeipServiceInstance` for which the Timing is valid.](RS_MANI_00024)

The number of `SomeipSdClientServiceInstanceConfig` elements determine how many timers shall actually be used by the middleware to keep the randomized times. Via the reference `RequiredSomeipServiceInstance.sdClientConfig` each `RequiredSomeipServiceInstance` defines to which timer it is assigned.

Note that it is possible to define several `SomeipSdClientServiceInstanceConfig` elements with identical timing specification values in order to request several timer handling in the middleware.

If several `RequiredSomeipServiceInstance` share the same timer then the expiration of that timer will lead a combined sending of service discovery messages.

[TPS_MANI_03231]{DRAFT} Sharing timers for `RequiredSomeipServiceInstance` [If several `RequiredSomeipServiceInstances` point to the same `SomeipSdClientServiceInstanceConfig` in the role `sdClientConfig` then all of these `RequiredSomeipServiceInstances` will share the same timers for their timing behavior. This will lead to combining several service discovery entries in one service discovery message.] (*RS_MANI_00024*)

Class	<code>SomeipSdClientServiceInstanceConfig</code>			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	Client specific settings that are relevant for the configuration of SOME/IP Service-Discovery. Tags: atp.recommendedPackage=SomeipSdTimingConfigs			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
initialFindBehavior	InitialSdDelayConfig	0..1	aggr	Controls initial find behavior of clients.
priority	PositiveInteger	0..1	attr	This attribute defines the VLAN frame priority for Service Discovery messages that result from <code>RequiredSomeipServiceInstances</code> that are referncing this <code>SomeipSdClientServiceInstanceConfig</code> (Find, SubscribeEventGroup, StopSubscribeEventgroup). Values from 0 (best effort) to 7 (highest) are allowed.

Table 11.52: `SomeipSdClientServiceInstanceConfig`

[TPS_MANI_03026]{DRAFT} Initial Wait Phase configuration for a `RequiredSomeipServiceInstance` [The Initial Wait Phase for a `RequiredSomeipServiceInstance` is configured with the `initialFindBehavior` and the two attributes `initialDelayMinValue` and `initialDelayMaxValue`.

If a calculated random timer based on these min and max values expires the first `FindService` entry will be sent out.] (*RS_MANI_00024*)

When the calculated random timer expires and no `OfferService` is received the Repetition Phase will be entered.

[TPS_MANI_03027]{DRAFT} Repetition Phase configuration for a `RequiredSomeipServiceInstance` [The Repetition Phase for a `RequiredSomeipServiceInstance` is configured with the `initialFindBehavior` and the two attributes `initialRepetitionsMax` and `initialRepetitionsBaseDelay`.] (*RS_MANI_00024*)

If the Repetition Phase is entered, the Service Discovery waits the `initialRepetitionsBaseDelay` and sends an `FindService` entry.

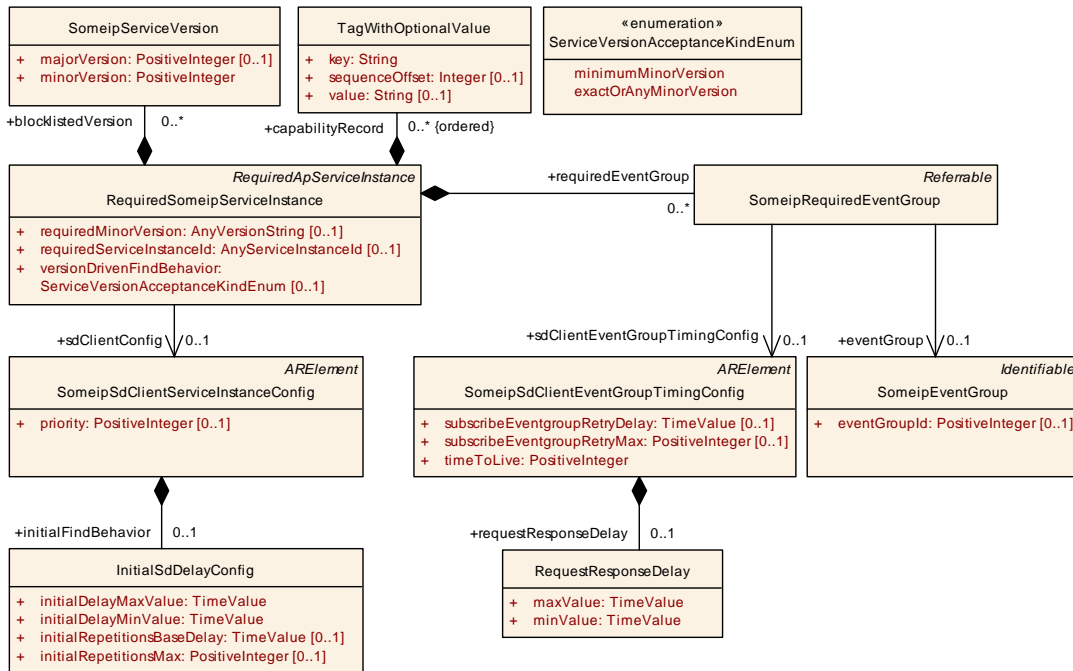


Figure 11.23: SOME/IP Service Discovery Client configuration settings

If the amount of sent FindService entries reaches `initialRepetitionsMax` and no OfferService is received the Main Phase will be entered. In the Main Phase no further FindService entries are sent by the client.

Figure 11.24 shows an example of the different SOME/IP phases on the Client side.

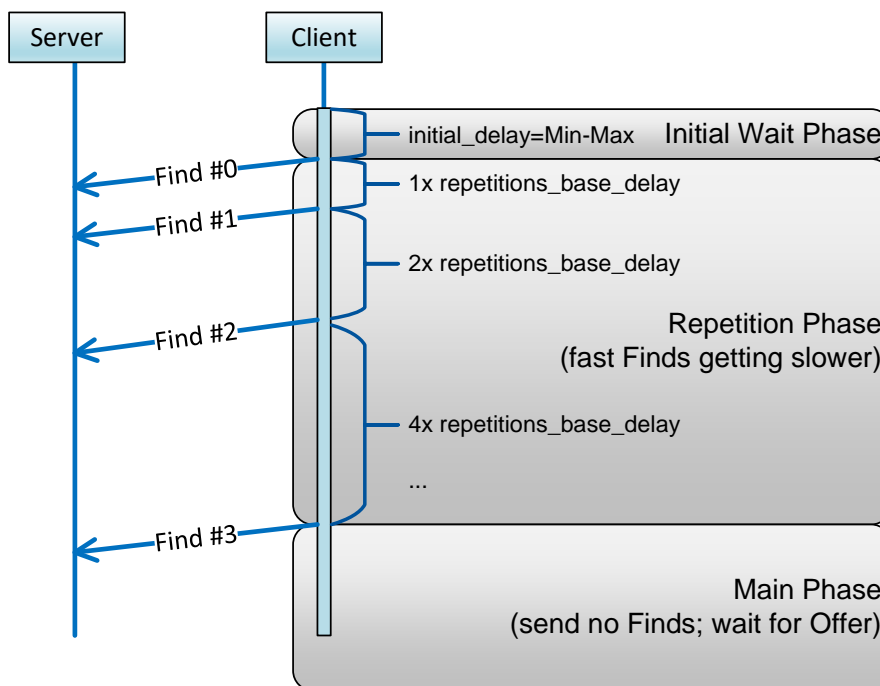


Figure 11.24: SOME/IP Client Timing example

SOME/IP allows for specifying additional information about the `RequiredSomeipServiceInstance` with the Capability Record that allows to transport arbitrary configuration strings (key/value pairs).

This allows to encode additional information like the name of a service or its configuration.

[TPS_MANI_03029]{DRAFT} Client Capability Records [A Capability Record (key/value pair) on the Client side is configurable with the `capabilityRecord` and the two attributes `key` and `value`.] (*RS_MANI_00024*)

11.3.1.2.4 Required Event Group

The `RequiredSomeipServiceInstance` aggregates a `SomeipRequiredEventGroup` in the role `requiredEventGroup` that allows to define service instance specific configuration settings for a `SomeipEventGroup`.

Class	SomeipRequiredEventGroup			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	The meta-class represents the ability to configure ServiceInstance related communication settings on the required side for each EventGroup separately.			
Base	<i>ARObject</i> , <i>Referrable</i>			
Aggregated by	<code>RequiredSomeipServiceInstance.requiredEventGroup</code>			
Attribute	Type	Mult.	Kind	Note
eventGroup	<code>SomeipEventGroup</code>	0..1	ref	Reference to the SomeipEventGroup in the System Manifest for which the ServiceInstance related Event Group settings are valid.
sdClientEventGroupTimingConfig	<code>SomeipSdClientEventGroupTimingConfig</code>	0..1	ref	Client Timing configuration settings that are EventGroup specific.

Table 11.53: SomeipRequiredEventGroup

[constr_10222]{DRAFT} Multiplicity of the reference in the role `SomeipRequiredEventGroup.sdClientEventGroupTimingConfig` [For each `SomeipRequiredEventGroup`, the reference in the role `sdClientEventGroupTimingConfig` shall exist **at the time when the creation of the manifest is finished.**] ()

Class	SomeipSdClientEventGroupTimingConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	This meta-class is used to specify configuration related to service discovery in the context of an event group on SOME/IP. Tags: atp.recommendedPackage=SomeipSdTimingConfigs			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>			
Aggregated by	<code>ARPackage.element</code>			





Class		SomeipSdClientEventGroupTimingConfig		
Attribute	Type	Mult.	Kind	Note
request ResponseDelay	RequestResponseDelay	0..1	aggr	The Service Discovery shall delay answers to unicast messages triggered by multicast messages (e.g. Subscribe Eventgroup after Offer Service).
subscribe Eventgroup RetryDelay	TimeValue	0..1	attr	This attribute defines the interval in seconds to re-trigger a subscription to a Eventgroup, if a retry to subscribe to a Eventgroup is configured (subscribeEventgroupRetryMax > 0).
subscribe Eventgroup RetryMax	PositiveInteger	0..1	attr	This attribute define the maximum counts of retries to subscribe to an Eventgroup. If the value is set to 0 no retry shall be done. If the value is set to 255 the retry shall be done as long as the Eventgroup is requested and no SubscribeEventGroupAck was received.
timeToLive	PositiveInteger	1	attr	Defines the time in seconds the subscription of this event is expected by the client. this value is sent from the client to the server in the SD-subscribeEvent message.

Table 11.54: SomeipSdClientEventGroupTimingConfig

[TPS_MANI_03030]{DRAFT} [SomeipSdClientEventGroupTimingConfig.timeToLive](#) for **SubscribeEventGroup Entries** [The lifetime of an event subscription is configurable with the [timeToLive](#) attribute of [SomeipSdClientEventGroupTimingConfig](#).

If the time that is configured by [timeToLive](#) expires, the event subscription is canceled.] ([RS_MANI_00024](#))

[TPS_MANI_03031]{DRAFT} **Clients [RequestResponseDelay](#) for received ServiceOffer entries** [The Client will delay the [SubscribeEventGroup](#) answer to a received [ServiceOffer](#) message by the configured [SomeipSdClientEventGroupTimingConfig.requestResponseDelay](#).

The actual delay will be randomly chosen between the [maxValue](#) and [minValue](#).] ([RS_MANI_00024](#))

11.3.1.2.5 [RequiredSomeipServiceInstance](#) related method call properties

[TPS_MANI_03156]{DRAFT} [RequiredSomeipServiceInstance](#) related configuration settings for **methods** [The class [SomeipMethodProps](#) that is aggregated by the [RequiredSomeipServiceInstance](#) in the role [methodRequestProps](#) allows specifying [RequiredSomeipServiceInstance](#) related configuration settings for a [method](#) request message. The [method](#) is defined in the [SomeipServiceInterfaceDeployment](#) referenced by the [RequiredSomeipServiceInstance](#) in the role [serviceInterfaceDeployment](#).] ([RS_MANI_00024](#))

[TPS_MANI_03159]{DRAFT} **Configuration of a data collection on a [RequiredSomeipServiceInstance](#) for transmission over UDP** [The attributes [udpCollectionBufferTimeout](#) and [udpCollectionTrigger](#) support the configuration

of a data collection of several messages for transmission over UDP. In the `RequiredSomeipServiceInstance` all `method` requests for which the `udpCollectionTrigger` is set to `never` will be collected in a buffer until a trigger arrives that starts the data transmission.

The following trigger options are supported:

- a message needs to be transmitted for which the `udpCollectionTrigger` is set to `always`.
- the `udpCollectionBufferTimeout` is reached for a message.
- the buffer size defined by the attribute `udpCollectionBufferSizeThreshold` is reached.

](RS_MANI_00024)

The modeling of the `RequiredSomeipServiceInstance`-related event-properties and method-properties is depicted in Figure 11.20.

11.3.1.3 Provided Service Instance with static remote peers

[TPS_MANI_03312] Static configuration of remote peer addresses for a `ProvidedSomeipServiceInstance` [AUTOSAR supports a static configuration of remote peers for a `ProvidedSomeipServiceInstance` that is mapped with a `SomeipServiceInstanceToMachineMapping` to an `ApApplicationEndpoint` with the `remoteUnicastConfig`.]()

If such `SomeipRemoteUnicastConfig` is referenced by the `SomeipServiceInstanceToMachineMapping` then the Service Discovery mechanism is not used and the address of the remote peers is retrieved from the configuration. This allows to establish a communication connection between the local address (defined by the `ApApplicationEndpoint` and the `NetworkEndpoint`) and the configured remote address that is defined by the referenced `SomeipRemoteUnicastConfig`.

Please note that a collection of remote peers can be defined if the `SomeipServiceInstanceToMachineMapping` references a `ProvidedSomeipServiceInstance` in the role `serviceInstance`. In this case a communication connection to each of the configured remote peer addresses will be established. The `ProvidedSomeipServiceInstance` will transmit event and field notifications to the address that is defined in the `SomeipRemoteUnicastConfig`.

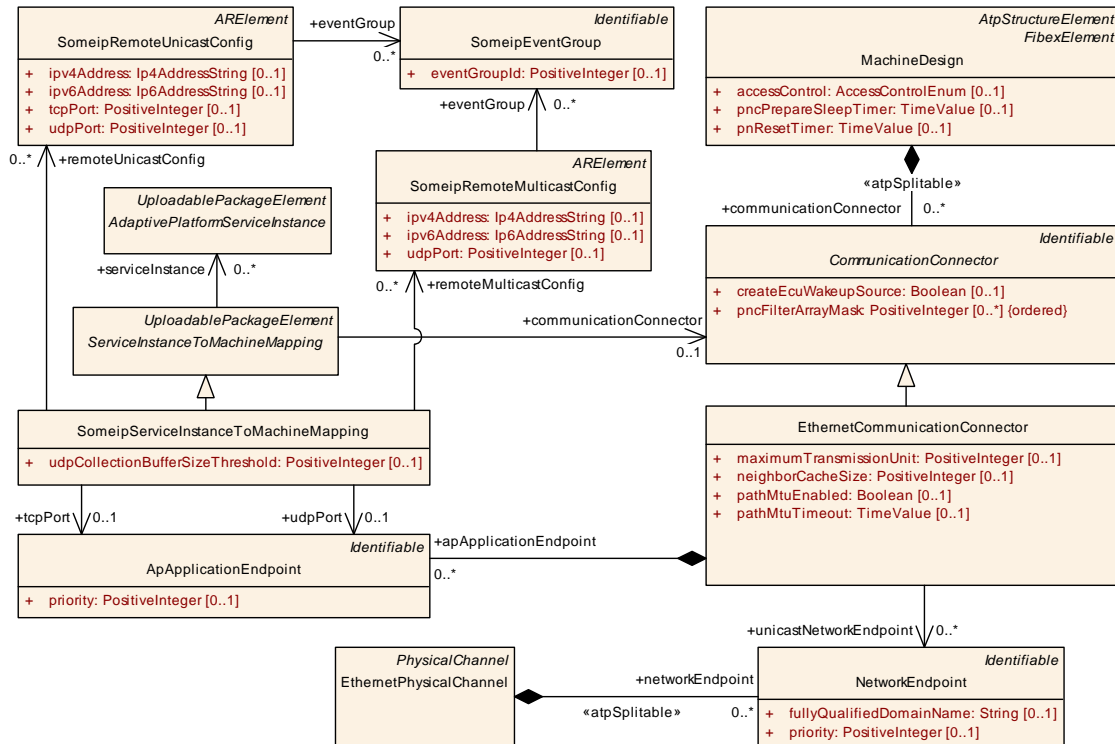


Figure 11.25: SomeipServiceInstanceToMachineMapping with static configured remote peers

Class	SomeipRemoteUnicastConfig			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceMapping			
Note	This meta-class is used to statically configure the remote peer's unicast address in case that a static service connection is used and only a single remote peer exists. Tags: atp.Status=candidate atp.recommendedPackage=SomeipRemoteUnicastConfigs			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
eventGroup	SomeipEventGroup	*	ref	Reference to the SomeipEventGroups this Someip RemoteUnicastConfig applies to. Tags: atp.Status=candidate
ipv4Address	Ip4AddressString	0..1	attr	This attribute defines the IPv4 address of the remote peer to allow a static service connection between Service Provider and Service Consumer. Tags: atp.Status=candidate
ipv6Address	Ip6AddressString	0..1	attr	This attribute defines the IPv6 address of the remote peer to allow a static service connection between Service Provider and Service Consumer. Tags: atp.Status=candidate





Class	SomeipRemoteUnicastConfig			
tcpPort	PositiveInteger	0..1	attr	This attribute defines the tcpPort of the remote peer to allow a static service connection between Service Provider and Service Consumer. Tags: atp.Status=candidate
udpPort	PositiveInteger	0..1	attr	This attribute defines the udpPort of the remote peer to allow a static service connection between Service Provider and Service Consumer. Tags: atp.Status=candidate

Table 11.55: SomeipRemoteUnicastConfig

[constr_5355] SomeipServiceInstanceToMachineMapping with configured remote peer addresses shall not mix ProvidedSomeipServiceInstances and RequiredSomeipServiceInstances [A `SomeipServiceInstanceToMachineMapping` that contains a reference to a `SomeipRemoteUnicastConfig` with the `remoteUnicastConfig` shall not reference:

- `ProvidedSomeipServiceInstances` in the role `serviceInstance` and
- `RequiredSomeipServiceInstances` in the role `serviceInstance` at the same time.

]()

[TPS_MANI_03313] Semantics of SomeipRemoteUnicastConfig.eventGroup reference [For each remote peer that is specified with the `SomeipRemoteUnicastConfig` it is possible to statically define the `SomeipEventGroups` that the remote peer is interested in with the `SomeipRemoteUnicastConfig.eventGroup` reference.]()

With the `SomeipRemoteUnicastConfig.eventGroup` information each service provider has the knowledge from the configuration to which service consumers which event notifications need to be transmitted.

The following example in [Figure 11.26](#) shows the setup of a Service Provider with two statically defined remote peers. The `ServiceInstanceToMachineMapping` maps two `ProvidedSomeipServiceInstances` to `ApApplicationEndpoints`: Camera and Radar_1. Two remote peers are referenced by the same `ServiceInstanceToMachineMapping` in the role `remoteUnicastConfig`: `RemotePeer1` and `RemotePeer2`. `RemotePeer1` is subscribed to EG2 and EG3 of ServiceInstance Radar_1. `RemotePeer2` is subscribed to EG1 and EG2 of ServiceInstance Radar_1.

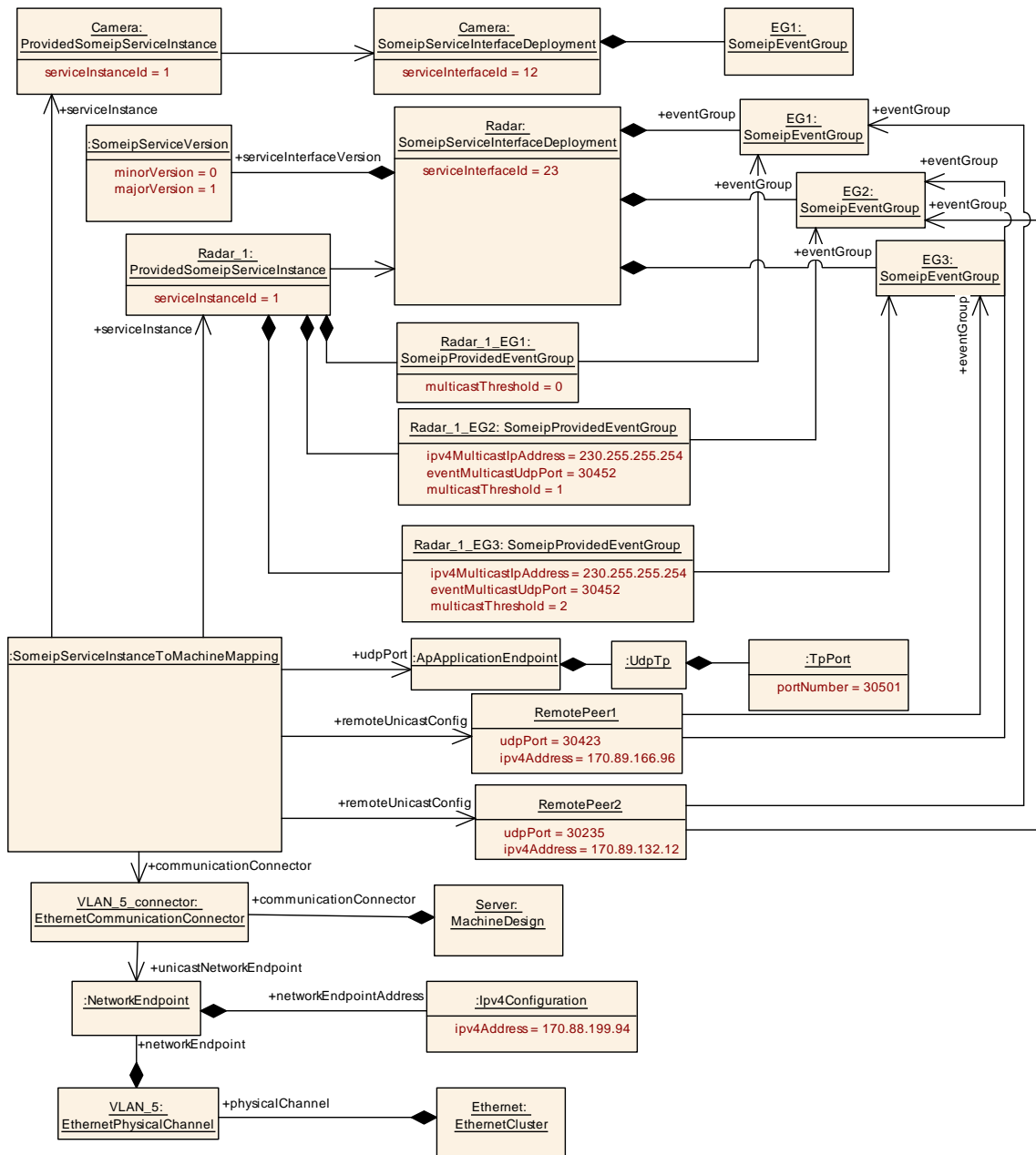


Figure 11.26: Example of a Service Provider with static configured remote peers

11.3.1.4 Required Service Instance with static remote peers

[TPS_MANI_03314] Static configuration of a remote peer address for a **RequiredSomeipServiceInstance** [AUTOSAR supports a static configuration of a remote peer for a **RequiredSomeipServiceInstance** that is mapped with a **SomeipServiceInstanceToMachineMapping** to an **ApApplicationEndpoint** with the `remoteUnicastConfig`.] ()

With the static configuration of a remote peer the `RequiredSomeipServiceInstance` knows the address of the `ProvidedSomeipServiceInstance` and is able to call methods of the provided service.

[constr_5356] `RequiredSomeipServiceInstance` is allowed to have only a single statically configured remote peer as service provider [A `SomeipServiceInstanceToMachineMapping` that contains references to a `RequiredSomeipServiceInstance` with the `serviceInstance` is allowed to reference only a single `SomeipRemoteUnicastConfig` in the role `remoteUnicastConfig`.]()

Since the service provider may transport event notification via IP Multicast, the service consumer needs to know the IP Multicast groups it needs to join:

[TPS_MANI_03315] Semantics of `SomeipRemoteMulticastConfig` [It is possible to statically define the IP Multicast addresses that the `RequiredSomeipServiceInstances` shall listen to with the `SomeipRemoteMulticastConfig` element that is referenced in the `remoteMulticastConfig` role by the `SomeipServiceInstanceToMachineMapping` that references the `RequiredSomeipServiceInstances` in the role `serviceInstance`.]()

Class	<code>SomeipRemoteMulticastConfig</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceMapping			
Note	This meta-class is used to statically configure the remote peer's multicast address. Tags: atp.Status=candidate atp.recommendedPackage=RemoteMulticastConfigs			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
eventGroup	SomeipEventGroup	*	ref	Reference to the <code>SomeipEventGroups</code> this <code>SomeipRemoteMulticastConfig</code> applies to. Tags: atp.Status=candidate
ipv4Address	<code>Ip4AddressString</code>	0..1	attr	This attribute defines the multicast IPv4 address to allow a static service connection between Service Provider and Service Consumers. Tags: atp.Status=candidate
ipv6Address	<code>Ip6AddressString</code>	0..1	attr	This attribute defines the multicast IPv6 address to allow a static service connection between Service Provider and Service Consumers. Tags: atp.Status=candidate
udpPort	<code>PositiveInteger</code>	0..1	attr	This attribute defines the <code>udpPort</code> used for the multicast communication. Tags: atp.Status=candidate

Table 11.56: `SomeipRemoteMulticastConfig`

[TPS_MANI_03316] Semantics of `SomeipRemoteMulticastConfig.eventGroup` [For each Multicast group that is specified with the `SomeipRemoteMulticastConfig`, it is possible to statically define the `eventGroups` that include events that may be transmitted from the configured remote peer to the configured IP Multicast address.]()

[constr_5357] SomeipRemoteMulticastConfig shall only be used on required side [Only a `SomeipServiceInstanceToMachineMapping` that contains references to one or several `RequiredSomeipServiceInstances` with the `serviceInstance` role is allowed to reference one or several `SomeipRemoteMulticastConfigs` in the role `remoteUnicastConfig`.]()

The following example in Figure 11.27 shows the setup of a Service Consumer with a statically defined remote peer. The `ServiceInstanceToMachineMapping` maps the `Radar_CSI1` `RequiredSomeipServiceInstance` to an `ApApplicationEndpoint`. The remote peer is referenced by the same `ServiceInstanceToMachineMapping` in the role `remoteUnicastConfig`. The service consumer may receive event notifications of EG2 and EG3 over the multicast address and therefore the `ServiceInstanceToMachineMapping` references the `SomeipRemoteMulticastConfig`.

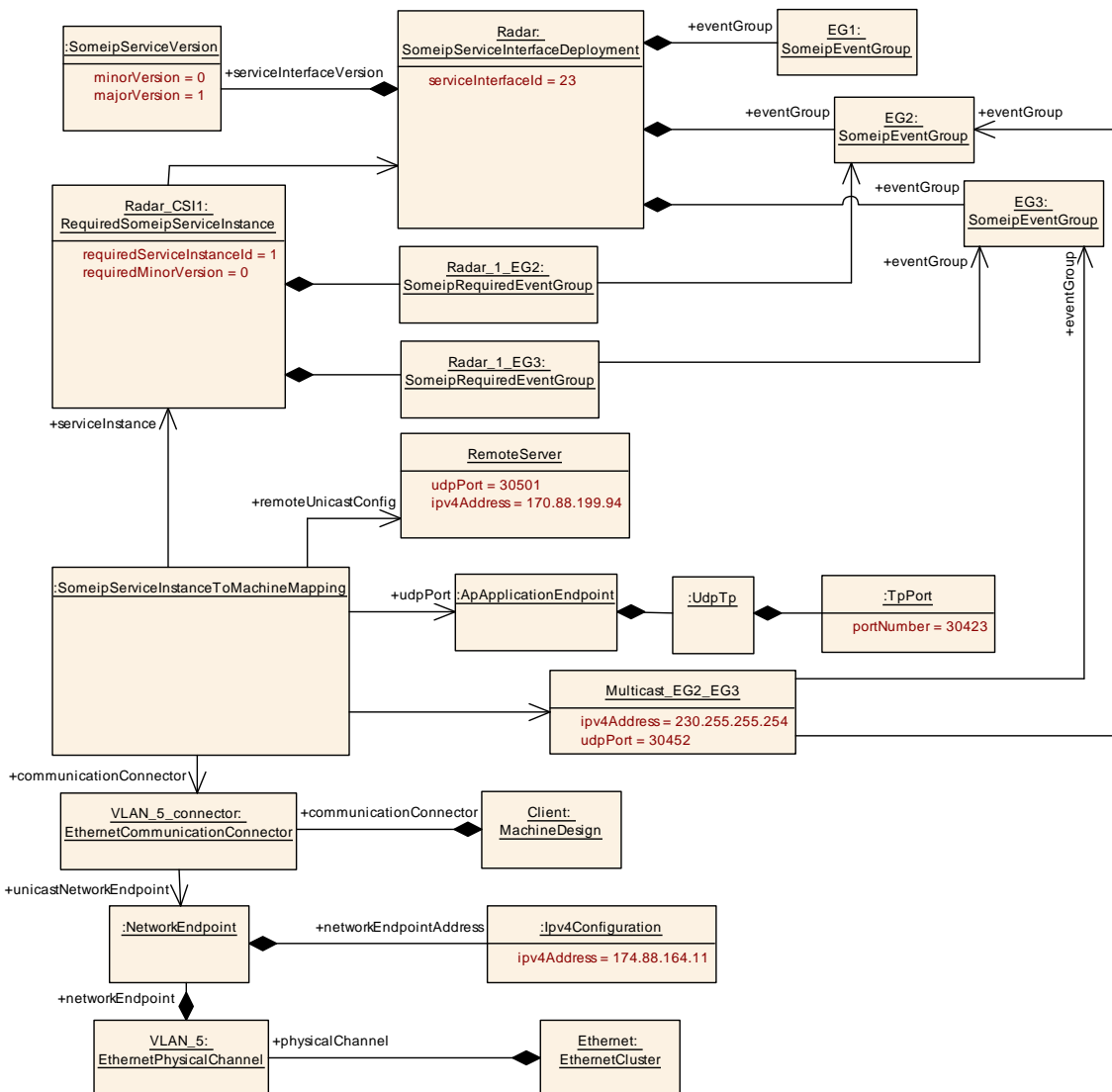


Figure 11.27: Example of a Service Consumer with static configured remote peer

11.3.2 DDS Service Instance Deployment

In the case of DDS used as the transport layer the derived meta-classes are [DdsProvidedServiceInstance](#) or [DdsRequiredServiceInstance](#). These meta-classes also carry attributes that apply for the service discovery on DDS.

Two discovery protocols are supported by the DDS Network binding:

- Service Instance announcement via purpose-specific formatting of the Domain Participant USER_DATA QoS policy
- Service Instance announcement through a purpose-specific discovery Topic.

For details on these two protocols and their implications, please refer to section 7.7.3 "DDS Network Binding" in [9].

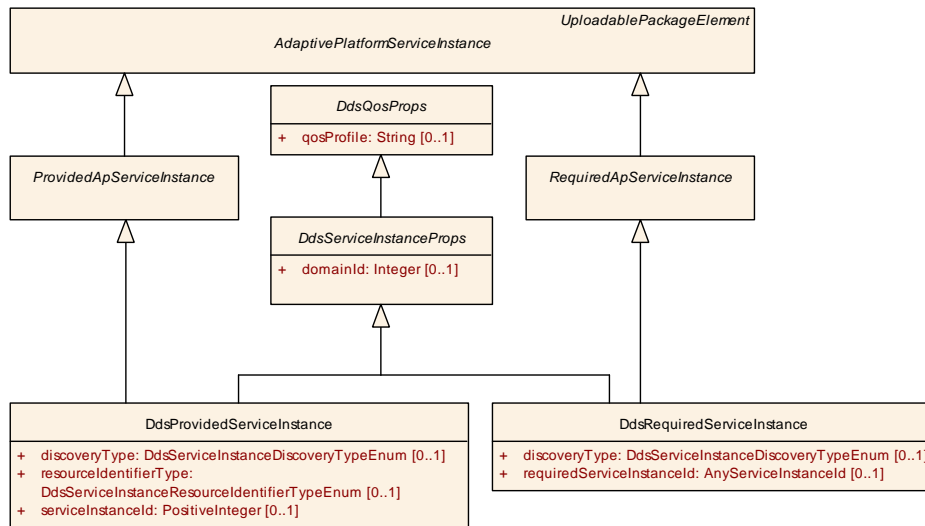


Figure 11.28: Dds Service Instances

Class	<i>DdsQosProps</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	QoS configuration properties for the DDS entities associated with an event, method, or field provided by or requested from a Service Instance using DDS as the underlying network binding.			
Base	<i>ARObject</i>			
Subclasses	DdsEventQosProps , DdsFieldQosProps , DdsServiceInstanceProps			
Attribute	Type	Mult.	Kind	Note
qosProfile	String	0..1	attr	Identifies a group of QoS Policies that apply to the DDS entities associated with the event, method, field, or the service instance.

Table 11.57: DdsQosProps

Class	<i>DdsServiceInstanceProps</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	Common configuration properties for the DDS entities provided by or requested from a Service Instance using DDS as the underlying network binding.			
Base	<i>ARObject</i> , <i>DdsQosProps</i>			
Subclasses	<i>DdsProvidedServiceInstance</i> , <i>DdsRequiredServiceInstance</i>			
Attribute	Type	Mult.	Kind	Note
domainId	Integer	0..1	attr	This attribute identifies the DDS Domain the Service Instance shall join.

Table 11.58: DdsServiceInstanceProps

[constr_10223]{DRAFT} Multiplicity of attribute *DdsServiceInstanceProps.domainId* [For each *DdsServiceInstanceProps*, the attribute *domainId* shall exist at the time when the creation of the manifest is finished.]()

11.3.2.1 Provided DDS Service Instance

[TPS_MANI_03527]{DRAFT} Definition of *DdsProvidedServiceInstance* [The *DdsProvidedServiceInstance* configures the Service to join a DDS Domain with the *domainId* attribute, and to instantiate the underlying DDS entities according to a QoS profile with the *qosProfile* attribute, using the discovery protocol defined by *discoveryType* and resource identification scheme defined by the *resourceIdentifierType* attribute. Moreover, it assigns an Instance ID to the Service for deployment with the *serviceInstanceId* attribute.] (*RS_MANI_00038*)

[TPS_MANI_03650]{DRAFT} Definition of *DdsServiceInstanceResourceIdentifierTypeEnum* [The resource identification schemes enumerated by *DdsServiceInstanceResourceIdentifierTypeEnum* in *DdsProvidedServiceInstance.resourceIdentifierType* attribute define the various combinations of DDS features through which Provided Service Interface Instances can advertise, be bound, and communicate on a given DDS domain, as defined by section 7.7.3 "DDS Network Binding" of [9].] (*RS_MANI_00038*)

[constr_3528]{DRAFT} Value range of *domainId* [The value of *domainId* at *DdsProvidedServiceInstance* and *domainId* at *DdsRequiredServiceInstance* shall be in the range of a signed 32-bit integer.]()

[constr_3529]{DRAFT} Value range of *serviceInstanceId* [The value of *serviceInstanceId* shall be in the range of 0..65535.]()

[constr_3541]{DRAFT} *qosProfile* mandatory for *DdsProvidedServiceInstance* [The attribute *qosProfile* shall be defined for every *DdsProvidedServiceInstance* at the time when manifest creation is finished.]()

[constr_3645]{DRAFT} *discoveryType* mandatory for *DdsProvidedServiceInstance* [The attribute *discoveryType* shall be defined for every *DdsProvidedServiceInstance* at the time when manifest creation is finished.]()

[constr_3646]{DRAFT} **resourceIdentifierType** mandatory for **DdsProvidedServiceInstance** [The attribute `resourceIdentifierType` shall be defined for every `DdsProvidedServiceInstance` at the time when manifest creation is finished.]()

[constr_3647]{DRAFT} **resourceIdentifierType** value for **USER_DATA QoS-based discovery** [If the value of `discoveryType` is `domainParticipantUserDataQos`, for a given `DdsProvidedServiceInstance`, the only valid value for attribute `resourceIdentifierType` is `partition`.]()

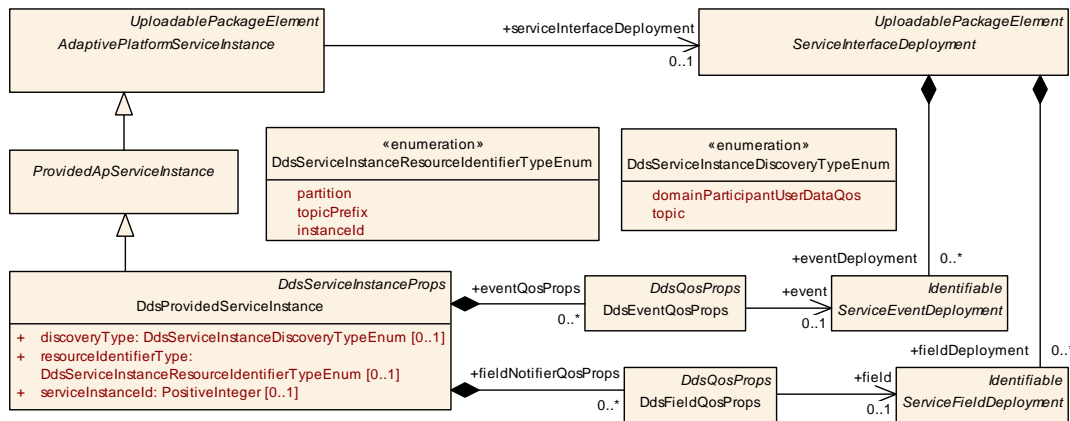


Figure 11.29: Provided Dds Service Instances

[constr_3564]{DRAFT} **Consistency between DDS Service Interface Deployment and Provided DDS Service Instance** [Transport attributes `DdsServiceInterfaceDeployment.transportProtocol` and `DdsEventDeployment.transportProtocol` shall be consistent with DDS profiles generated and selected by the `DdsQosProps` component of `DdsProvidedServiceInstance`, `DdsFieldQosProps`, and `DdsEventQosProps`.]()

Class	DdsProvidedServiceInstance			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class represents the ability to describe the existence and configuration of a provided service instance in a concrete implementation on top of DDS. Tags: atp.recommendedPackage=ServiceInstances			
Base	<i>ARElement, ARObjct, AdaptivePlatformServiceInstance, CollectableElement, DdsQosProps, DdsServiceInstanceProps, Identifiable, MultilanguageReferrable, PackageableElement, ProvidedApServiceInstance, Referrable, UploadablePackageElement</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
discoveryType	DdsServiceInstanceDiscoveryTypeEnum	0..1	attr	Discovery protocol.
eventQosProps	DdsEventQosProps	*	aggr	List of configuration properties for the Events that are provided by the Service Instance.
fieldNotifierQosProps	DdsFieldQosProps	*	aggr	List of configuration properties for Field notifiers that are provided by the Service Instance.





Class	DdsProvidedServiceInstance			
resourceIdentifierType	DdsServiceInstanceResourceIdentifierTypeEnum	0..1	attr	Type of resource identification scheme.
serviceInstanceId	PositiveInteger	0..1	attr	Identification number that is used by DDS to identify DomainParticipants associated with an instance of the service.

Table 11.59: DdsProvidedServiceInstance

Enumeration	DdsServiceInstanceDiscoveryTypeEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment
Note	Supported discovery schemes for DDS Service Instances.
Aggregated by	DdsProvidedServiceInstance.discoveryType , DdsRequiredServiceInstance.discoveryType
Literal	Description
domainParticipantUserDataQos	The USER_DATA QoS policy is used to advertise and discover available Service Instances hosted by each Domain Participant. Tags: atp.EnumerationLiteralIndex=0
topic	A purpose-specific Topic is used to convey availability of Service Instances and how to bind against them. Tags: atp.EnumerationLiteralIndex=1

Table 11.60: DdsServiceInstanceDiscoveryTypeEnum

Enumeration	DdsServiceInstanceResourceIdentifierTypeEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment
Note	Supported Resource Identification schemes for DDS Service Instances.
Aggregated by	DdsProvidedServiceInstance.resourceIdentifierType
Literal	Description
instanceId	In-band instance identification fields are used to discriminate samples related to specific Service Instances sharing the same DDS Topics <ul style="list-style-type: none"> Partitions: - Topics: ara.com://services/<InterfaceId>/<Major>.<<Minor>/<TopicName> Tags: atp.EnumerationLiteralIndex=2
partition	The DDS PARTITION QoS policy is used to isolate DDS Topics related to specific Service Instances <ul style="list-style-type: none"> Partitions: ara.com://services/<InterfaceId>/<InstanceId> Topics: ara.com://services/<InterfaceId>/<Major>.<Minor>/<TopicName> Tags: atp.EnumerationLiteralIndex=0
topicPrefix	Unique prefixes are assigned to DDS Topics related to specific Service Instances <ul style="list-style-type: none"> Partitions: - Topics: ara.com://services/<InterfaceId>/<InstanceId>/<TopicName> Tags: atp.EnumerationLiteralIndex=1

Table 11.61: DdsServiceInstanceResourceIdentifierTypeEnum

[TPS_MANI_03528]{DRAFT} **Definition of [DdsProvidedServiceInstance.eventQosProps](#)** [The [DdsProvidedServiceInstance.eventQosProps](#) configures the DDS entities associated with the [event](#) according to a QoS Profile specified with the [qosProfile](#) attribute.] ([RS_MANI_00038](#))

[TPS_MANI_03531]{DRAFT} qosProfile of DdsProvidedServiceInstance.eventQosProps is optional [The attribute `qosProfile` of `DdsProvidedServiceInstance.eventQosProps` is optional; if `qosProfile` is not defined, the underlying DDS entities shall be configured according to the `qosProfile` attribute of the parent `DdsProvidedServiceInstance`.] ([RS_MANI_00038](#))

Class	DdsEventQosProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	Configuration properties of the Event using DDS as the underlying network binding.			
Base	<i>ARObject</i> , <i>DdsQosProps</i>			
Aggregated by	<code>DdsProvidedServiceInstance.eventQosProps</code> , <code>DdsRequiredServiceInstance.eventQosProps</code>			
Attribute	Type	Mult.	Kind	Note
event	ServiceEvent Deployment	0..1	ref	Reference to an event that is provided.

Table 11.62: DdsEventQosProps

[constr_10224]{DRAFT} Multiplicity of reference in the role DdsEventQosProps.event [For each `DdsEventQosProps`, the reference in the role `event` shall exist **at the time when the creation of the manifest is finished**.] ()

[TPS_MANI_03561]{DRAFT} Definition of DdsProvidedServiceInstance.fieldNotifierQosProps [The `DdsProvidedServiceInstance.fieldNotifierQosProps` configures the DDS entities associated with the `field` according to a QoS Profile specified with the `qosProfile` attribute.] ([RS_MANI_00038](#))

[TPS_MANI_03562]{DRAFT} qosProfile of DdsProvidedServiceInstance.fieldNotifierQosProps is optional [The attribute `qosProfile` of `DdsProvidedServiceInstance.fieldNotifierQosProps` is optional; if `qosProfile` is not defined, the underlying DDS entities shall be configured according to the `qosProfile` attribute of the parent `DdsProvidedServiceInstance`.] ([RS_MANI_00038](#))

Class	DdsFieldQosProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	Configuration properties of the Field interaction when using DDS as the underlying network binding.			
Base	<i>ARObject</i> , <i>DdsQosProps</i>			
Aggregated by	<code>DdsProvidedServiceInstance.fieldNotifierQosProps</code> , <code>DdsRequiredServiceInstance.fieldNotifierQosProps</code>			
Attribute	Type	Mult.	Kind	Note
field	ServiceField Deployment	0..1	ref	Reference to the field.

Table 11.63: DdsFieldQosProps

[constr_10225]{DRAFT} Multiplicity of reference in the role DdsFieldQosProps.field [For each `DdsFieldQosProps`, the reference in the role `field` shall exist **at the time when the creation of the manifest is finished**.] ()

11.3.2.2 Required DDS Service Instance

[TPS_MANI_03529]{DRAFT} **Definition of DdsRequiredServiceInstance** [The *DdsRequiredServiceInstance* configures the Client to join a DDS Domain with the *domainId* attribute, and to instantiate the underlying DDS entities according to a QoS Profile with the *qosProfile* attribute, using the discovery protocol defined by *discoveryType*. Optionally, the *requiredServiceInstanceId* attribute allows a Client to search for a specific Instance ID of the serviceInterface.] (*RS_MANI_00038*)

[constr_3542]{DRAFT} **qosProfile mandatory for DdsRequiredServiceInstance** [The attribute *qosProfile* shall be defined for every *DdsRequiredServiceInstance* at the time when manifest creation is finished.] ()

[constr_3648]{DRAFT} **discoveryType mandatory for DdsRequiredServiceInstance** [The attribute *discoveryType* shall be defined for every *DdsRequiredServiceInstance* at the time when manifest creation is finished.] ()

[constr_3565]{DRAFT} **Consistency between DDS Service Interface Deployment and Required DDS Service Instance** [Transport attributes *DdsServiceInterfaceDeployment.transportProtocol* and *DdsEventDeployment.transportProtocol* shall be consistent with DDS profiles generated and selected by the *DdsQosProps* component of *DdsRequiredServiceInstance*, *DdsFieldQosProps*, and *DdsEventQosProps*.] ()

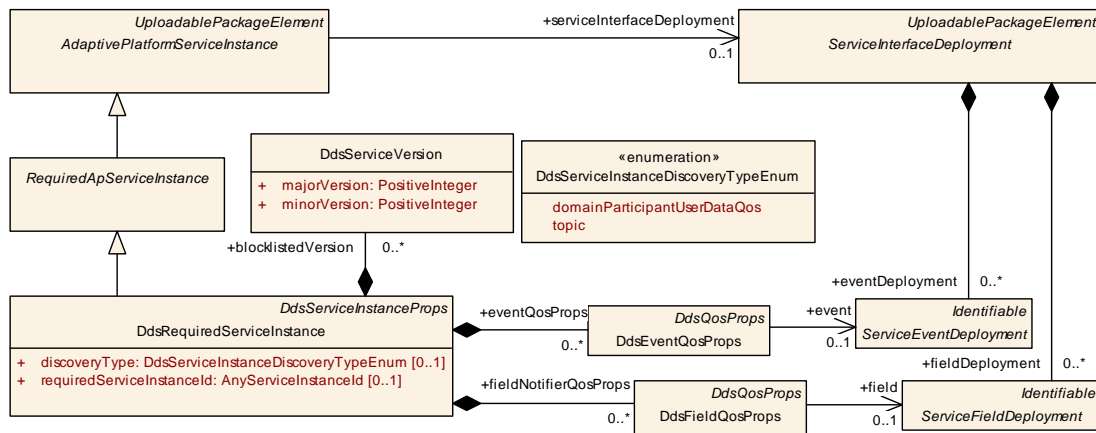


Figure 11.30: Required Dds Service Instances

Class	DdsRequiredServiceInstance
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment
Note	This meta-class represents the ability to describe the existence and configuration of a required service instance in a concrete implementation on top of DDS. Tags: atp.recommendedPackage=ServiceInstances
Base	<i>ARElement</i> , <i>ARObject</i> , <i>AdaptivePlatformServiceInstance</i> , <i>CollectableElement</i> , <i>DdsQosProps</i> , <i>DdsServiceInstanceProps</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i> , <i>RequiredApServiceInstance</i> , <i>UploadablePackageElement</i>
Aggregated by	<i>ARPackage.element</i>





Class	DdsRequiredServiceInstance			
Attribute	Type	Mult.	Kind	Note
blocklistedVersion	DdsServiceVersion	*	aggr	Collection of blocklisted versions.
discoveryType	DdsServiceInstanceDiscoveryTypeEnum	0..1	attr	Discovery protocol.
eventQosProps	DdsEventQosProps	*	aggr	List of configuration properties for the Events that are required by the Service Instance.
fieldNotifierQosProps	DdsFieldQosProps	*	aggr	List of configuration properties for Field notifiers that are required by the Service Instance.
requiredServiceInstanceid	AnyServiceInstanceid	0..1	attr	This attribute represents the ability to describe the required service instance ID.

Table 11.64: DdsRequiredServiceInstance

[TPS_MANI_03530]{DRAFT} **Definition of [DdsRequiredServiceInstance.eventQosProps](#)** [The [DdsRequiredServiceInstance.eventQosProps](#) configures the DDS entities responsible for subscribing to an [event](#) according to a QoS Profile specified with the [qosProfile](#) attribute.] ([RS_MANI_00038](#))

[TPS_MANI_03532]{DRAFT} **[qosProfile](#) of [DdsRequiredServiceInstance.eventQosProps](#) is optional** [The attribute [qosProfile](#) of [DdsRequiredServiceInstance.eventQosProps](#) is optional; if [qosProfile](#) is not defined, the underlying DDS entities shall be configured according to the [qosProfile](#) attribute of the parent [DdsRequiredServiceInstance](#).] ([RS_MANI_00038](#))

[TPS_MANI_03567]{DRAFT} **Definition of [DdsRequiredServiceInstance.fieldNotifierQosProps](#)** [The [DdsRequiredServiceInstance.fieldNotifierQosProps](#) configures the DDS entities associated with the [field](#) according to a QoS Profile specified with the [qosProfile](#) attribute.] ([RS_MANI_00038](#))

[TPS_MANI_03568]{DRAFT} **[qosProfile](#) of [DdsRequiredServiceInstance.fieldNotifierQosProps](#) is optional** [The attribute [qosProfile](#) of [DdsRequiredServiceInstance.fieldNotifierQosProps](#) is optional; if [qosProfile](#) is not defined, the underlying DDS entities shall be configured according to the [qosProfile](#) attribute of the parent [DdsRequiredServiceInstance](#).] ([RS_MANI_00038](#))

11.3.2.3 DDS Service Instance to Machine mapping

The [DdsServiceInstanceToMachineMapping](#) defines on which network / VLAN the DDS communication shall be deployed.

[TPS_MANI_03533]{DRAFT} **[DdsServiceInstanceToMachineMapping](#)** [The [DdsServiceInstanceToMachineMapping](#) defines for a specific [serviceInstance](#) (either [DdsProvidedServiceInstance](#) or [DdsRequiredServiceInstance](#)) on which network the communication shall be done using the reference [communicationConnector](#) to [CommunicationConnector](#).] ([RS_MANI_00038](#))

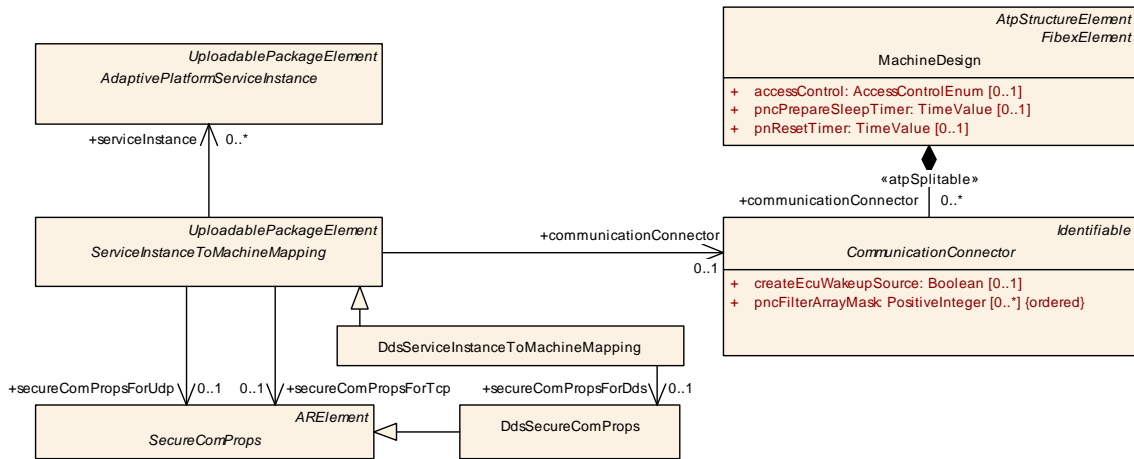


Figure 11.31: Dds Service Instance to Machine mapping

[constr_3684]{DRAFT} Mutual exclusivity of Secure Communication Properties [The attributes `ServiceInstanceToMachineMapping.secOcComPropsForMulticast` and `DdsServiceInstanceToMachineMapping.secureComPropsForDds` are mutually exclusive, meaning zero or just one of them shall be set depending on whether no security, SecOC, or DDS Security is chosen as data-level security (optionally) above transport-level security **at the time when the creation of the manifest is finished.**]()

Class	DdsServiceInstanceToMachineMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceMapping			
Note	This meta-class allows to map DdsServiceInstances to a CommunicationConnector of a Machine. Tags: atp.recommendedPackage=ServiceInstanceToMachineMappings			
Base	<i>ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, ServiceInstanceToMachineMapping, UploadablePackageElement</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
secureComPropsForDds	DdsSecureComProps	0..1	ref	Reference to SecureComProps applicable to the service instance.

Table 11.65: DdsServiceInstanceToMachineMapping

11.3.3 User Defined Service Instance Deployment

[TPS_MANI_03032]{DRAFT} Description of middleware technologies not standardized by AUTOSAR [The elements `ProvidedUserDefinedServiceInstance` and `RequiredUserDefinedServiceInstance` can be used to describe alternative middleware technologies that are not standardized by AUTOSAR.] (*RS_MANI_00014*)

Please note that both elements `ProvidedUserDefinedServiceInstance` and `RequiredUserDefinedServiceInstance` are `Identifiable` and therefore are able to describe special data (`sdg`) which is not represented by the standard model.

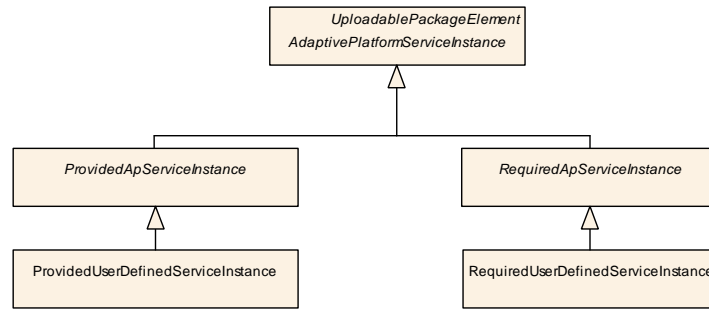


Figure 11.32: User Defined Service Instance Deployment

Class	ProvidedUserDefinedServiceInstance			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class represents the ability to describe the existence and configuration of a provided service instance in a concrete implementation that is not standardized by AUTOSAR. Tags: atp.recommendedPackage=ServiceInstances			
Base	ARElement , ARObject , AdaptivePlatformServiceInstance , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , ProvidedApServiceInstance , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 11.66: ProvidedUserDefinedServiceInstance

Class	RequiredUserDefinedServiceInstance			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This meta-class represents the ability to describe the existence and configuration of a required service instance in a concrete implementation that is not standardized by AUTOSAR. Tags: atp.recommendedPackage=ServiceInstances			
Base	ARElement , ARObject , AdaptivePlatformServiceInstance , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , RequiredApServiceInstance , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 11.67: RequiredUserDefinedServiceInstance

11.3.4 Service Deployment Relations

The meta-model is set up in a way that it is in general possible to create a relation between different sub-classes of

- [ServiceInterfaceDeployment](#)
- [AdaptivePlatformServiceInstance](#)
- [ServiceInstanceToMachineMapping](#)

For example, from the formal point of view, it would be possible to let a `UserDefinedServiceInstanceToMachineMapping` reference a `DdsProvidedServiceInstance` that in turn references a `SomeipServiceInterfaceDeployment`. But it is obviously questionable whether such a combination makes sense in a real-world model.

The consequence of the modeling is therefore that the possible combinations of the three mentioned meta-classes need to be regulated by a constraint.

[constr_3641]{DRAFT} Allowed combinations of `ServiceInterfaceDeployment`, `AdaptivePlatformServiceInstance`, `ServiceInstanceToMachineMapping` [

	<code>DdsProvidedServiceInstance</code>	<code>ProvidedSomeipServiceInstance</code>	<code>ProvidedUserDefinedServiceInstance</code>	<code>DdsRequiredServiceInstance</code>	<code>RequiredSomeipServiceInstance</code>	<code>RequiredUserDefinedServiceInstance</code>
<code>DdsServiceInterfaceDeployment</code>	Yes	No	Yes	Yes	No	Yes
<code>SomeipServiceInterfaceDeployment</code>	No	Yes	Yes	No	Yes	Yes
<code>UserDefinedServiceInterfaceDeployment</code>	No	No	Yes	No	No	Yes
<code>DdsServiceInstanceToMachineMapping</code>	Yes	No	No	Yes	No	No
<code>SomeipServiceInstanceToMachineMapping</code>	No	Yes	No	No	Yes	No
<code>UserDefinedServiceInstanceToMachineMapping</code>	No	Yes	Yes	No	Yes	Yes

]()

11.4 EndToEndProtection

AUTOSAR supports the protection of `events`, `methods`, `Field` `notifiers`, `Field` `get` `methods` and `Field` `set` `methods` with E2E Profiles that are defined in the E2E Communication Protection Library [34].

[TPS_MANI_03127]{DRAFT} Usage of `End2EndEventProtectionProps` [The `End2EndEventProtectionProps` element is used to define `event` specific E2E configuration settings in the context of an `AdaptivePlatformServiceInstance`.] (*RS_MANI_00028*)

Please note that the E2E protection of a field `notifier` is possible with the `End2EndEventProtectionProps.event` reference since each specific `ServiceFieldDeployment` element aggregates a `ServiceEventDeployment` in the role `notifier`. If such an aggregated `ServiceEventDeployment` is referenced with the `End2EndEventProtectionProps.event` reference the E2E protection settings are valid for the `notifier` that is embedded by the `ServiceFieldDeployment`.

Since the `End2EndEventProtectionProps` element is aggregated by the abstract `AdaptivePlatformServiceInstance` it can be used to describe the End-to-End protection on specific derived classes like `ProvidedSomeipServiceInstance` or `RequiredSomeipServiceInstance` that fit the underlying middleware.

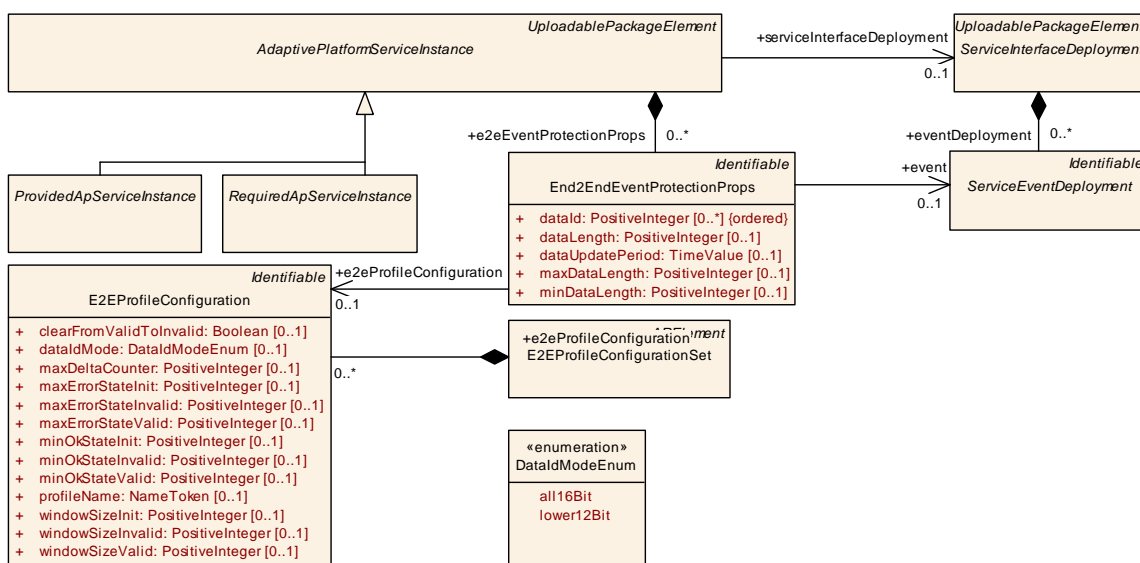


Figure 11.33: E2E EventProtection

With this approach it is possible to define different End-to-End protection settings for different used transport layer mechanisms in case of Multi-Binding.

[TPS_MANI_03228]{DRAFT} Usage of `End2EndMethodProtectionProps` [The `End2EndMethodProtectionProps` element is used to define `method` specific E2E configuration settings in the context of an `AdaptivePlatformServiceInstance`.] ([RS_MANI_00028](#))

Please note that the E2E protection of field `get` and `set` methods is possible with the `End2EndMethodProtectionProps.method` reference since each specific `ServiceFieldDeployment` element is allowed to aggregate a `ServiceMethodDeployment` in the role `get` and/or `set`.

If such an aggregated `ServiceMethodDeployment` is referenced with the `End2EndMethodProtectionProps.method` reference the E2E protection settings are valid for the `get` or `set` method that is embedded by the `ServiceFieldDeployment`.

[TPS_MANI_03129]{DRAFT} E2E profile [The E2E profile is defined by `E2EProfileConfiguration.profileName`.] ([RS_MANI_00028](#))

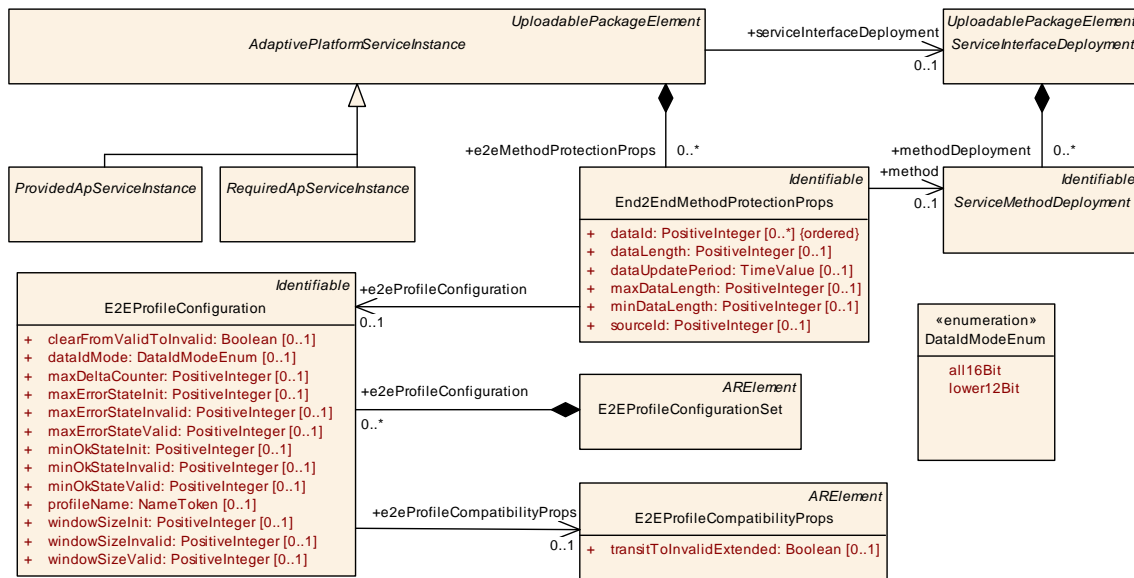


Figure 11.34: E2E MethodProtection

[TPS_MANI_03130]{DRAFT} **Standardized values of the attribute `E2EProfileConfiguration.profileName`** [The `E2EProfileConfiguration.profileName` that is referenced by an `End2EndEventProtectionProps` or by an `End2EndMethodProtectionProps` can have the following values that are standardized by AUTOSAR: `PROFILE_04`, `PROFILE_05`, `PROFILE_06`, `PROFILE_07`, `PROFILE_08`, `PROFILE_11`, `PROFILE_22`, `PROFILE_04m`, `PROFILE_07m`, `PROFILE_44`, `PROFILE_08m`, and `PROFILE_44m`.] (*RS_MANI_00028*)

[TPS_MANI_03131]{DRAFT} **Non-Standardized values of attribute `E2EProfileConfiguration.profileName`** [The values for the `profileName` of `E2EProfileConfiguration` mentioned in [TPS_MANI_03130] are standardized and reserved for being used in the way the AUTOSAR standard foresees.

`PROFILE_01` and `PROFILE_02` are also reserved by AUTOSAR but excluded for usage on the *AUTOSAR adaptive Platform*. In addition, it is positively possible to use other than the standardized values for the `profileName`.] (*RS_MANI_00028*)

[TPS_MANI_03128]{DRAFT} **Usage of same `End2EndEventProtectionProps.dataId` in case of Multi-Binding** [In case of Multi-Binding, i.e. if different `AdaptivePlatformServiceInstances` exist that are mapped by `ServiceInstanceToPortPrototypeMapping` to the same `PortPrototype`, the different `AdaptivePlatformServiceInstances` may contain the same `dataId` for the same event.] (*RS_MANI_00028*)

In other words, if a `PortPrototype` contains two transport layer bindings, e.g. a `ProvidedSomeipServiceInstance` and a `ProvidedUserDefinedServiceInstance` representing an IPC communication, then an `event` is allowed to be protected with the same `dataId` in both `AdaptivePlatformServiceInstances` because the two `AdaptivePlatformServiceInstances` effectively represent the identical piece of data.

[TPS_MANI_03229]{DRAFT} Usage of same [End2EndMethodProtectionProps.dataId](#) in case of Multi-Binding [In case of Multi-Binding, i.e. if different [AdaptivePlatformServiceInstances](#) exist that are mapped by [ServiceInstanceToPortPrototypeMapping](#) to the same [PortPrototype](#), the different [AdaptivePlatformServiceInstances](#) may contain the same [dataId](#) for the same method.]([RS_MANI_00028](#))

In other words if a [PortPrototype](#) contains two transport layer bindings, e.g. a [ProvidedSomeipServiceInstance](#) and a [ProvidedUserDefinedServiceInstance](#) representing an IPC communication then a [method](#) is allowed to be protected with the same [dataId](#) in both [AdaptivePlatformServiceInstances](#).

[TPS_MANI_03252]{DRAFT} Usage of same [End2EndMethodProtectionProps.sourceId](#) in case of Multi-Binding [In case of Multi-Binding, i.e. if different [AdaptivePlatformServiceInstances](#) exist that are mapped by [ServiceInstanceToPortPrototypeMapping](#) to the same [PortPrototype](#), the different [AdaptivePlatformServiceInstances](#) may contain the same [sourceId](#) (for the same and even for a different [method](#)).]([RS_MANI_00028](#))

In other words if a [PortPrototype](#) contains two transport layer bindings, e.g. a [ProvidedSomeipServiceInstance](#) and a [ProvidedUserDefinedServiceInstance](#) representing an IPC communication then a single as well as different [methods](#) are allowed to be protected with the same [sourceId](#) in both [AdaptivePlatformServiceInstances](#).

Class	End2EndEventProtectionProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::E2E			
Note	This element allows to protect an event or a field notifier with an E2E profile.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	AdaptivePlatformServiceInstance.e2eEventProtectionProps			
Attribute	Type	Mult.	Kind	Note
dataId (ordered)	PositiveInteger	*	attr	This represents a unique numerical identifier for the referenced event or field notifier that is included in the CRC calculation. Note: ID is used for protection against masquerading. The details concerning the maximum number of values (this information is specific for each E2E profile) applicable for this attribute are controlled by a semantic constraint that depends on the category of the EndToEnd Protection.
dataLength	PositiveInteger	0..1	attr	Length of payload including E2E header in bits.
dataUpdate Period	TimeValue	0..1	attr	This attribute describes the period in which the applications are assumed to process E2E-protected messages. The middleware does not use this attribute at all.
e2eProfile Configuration	E2EProfileConfiguration	0..1	ref	Reference to E2E profile configuration settings that are valid to protect the referenced event or field notifier.
event	ServiceEvent Deployment	0..1	ref	Reference to an event that is protected by the E2E profile.
maxDataLength	PositiveInteger	0..1	attr	Maximum length of payload including E2E header in bits.
minDataLength	PositiveInteger	0..1	attr	Minimum length of payload including E2E header in bits.

Table 11.68: End2EndEventProtectionProps

Class	End2EndMethodProtectionProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::E2E			
Note	This element allows to protect a method, a field setter or a field getter with an E2E profile.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	<i>AdaptivePlatformServiceInstance.e2eMethodProtectionProps</i>			
Attribute	Type	Mult.	Kind	Note
dataId (ordered)	PositiveInteger	*	attr	This represents a numerical identifier that is included in the CRC calculation. This dataId is used for call and response. Note: ID is used for protection against masquerading. The details concerning the maximum number of values (this information is specific for each E2E profile) applicable for this attribute are controlled by a semantic constraint that depends on the category of the EndToEnd Protection.
dataLength	PositiveInteger	0..1	attr	Length of payload including E2E header in bits.
dataUpdate Period	TimeValue	0..1	attr	This attribute describes the period in which the applications are assumed to process E2E-protected messages. The middleware does not use this attribute at all.
e2eProfile Configuration	E2EProfileConfiguration	0..1	ref	Reference to E2E profile configuration settings that are valid to protect the referenced method, field getter or field setter.
maxDataLength	PositiveInteger	0..1	attr	Maximum length of payload including E2E header in bits.
method	ServiceMethod Deployment	0..1	ref	Reference to a method, a field getter or a field setter that is protected by the E2E profile.
minDataLength	PositiveInteger	0..1	attr	Minimum length of payload including E2E header in bits.
sourceId	PositiveInteger	0..1	attr	This represents a unique numerical identifier identifying the source of a certain transmission. In case of C/S communication, this ID uniquely identifies the client. Note: ID is used for protection against masquerading. The details concerning the maximum number of values (this information is specific for each E2E profile) applicable for this attribute are controlled by a semantic constraint that depends on the category of the EndToEnd Protection.

Table 11.69: End2EndMethodProtectionProps

Class	E2EProfileConfigurationSet			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::E2E			
Note	This meta-class represents the ability to aggregate a collection of E2EProfileConfigurations. Tags: atp.recommendedPackage=E2EProfileConfigurationSets			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Packageable Element</i> , <i>Referrable</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
e2eProfile Configuration	E2EProfileConfiguration	*	aggr	This represents the collection of E2EProfileConfigurations aggregated at the E2EProfileConfigurationSet.

Table 11.70: E2EProfileConfigurationSet

Class	E2EProfileConfiguration			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::E2E			
Note	This element holds E2E profile specific configuration settings.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	E2EProfileConfigurationSet.e2eProfileConfiguration			
Attribute	Type	Mult.	Kind	Note
clearFromValidToInvalid	Boolean	0..1	attr	Clear monitoring window on transition from state Valid to state Invalid.
dataIdMode	DataIdModeEnum	0..1	attr	This attribute describes the inclusion mode that is used to include the implicit Data ID in the one-byte CRC.
e2eProfileCompatibilityProps	E2EProfileCompatibilityProps	0..1	ref	Reference to additional settings for the E2E state machine.
maxDeltaCounter	PositiveInteger	0..1	attr	Maximum allowed difference between two counter values of two consecutively received valid messages. For example, if the receiver gets data with counter 1 and Max DeltaCounter is 3, then at the next reception the receiver can accept Counters with values 2, 3 or 4.
maxErrorStateInit	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last Window Size checks, for the state E2E_SM_INIT.
maxErrorStateInvalid	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last Window Size checks, for the state E2E_SM_INVALID.
maxErrorStateValid	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last Window Size checks, for the state E2E_SM_VALID.
minOkStateInit	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_INIT.
minOkStateInvalid	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_INVALID.
minOkStateValid	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_VALID.
profileName	NameToken	0..1	attr	Definition of the E2E profile.
windowSizeInit	PositiveInteger	0..1	attr	Size of the monitoring window of state Init for the E2E state machine.
windowSizeInvalid	PositiveInteger	0..1	attr	Size of the monitoring window of state Invalid for the E2E state machine.
windowSizeValid	PositiveInteger	0..1	attr	Size of the monitoring window of state Valid for the E2E state machine.

Table 11.71: E2EProfileConfiguration

[constr_10226]{DRAFT} Multiplicity of attribute [E2EProfileConfiguration.profileName](#) [For each [E2EProfileConfiguration](#), the attribute [profileName](#) shall exist **at the time when the creation of the manifest is finished.**]()

Enumeration	DataIdModeEnum
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer
Note	Supported inclusion modes to include the implicit two-byte Data ID in the one-byte CRC.
Aggregated by	E2EProfileConfiguration.dataIdMode , EndToEndTransformationDescription.dataIdMode
Literal	Description
all16Bit	Two bytes are included in the CRC (double ID configuration). Tags: atp.EnumerationLiteralIndex=0
lower12Bit	The low byte is included in the implicit CRC calculation, the low nibble of the high byte is transmitted along with the data (i.e. it is explicitly included), the high nibble of the high byte is not used. This is applicable for the IDs up to 12 bits. Tags: atp.EnumerationLiteralIndex=2

Table 11.72: DataIdModeEnum

Class	E2EProfileCompatibilityProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer			
Note	This meta-class collects settings for configuration of the E2E state machine. Tags: atp.recommendedPackage=E2EProfileCompatibilityPropsCollection			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
transitToInvalidExtended	Boolean	0..1	attr	E2E State machine behavior concerning transition from NODATA/INIT to INVALID value=0 (false): no direct transition from NODATA to INVALID, no transition from INIT to INVALID due to counter-related faults (Autosar R19-11 or former behavior) value=1 (true): direct transition from NODATA to INVALID covered, transition from INIT to INVALID due to counter-related faults covered (state machine extended)

Table 11.73: E2EProfileCompatibilityProps

It is possible to overwrite the E2E state machine configuration settings that are defined in [E2EProfileConfiguration](#) at the [RPortPrototype](#) of a [SwComponentType](#) with settings available in the [ReceiverComSpec](#) as described in [TPS_MANI_03132]. With this approach it is possible to define individual E2E settings for different receivers of the event, or field notifiers.

Likewise, it is possible to overwrite the E2E state machine configuration settings that are defined in [E2EProfileConfiguration](#) at the [RPortPrototype](#) of a [SwComponentType](#) with settings available in the [ClientComSpec](#) as described in [TPS_MANI_01324].

With this approach it is possible to define individual E2E settings for different callers of a [method](#).

Finally, it is possible to overwrite the E2E state machine configuration settings that are defined in [E2EProfileConfiguration](#) at the [PPortPrototype](#) of a [SwComponentType](#) with settings available in the [ServerComSpec](#) as described in [TPS_MANI_01325].

[constr_3493]{DRAFT} Applicable attributes for standardized E2E Profiles [

E2E Attributes	Root Element			Attribute Existence per Profile											
	End2EndEventProtectionProps	End2EndMethodProtectionProps	E2EProfileConfiguration	PROFILE_04	PROFILE_05	PROFILE_06	PROFILE_07	PROFILE_08	PROFILE_11	PROFILE_22	PROFILE_04m	PROFILE_07m	PROFILE_44	PROFILE_08m	PROFILE_44m
<code>dataId</code>	x	x		1	1	1	1	1	1	n	1	1	1	1	1
<code>dataLength</code>	x	x			x				x	x					
<code>minDataLength</code>	x	x		x		x	x	x			x	x	x	x	x
<code>maxDataLength</code>	x	x		x		x	x	x			x	x	x	x	x
<code>dataUpdatePeriod</code>	x	x		x	x	x	x	x	x	x	x	x	x	x	x
<code>sourceId</code>		x									x	x		x	x
<code>dataIdMode</code>			x						x						
<code>maxDeltaCounter</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>maxErrorStateInit</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>maxErrorStateInvalid</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>maxErrorStateValid</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>minOkStateInit</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>minOkStateInvalid</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>minOkStateValid</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>windowSizeValid</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>windowSizeInvalid</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>windowSizeInit</code>			x	x	x	x	x	x	x	x	x	x	x	x	x
<code>clearFromValidToInvalid</code>			x	x	x	x	x	x	x	x	x	x	x	x	x

]()

In `PROFILE_22`, the `dataId` is defined as a list of 16 `dataId` values, where a different value is transmitted depending on the counter value.

Please also note that the Classic Platform attributes `counterOffset`, `crcOffset` and `dataIdNibbleOffset` are not configurable on the *AUTOSAR adaptive Platform* and are set to fixed values by the AUTOSAR Standard.

[constr_5230]{DRAFT} Attribute `E2EProfileCompatibilityProps.transitToInvalidExtended` shall exist for each `E2EProfileConfiguration` [For each `E2EProfileConfiguration`, a reference to `E2EProfileCompatibilityProps` in the role `e2eProfileCompatibilityProps` shall exist and the referenced `E2EProfileCompatibilityProps` shall define a value for the attribute `transitToInvalidExtended`.]()

[constr_5250]{DRAFT} **Protection of AdaptivePlatformServiceInstances of the same ServiceInterfaceDeployment** [If several AdaptivePlatformServiceInstances exist that are referencing the same ServiceInterfaceDeployment and these AdaptivePlatformServiceInstances contain aggregated End2EndMethodProtectionProps and/or End2EndEventProtectionProps then the E2EProfileConfigurations that are referenced by the End2EndMethodProtectionProps and End2EndEventProtectionProps shall have the same profileName defined.]()

In other words it is not allowed to protect different AdaptivePlatformServiceInstances of the same ServiceInterfaceDeployment with different E2E Profiles. Please note that the End2EndMethodProtectionProps and/or End2EndEventProtectionProps in the different AdaptivePlatformServiceInstances are allowed to reference different E2EProfileConfigurations since the same E2E Profile may be configured with different E2E settings.

11.5 Secure Communication

AUTOSAR supports different protocols that provide communication security over a network. To configure the secured communication of ServiceInterface elements between a ProvidedApServiceInstance and a RequiredApServiceInstance the ServiceInterfaceElementSecureComConfig meta-class is defined.

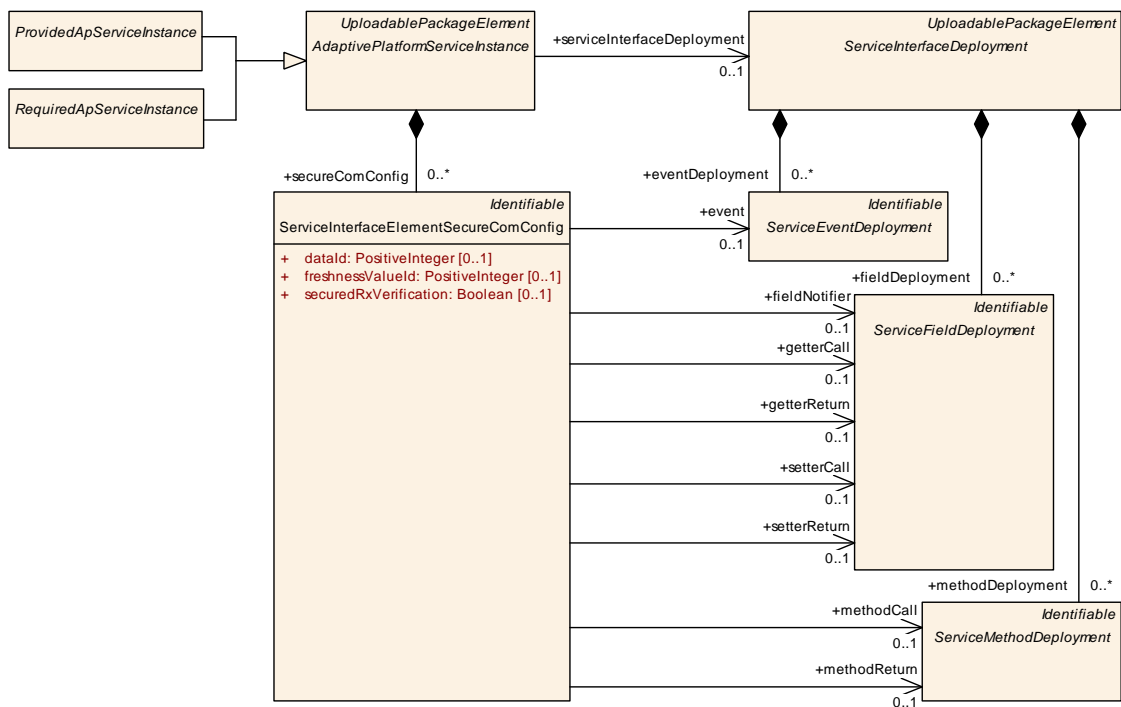


Figure 11.35: Secure Communication

[TPS_MANI_03133]{DRAFT} **Usage of ServiceInterfaceElementSecureComConfig** [The ServiceInterfaceElementSecureComConfig element is used to

define `ServiceInterface` element specific secure communication configuration settings in the context of an `AdaptivePlatformServiceInstance`.] (*RS_MANI_00036*)

The modeling allows protecting selected elements of a `ServiceInterface`, like particular `events` or `methods`.

Since the `ServiceInterfaceElementSecureComConfig` meta-class is aggregated by the abstract `AdaptivePlatformServiceInstance` it can be used to configure the secure communication on specific derived classes like `ProvidedSomeipServiceInstance` or `RequiredSomeipServiceInstance` that fit the underlying middleware. With this approach it is possible to define different communication security protections for different used transport layer mechanisms in case of Multi-Binding.

<i>Class</i>	ServiceInterfaceElementSecureComConfig			
<i>Package</i>	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication			
<i>Note</i>	This element allows to secure the communication of the referenced <code>ServiceInterface</code> element.			
<i>Base</i>	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>			
<i>Aggregated by</i>	<code>AdaptivePlatformServiceInstance.secureComConfig</code>			
<i>Attribute</i>	<i>Type</i>	<i>Mult.</i>	<i>Kind</i>	<i>Note</i>
dataId	PositiveInteger	0..1	attr	This attribute defines a unique numerical identifier for the referenced <code>ServiceInterface</code> element.
event	<code>ServiceEventDeployment</code>	0..1	ref	Reference to an event that is protected by a security protocol.
fieldNotifier	<code>ServiceFieldDeployment</code>	0..1	ref	Reference to a field notifier that is protected by a security protocol.
freshnessValueId	PositiveInteger	0..1	attr	This attribute defines the Id of the Freshness Value.
getterCall	<code>ServiceFieldDeployment</code>	0..1	ref	Reference to a field getter call message that is protected by a security protocol.
getterReturn	<code>ServiceFieldDeployment</code>	0..1	ref	Reference to a field getter return message that is protected by a security protocol.
methodCall	<code>ServiceMethodDeployment</code>	0..1	ref	Reference to a method call message that is protected by a security protocol.
methodReturn	<code>ServiceMethodDeployment</code>	0..1	ref	Reference to a method return message that is protected by a security protocol.
securedRxVerification	Boolean	0..1	attr	This attribute defines whether the <code>ServiceInterface</code> element shall verify its security credentials during reception.
setterCall	<code>ServiceFieldDeployment</code>	0..1	ref	Reference to a field setter call message that is protected by a security protocol.
setterReturn	<code>ServiceFieldDeployment</code>	0..1	ref	Reference to a field setter return message that is protected by a security protocol.

Table 11.74: ServiceInterfaceElementSecureComConfig

[*constr_3391*]{DRAFT} `ServiceInterfaceElementSecureComConfig` references to `ServiceInterfaceDeployment` elements [`ServiceInterfaceElementSecureComConfig` element shall be defined for exactly one `ServiceInterface` element and shall therefore contain only one single reference to an element defined in the scope of a `ServiceInterfaceDeployment`.]()

The attributes in the `ServiceInterfaceElementSecureComConfig` meta-class are defining security configuration settings that are specific for the referenced `ServiceInterface` element in the context of an `AdaptivePlatformServiceInstance`. The used security protocol is defined in the `ServiceInstanceToMachineMapping`.

[TPS_MANI_03199]{DRAFT} **Endpoint protection by `SecureComProps`** [The `ServiceInstanceToMachineMapping` allows to assign a security protocol configuration settings that are defined in the referenced `SecureComProps` meta-class to protect endpoints that are defined by the Transport Protocol, Port and IP Address on which one or several `AdaptivePlatformServiceInstances` are provided or consumed.]
(RS_MANI_00036)

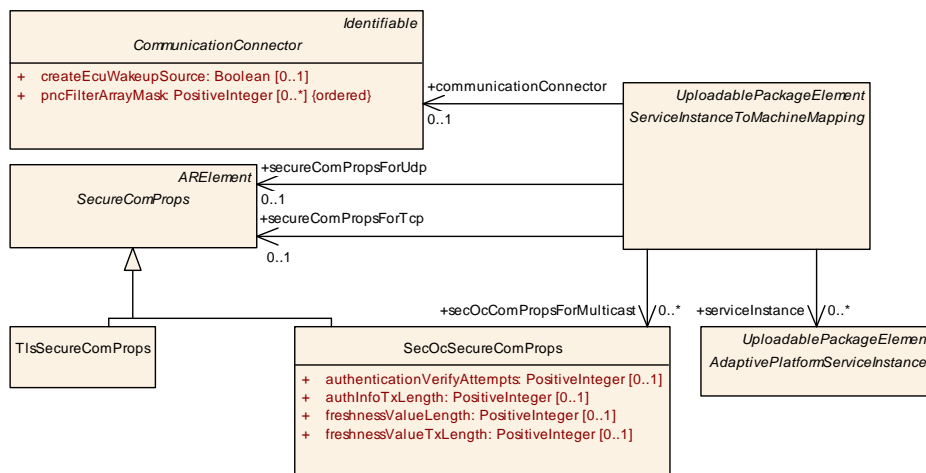


Figure 11.36: Security protocol configuration

[TPS_MANI_03200]{DRAFT} **`SecureComProps` for udp, tcp and multicast communication** [The `ServiceInstanceToMachineMapping` allows to assign a security protocol configuration settings for:

- udp communication if the `ServiceInstanceToMachineMapping` refers to the `SecureComProps` in the role `secureComPropsForUdp`
- tcp communication in case the `ServiceInstanceToMachineMapping` refers to the `SecureComProps` in the role `secureComPropsForTcp`
- multicast communication in case the `ServiceInstanceToMachineMapping` refers to the `SecOcSecureComProps` in the role `secOcComPropsForMulticast`

] (RS_MANI_00036)

With this modeling approach it is possible to configure different security protocol settings for the communication over TCP, UDP and multicast. For example it is allowed to use different settings to protect the TCP communication of a `AdaptivePlatformServiceInstance` via TLS and UDP communication via DTLS.

Please note that protection of IP multicast traffic is only supported by SecOC and therefore the [ServiceInstanceToMachineMapping](#) refers directly the [SecOcSecureComProps](#) in the [secOcComPropsForMulticast](#) role.

Class	<i>SecureComProps</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication			
Note	This meta-class defines a communication security protocol and its configuration settings.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	DdsSecureComProps , SecOcSecureComProps , TlsSecureComProps			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table 11.75: SecureComProps

11.5.1 Secure Communication over TLS

The configuration of the Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS) protocols is supported with the [TlsSecureComProps](#) meta-class, which is a specialization of [SecureComProps](#).

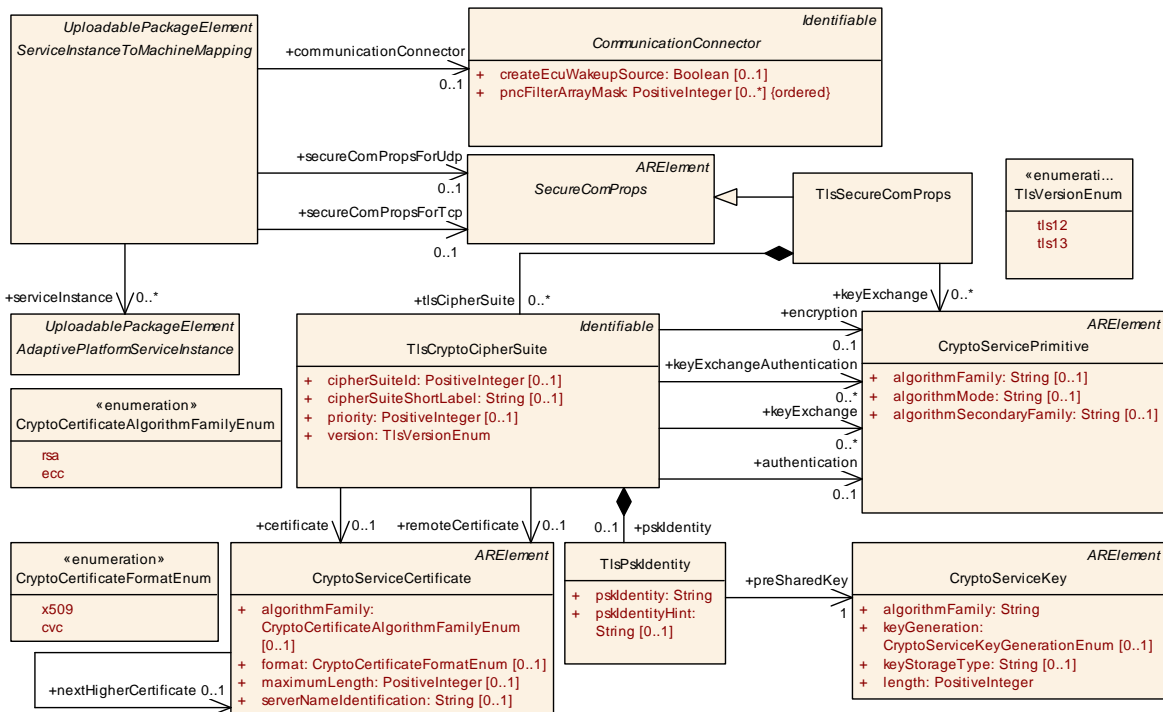


Figure 11.37: Secure Communication over TLS

It is a common use case that only one end of a TLS-based connection is actually modeled in an AUTOSAR model. It is therefore important that the modeling does not rely on or imply knowledge about both ends of such a TLS-based connection.

An AUTOSAR model that only describes one end of the communication is positively required to work, independently of the availability of a formal modeling of the other end.

Class	TlsSecureComProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication			
Note	Configuration of the Transport Layer Security protocol (TLS). Tags: atp.recommendedPackage=SecureComProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , SecureComProps			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
keyExchange	CryptoServicePrimitive	*	ref	This reference identifies the shared (i.e. applicable for each of the aggregated cipher suites) crypto service primitive for the execution of key exchange during the handshake phase.
tlsCipherSuite	TlsCryptoCipherSuite	*	aggr	Collection of supported cipher suites that are used to negotiate the security settings for a network connection defined by the ServiceInstanceToMachineMapping.

Table 11.76: TlsSecureComProps

Enumeration	CryptoServiceKeyGenerationEnum			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This enumeration shall be taken to express the handling of a crypto key in terms of whether it is obtained from e.g. a diagnostic tester or whether it is created by derivation from a master key.			
Aggregated by	CryptoServiceKey.keyGeneration			
Literal	Description			
keyDerivation	This means that the crypto key is created by derivation from a master key. Tags: atp.EnumerationLiteralIndex=0			
keyStorage	This means that the crypto key is obtained from an external entity, e.g. a diagnostic tester. Tags: atp.EnumerationLiteralIndex=1			

Table 11.77: CryptoServiceKeyGenerationEnum

TLS is composed of the TLS Record Protocol and the TLS Handshake Protocol. The Record Protocol provides connection security and encrypts and authenticates packets. The record layer functions can be called at any time after the handshake process is finished, when there is need to receive or send data.

The Handshake Protocol allows the server and client to authenticate each other and to negotiate encryption algorithms and cryptographic keys before any data is exchanged.

In order to establish a cryptographically secure data channel, the communication partners in form of [ServiceInstanceToMachineMappings](#) shall agree on ciphersuites and on keys that will be used to encrypt the data.

The client sends a list of supported ciphersuites to the server. The server decides on a ciphersuite from the list provided by the client, and continues with the handshake. Please note that the server and client roles cannot be swapped while the connection exists, i.e. a *server* remains the *server* for the full amount of time the connection exists.

[TPS_MANI_03213]{DRAFT} **Semantics of meta-class `TlsSecureComProps`** [As a sub-class of `SecureComProps`, meta-class `TlsSecureComProps` has the ability to collect the TLS-related configuration aspects from either the perspective of the client or the server.

In the case of TLS, the collection boils down to the aggregation of meta-class `TlsCryptoCipherSuite` in the role `tlsCipherSuite` plus the ability (by means of the role `keyExchange`) to define handshake properties that are shared for each of the aggregated `tlsCipherSuite`.] ([RS_MANI_00036](#))

[**constr_5047**]{DRAFT} **Supported values of `TlsSecureComProps.category`** [The only supported values of attribute `TlsSecureComProps.category` are:

- **TLS_SERVER**: the `TlsSecureComProps` assumes the role of the *server* in the TLS connection.
- **TLS_CLIENT**: the `TlsSecureComProps` assumes the role of the *client* in the TLS connection.

]()

[TPS_MANI_03134]{DRAFT} **Configuration of supported TLS ciphersuites** [The creation of a TLS connection requires the usage of a suite of cryptographic operations in specific roles, also known as a *cipher suite*.

Meta-class `TlsCryptoCipherSuite` represents a given cipher suite for a TLS connection. `TlsCryptoCipherSuite` references meta-class `CryptoServicePrimitive` in three dedicated roles that represent the steps of the creation of a TLS connection.

More specifically, the cryptographic operations for setting up a TLS connection involve the following steps:

- **Key exchange**: these `CryptoServicePrimitives` may be used for the handshake phase of the TLS connection. Different alternatives exist for executing this phase and therefore the multiplicity of this reference is 0..*.
- **Authentication** of communication partners during the operational phase of the TLS connection. For this purpose a single `CryptoServicePrimitive` is used on each end of the communication.
- **Encryption** of content exchanged between the communication partners that have established the TLS connection. For this purpose a single `CryptoServicePrimitive` is used on each end of the communication.

] ([RS_MANI_00036](#))

Please note that according to TLS each `TlsCryptoCipherSuite` may support multiple PSKs or certificates. The model restricts the multiplicity of references from `TlsCryptoCipherSuite` to `CryptoServiceCertificate` and `TlsPskIdentity` to 0..1. A TLS configuration with multiple PSKs or Certificates per Cipher-Suite can be achieved by having multiple `TlsCryptoCipherSuite`'s that share the

same set of parameters but reference different [CryptoServiceCertificate](#)'s or [TlsPskIdentity](#)'s, respectively.

Class		TlsCryptoCipherSuite		
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class represents a cipher suite for describing cryptographic operations in the context of establishing a connection of ApplicationEndpoints that is protected by TLS.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	TlsCryptoServiceMapping.tlsCipherSuite , TlsSecureComProps.tlsCipherSuite			
Attribute	Type	Mult.	Kind	Note
authentication	CryptoServicePrimitive	0..1	ref	This reference identifies the crypto service primitive for the generation and verification of MACs.
certificate	CryptoServiceCertificate	0..1	ref	This reference identifies the applicable local certificate.
cipherSuiteId	PositiveInteger	0..1	attr	Identification of the CipherSuite according to the IANA assignments list.
cipherSuiteShortLabel	String	0..1	attr	Name of the CipherSuite according to the IANA assignments list.
ellipticCurve	CryptoEllipticCurveProps	*	ref	This references point to the properties of elliptic curves.
encryption	CryptoServicePrimitive	0..1	ref	This reference identifies the crypto service primitive for the execution of encryption.
keyExchange	CryptoServicePrimitive	*	ref	This reference identifies the individual (i.e. per cipher suite) crypto service primitive for the execution of key exchange during the handshake phase.
keyExchangeAuthentication	CryptoServicePrimitive	*	ref	This reference identifies the crypto service primitives for the generation and verification of signatures during the key exchange algorithm.
priority	PositiveInteger	0..1	attr	This attribute identifies the priority of the cipher suite. Range: 1..65535. Lower values represent higher priorities.
props	TlsCryptoCipherSuiteProps	0..1	aggr	The aggregated TlsCryptoCipherSuiteProps provide details for the TLS Cipher Suite.
pskIdentity	TlsPskIdentity	0..1	aggr	Pre-shared key identity shared during the handshake among the communication parties, to establish a TLS connection if the handshake is based on the existence of a pre-shared key.
remoteCertificate	CryptoServiceCertificate	0..1	ref	This reference identifies the applicable remote certificate.
signatureScheme	CryptoSignatureScheme	*	ref	This reference points to the properties of a TLS Signature Scheme.
version	TlsVersionEnum	1	attr	This attribute supports the definition of the applicable version of TLS.

Table 11.78: TlsCryptoCipherSuite

Class		CryptoServicePrimitive		
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class has the ability to represent a crypto primitive. Tags: atp.recommendedPackage=CryptoPrimitives			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			





Class		CryptoServicePrimitive		
Attribute	Type	Mult.	Kind	Note
algorithmFamily	String	0..1	attr	This attribute represents a description of the family (e.g. AES) of crypto algorithm implemented by the crypto primitive.
algorithmMode	String	0..1	attr	This attribute represents a description of the mode of the crypto algorithm implemented by the crypto primitive.
algorithm Secondary Family	String	0..1	attr	This attribute represents a further description of the secondary family of crypto algorithm implemented by the crypto primitive. The secondary family is needed for the specification of the hash algorithm for a signature check, e.g. using RSA.

Table 11.79: CryptoServicePrimitive

Class		CryptoServiceKey		
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class has the ability to represent a crypto key. Tags: atp.recommendedPackage=CryptoDevelopmentKeys			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
algorithmFamily	String	1	attr	This attribute represent the description of the family of the applicable crypto algorithm.
development Value	ValueSpecification	0..1	aggr	This aggregation represents the ability to assign a specific value to the crypto key as part of the system description. This value can then be taken for the development of the respective ECU.
keyGeneration	CryptoServiceKeyGenerationEnum	0..1	attr	This attribute describes how a the specific cryptographic key is created.
keyStorageType	String	0..1	attr	This attribute describes where the enclosing cryptographic key shall be stored. AUTOSAR reserves specific values for this attributes but it is possible to insert custom values as well.
length	PositiveInteger	1	attr	This attribute describes the length of the cryptographic key in bits.

Table 11.80: CryptoServiceKey

[TPS_MANI_03214]{DRAFT} **Existence of [TlsCryptoCipherSuite.keyExchange](#) vs. [TlsSecureComProps.keyExchange](#)** [The role [TlsSecureComProps.keyExchange](#) has been introduced as an optimization.

It is assumed that the references for key exchange look pretty similar if not identical for many concrete [TlsCryptoCipherSuites](#).

Adding these references in an identical form to a bunch of [TlsCryptoCipherSuites](#) does not really make sense. Therefore, [TlsSecureComProps](#) allows to define these references as well with the intention to make them valid for all [TlsSecureComProps.tlsCipherSuites](#).

A mixture of references in the role `TlsCryptoCipherSuite.keyExchange` and `TlsSecureComProps.keyExchange` is supported. [\(RS_MANI_00036\)](#)

[TPS_MANI_03215]{DRAFT} **Semantics of `CryptoServiceCertificate`** [Meta-class `CryptoServiceCertificate` represents a cryptographic certificate needed for the creation of a TLS connection between *server* and *client*.] [\(RS_MANI_00036\)](#)

Class	CryptoServiceCertificate			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class represents the ability to model a cryptographic certificate. Tags: atp.recommendedPackage=CryptoServiceCertificates			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
algorithmFamily	CryptoCertificateAlgorithmFamilyEnum	0..1	attr	This attribute represents a description of the family of crypto algorithm used to generate public key and signature of the cryptographic certificate.
format	CryptoCertificateFormatEnum	0..1	attr	This attribute can be used to provide information about the format used to create the certificate
maximumLength	PositiveInteger	0..1	attr	This attribute represents the ability to define the maximum length of the certificate in bytes.
nextHigherCertificate	CryptoServiceCertificate	0..1	ref	The reference identifies the next higher certificate in the certificate chain.
serverNameIdentification	String	0..1	attr	Server Name Indication (SNI) is needed if the IP address hosts multiple servers (on the same port), each of them using a different certificate. If the client sends the SNI to the Server in the client hello, the server looks the SNI up in its certificate list and uses the certificate identified by the SNI.

Table 11.81: CryptoServiceCertificate

Enumeration	CryptoCertificateAlgorithmFamilyEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	This meta-class defines possible cryptographic algorithm families used to create public keys and signatures within the certificate.
Aggregated by	CryptoServiceCertificate.algorithmFamily
Literal	Description
ecc	The cryptographic operations in the certificate are executed using elliptic curves (ecc) Tags: atp.EnumerationLiteralIndex=2
rsa	The cryptographic operations in the certificate are executed using the RSA approach. Tags: atp.EnumerationLiteralIndex=1

Table 11.82: CryptoCertificateAlgorithmFamilyEnum

Enumeration	CryptoCertificateFormatEnum
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication
Note	This meta-class defines possible formats of cryptographic certificates.
Aggregated by	CryptoServiceCertificate.format





<i>Enumeration</i>	CryptoCertificateFormatEnum
<i>Literal</i>	<i>Description</i>
cvc	The certificate has been created in Card Verifiable Certificate (CVC) format Tags: atp.EnumerationLiteralIndex=2
x509	The certificate is created in X.509 format. Tags: atp.EnumerationLiteralIndex=1

Table 11.83: CryptoCertificateFormatEnum

[constr_5048]{DRAFT} Existence of `TlsCryptoCipherSuite.certificate` and `TlsCryptoCipherSuite.pskIdentity` in the server role [Either

- the reference to `CryptoServiceCertificate` in the role `TlsCryptoCipherSuite.certificate`
- the aggregation of `TlsPskIdentity` in the role `TlsCryptoCipherSuite.pskIdentity`

shall exist if the `TlsCryptoCipherSuite` is aggregated by `TlsSecureComProps` that has the attribute `category` set to the value `TLS_SERVER`.]()

In other words two different approaches are supported by TLS for the handling of key compromise: Pre-shared secret and certificate.

The server may optionally request a certificate from the *client*. If this option is not used then other documented approaches for completing the handshake phase is foreseen for the specific case.

[TPS_MANI_03216]{DRAFT} Existence of `TlsCryptoCipherSuite.certificate` and `TlsCryptoCipherSuite.pskIdentity` in the *client* role [The client (`TlsSecureComProps` has set the value of attribute `category` to `TLS_CLIENT`) has the following authentication options:

- the reference to `CryptoServiceCertificate` in the role `TlsCryptoCipherSuite.certificate` exists,
- the aggregation of `TlsPskIdentity` in the role `TlsCryptoCipherSuite.pskIdentity` exists,
- neither one nor the other exists. In this case the handshake is provided on the basis of the server certificate only.

] ([RS_MANI_00036](#))

In the pre-shared Key approach the client indicates which key to use by including a `pskIdentity` in the ClientKeyExchange message. To help the client in selecting which identity to use, the server can provide a `pskIdentityHint` in the ServerKeyExchange message. Please note that the usage of `pskIdentityHints` is restricted for usage with TLS 1.2.

[TPS_MANI_03137]{DRAFT} **ServiceInterfaceElementSecureComConfig is not relevant in case of TLS communication** [The element `ServiceInterfaceElementSecureComConfig` is not relevant in case of TLS communication.] ([RS_MANI_00036](#))

[constr_3485]{DRAFT} **UDP endpoint using DTLS SERVER role can only serve provided service instances** [A `ServiceInstanceToMachineMapping` that refers to `TlsSecureComProps` in the role `secureComPropsForUdp` is only allowed to reference `ProvidedApServiceInstances` in the role `serviceInstance` if the `TlsSecureComProps` has the category `TLS_SERVER`.]()

[constr_3486]{DRAFT} **TCP endpoint using TLS SERVER role can only serve provided service instances** [A `ServiceInstanceToMachineMapping` that refers to `TlsSecureComProps` in the role `secureComPropsForTcp` is only allowed to reference `ProvidedApServiceInstances` in the role `serviceInstance` if the `TlsSecureComProps` has the category `TLS_SERVER`.]()

[constr_5260]{DRAFT} **UDP endpoint using DTLS CLIENT role can only serve required service instances** [A `ServiceInstanceToMachineMapping` that refers to `TlsSecureComProps` in the role `secureComPropsForUdp` is only allowed to reference `RequiredApServiceInstances` in the role `serviceInstance` if the `TlsSecureComProps` has the category `TLS_CLIENT`.]()

[constr_5261]{DRAFT} **TCP endpoint using TLS CLIENT role can only serve required service instances** [A `ServiceInstanceToMachineMapping` that refers to `TlsSecureComProps` in the role `secureComPropsForTcp` is only allowed to reference `RequiredApServiceInstances` in the role `serviceInstance` if the `TlsSecureComProps` has the category `TLS_CLIENT`.]()

The reason for [[constr_3485](#)], [[constr_3486](#)], [[constr_5260](#)], [[constr_5261](#)] is that the (D)TLS client needs to establish the (D)TLS connection and a TCP/UDP endpoint that is described by the `ServiceInstanceToMachineMapping` can only take one role: (D)TLS client or (D)TLS server. If a `ServiceInstanceToMachineMapping` would act as (D)TLS client and would refer to a `ProvidedApServiceInstance` then this (D)TLS client would need to establish the (D)TLS connection. But in this case the (D)TLS client would not know to which remote service client a connection needs to be established since different `RequiredApServiceInstances` may directly call `methods` of the `ProvidedApServiceInstance` without any registration.

The same issue exists if the `ServiceInstanceToMachineMapping` acts as (D)TLS server and refers to `RequiredApServiceInstances`. The (D)TLS client needs to establish the (D)TLS connection before any messages are exchanged. But the remote service provider has no knowledge that this service consumer wants to call `methods` over a (D)TLS connection.

11.5.2 Secure Communication over SecOC

AUTOSAR Secure Onboard Communication (SecOC) supports symmetric and asymmetric authentication approaches. To configure the SecOC secure protection of a message by a MAC or Signature the `ServiceInterfaceElementSecureComConfig` needs to be defined. This element contains the configuration settings for the individual `ServiceInterface` elements. In addition, the `ServiceInstanceToMachineMapping` needs to point to `SecOcSecureComProps` to configure the endpoint protection that is defined by the Transport Protocol, Port and IP Address.

[constr_3392]{DRAFT} `ServiceInterfaceElementSecureComConfig.dataId` and `ServiceInterfaceElementSecureComConfig.freshnessValueId` are mandatory in case of SecOC communication [The attributes `ServiceInterfaceElementSecureComConfig.dataId` and `ServiceInterfaceElementSecureComConfig.freshnessValueId` are mandatory in case of SecOC communication.]()

[TPS_MANI_03664]{DRAFT} `ServiceInterfaceElementSecureComConfig.securedRxVerification` [The attribute `ServiceInterfaceElementSecureComConfig.securedRxVerification` defines whether a received SecOC message shall be verified with respect to the security credentials or not.

If the attribute `ServiceInterfaceElementSecureComConfig.securedRxVerification` is set to false, then security verification shall not be applied and the message payload shall be forwarded to the receivers.

If the attribute `ServiceInterfaceElementSecureComConfig.securedRxVerification` is set to true or is not defined, then security verification shall be applied.] (*RS_MANI_00036*)

[constr_3691]{DRAFT} Existence of `ServiceInterfaceElementSecureComConfig.securedRxVerification` [The attribute `ServiceInterfaceElementSecureComConfig.securedRxVerification` shall only be defined for a `ServiceInterfaceElementSecureComConfig` with the following definitions:

- The `ServiceInterfaceElementSecureComConfig` is aggregated by a `RequiredApServiceInstance` and defines at least one of the following roles:
 - `ServiceInterfaceElementSecureComConfig.event`
 - `ServiceInterfaceElementSecureComConfig.fieldNotifier`
 - `ServiceInterfaceElementSecureComConfig.getterReturn`
 - `ServiceInterfaceElementSecureComConfig.setterReturn`
 - `ServiceInterfaceElementSecureComConfig.methodReturn`
- The `ServiceInterfaceElementSecureComConfig` is aggregated by a `ProvidedApServiceInstance` and defines at least one of the following roles:
 - `ServiceInterfaceElementSecureComConfig.getterCall`

- `ServiceInterfaceElementSecureComConfig.setterCall`
- `ServiceInterfaceElementSecureComConfig.methodCall`

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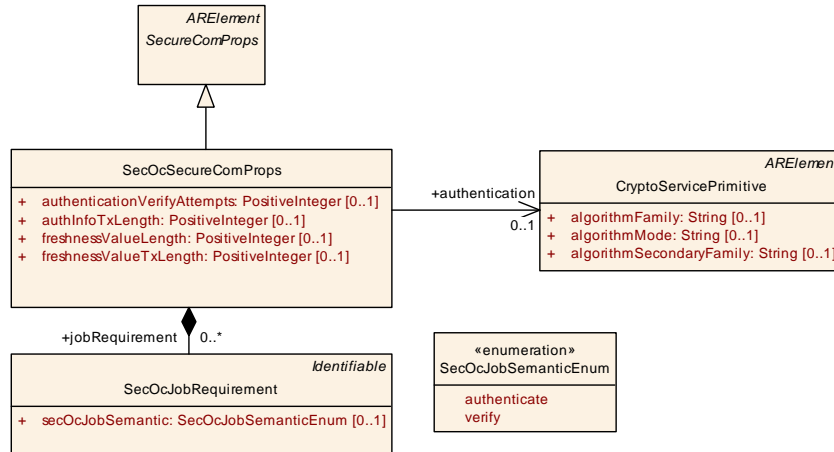


Figure 11.38: Secure Communication over SecOC

[TPS_MANI_03138]{DRAFT} **SecOC Security Profile** [The SecOC security profile is defined by `SecOcSecureComProps.category`.] ([RS_MANI_00036](#))

Class	SecOcSecureComProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication			
Note	Configuration of AUTOSAR SecOC. Tags: atp.recommendedPackage=SecureComProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , SecureComProps			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
authentication	CryptoServicePrimitive	0..1	ref	This reference defines the authentication algorithm used for MAC generation and verification.
authenticationVerifyAttempts	PositiveInteger	0..1	attr	This attribute defines the additional number of authentication attempts that are to be carried out when the generation of the authentication information failed for a given message. If zero is set than only one authentication attempt is done.
authInfoTxLength	PositiveInteger	0..1	attr	This attribute defines the length in bits of the authentication code to be included in the payload of the authenticated Message.
freshnessValueLength	PositiveInteger	0..1	attr	This attribute defines the complete length in bits of the Freshness Value.
freshnessValueTxLength	PositiveInteger	0..1	attr	This attribute defines the length in bits of the Freshness Value to be included in the payload of the secured message.
jobRequirement	SecOcJobRequirement	*	aggr	Collection of cryptographic job requirements.

Table 11.84: SecOcSecureComProps

[TPS_MANI_03139]{DRAFT} **Standardized SecOC Security Profiles** [The SecOC security profile that is defined by `SecOcSecureComProps.category` can have the

following values that are standardized by AUTOSAR: PROFILE_01, PROFILE_02, PROFILE_03.] ([RS_MANI_00036](#))

The attribute values for the predefined categories mentioned in [[TPS_MANI_03139](#)] are defined in [constr_3325] in [[19](#)].

[constr_5347]{DRAFT} **Supported value range for attribute [SecOcSecureComProps.authenticationVerifyAttempts](#)** [The supported value range of attribute [SecOcSecureComProps.authenticationVerifyAttempts](#) is limited to the interval [0..65535].] ()

[TPS_MANI_03140]{DRAFT} **Non-Standardized SecOC Security Profiles** [The values for the [SecOcSecureComProps.category](#) mentioned in [[TPS_MANI_03139](#)] are standardized and reserved for being used in the way the AUTOSAR standard foresees. In addition, it is positively possible to use other than the standardized values for the [SecOcSecureComProps.category](#).] ([RS_MANI_00036](#))

With the [SecOcJobRequirement](#) the cryptographic routines can be selected that need to be supported. In case of SecOC it can be selected whether the symmetric and/or asymmetric authentication approach is needed.

Class	SecOcJobRequirement			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication			
Note	Requirements for the cryptographic job that need to be executed.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	SecOcSecureComProps.jobRequirement			
Attribute	Type	Mult.	Kind	Note
secOcJobSemantic	SecOcJobSemanticEnum	0..1	attr	This attribute defines the cryptographic algorithm that needs to be supported.

Table 11.85: SecOcJobRequirement

[constr_10227]{DRAFT} **Multiplicity of attribute [SecOcJobRequirement.secOcJobSemantic](#)** [For each [SecOcJobRequirement](#), the attribute [secOcJobSemantic](#) shall exist **at the time when the creation of the manifest is finished.**] ()

Enumeration	SecOcJobSemanticEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication
Note	List of cryptographic routines supported by SecOC.
Aggregated by	SecOcJobRequirement.secOcJobSemantic
Literal	Description
authenticate	Authentication algorithm for Authenticator generation/verification. Tags: atp.EnumerationLiteralIndex=0
verify	Asymmetric cryptographic algorithm to generate/verify a signature Tags: atp.EnumerationLiteralIndex=1

Table 11.86: SecOcJobSemanticEnum

11.5.3 Secure Communication over DDS

The configuration of participant identities for the DDS Security [35] plugins is supported by the `DdsSecureComProps` meta-class, which is a specialization of `SecureComProps`.

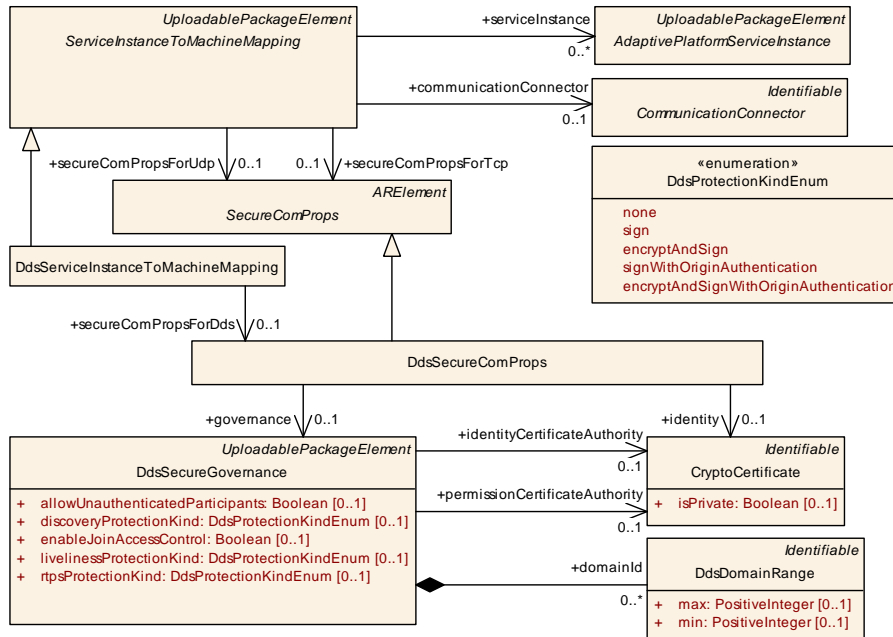


Figure 11.39: DdsSecureComProps at the DdsServiceInstanceToMachineMapping

Please note the following classes and constraints depict a structural specification of DDS Security deployment configuration. For functional details please refer to section "Secure Communication" of SWS_CommunicationManagement [9].

These modeling elements affect only DDS Security (as defined by [35]) deployments via `DdsServiceInstanceToMachineMapping.secureComPropsForDds`. For DDS Transport Security over TCP (TLS) and UDP (DTLS) configuration please refer to `ServiceInstanceToMachineMapping.secureComPropsForTcp` and `ServiceInstanceToMachineMapping.secureComPropsForUdp`, respectively.

Class	DdsSecureComProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceMapping			
Note	Identity and governance information of participants in case of DDS Security. Tags: atp.recommendedPackage=SecureComProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , SecureComProps			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	DdsSecureComProps			
governance	DdsSecureGovernance	0..1	ref	This attribute defines general DDS Security communication properties applicable to the DDS domain(s) in which the subject operates. Tags: atp.Status=candidate
identity	CryptoCertificate	0..1	ref	This attribute defines the cryptographic identity of the subject.

Table 11.87: DdsSecureComProps

[constr_3678]{DRAFT} **Existence of attributes for [DdsSecureComProps](#)** [The following attributes of [DdsSecureComProps](#) shall exist **at the time when the creation of the manifest is finished**

- [identity](#)
- [governance](#)

]()

[TPS_MANI_03661]{DRAFT} **Configuration of Governance in DDS Security** [The [DdsSecureGovernance](#) meta-class defines domain-wide rules determining relevant certificate authorities (for participant identities and permission manifests), constraints related to how participants may join such domain(s) and protection levels associated to each kind of communication (none, sign, encrypt+sign, with or without origin authentication).] ([RS_MANI_00036](#))

Class	DdsSecureGovernance			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication			
Note	Configuration of DDS Security for all applications joining a specific set of DDS Domains. Tags: atp.Status=candidate atp.recommendedPackage=DdsSecureGovernances			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
allowUnauthenticatedParticipants	Boolean	0..1	attr	Defines whether unauthenticated participants can join this domain. Tags: atp.Status=candidate
discoveryProtectionKind	DdsProtectionKindEnum	0..1	attr	Defines the kind of cryptographic transformation to apply in DDS discovery communication. Tags: atp.Status=candidate
domainId	DdsDomainRange	*	aggr	Set of domains to be covered by this property set. Tags: atp.Status=candidate
enableJoinAccessControl	Boolean	0..1	attr	Defines whether access control is to be enforced upon joining this domain. Tags: atp.Status=candidate





Class	DdsSecureGovernance			
identity Certificate Authority	CryptoCertificate	0..1	ref	Certificate representing the identity certificate authority applicable to the domain(s) specified by domainsIds. Tags: atp.Status=candidate
liveliness ProtectionKind	DdsProtectionKind Enum	0..1	attr	Defines the kind of cryptographic transformation to apply in DDS liveliness communication. Tags: atp.Status=candidate
permission Certificate Authority	CryptoCertificate	0..1	ref	Certificate representing the permissions certificate authority applicable to the domain(s) specified by domainsIds. Tags: atp.Status=candidate
rtpsProtection Kind	DdsProtectionKind Enum	0..1	attr	Defines the kind of cryptographic transformation to apply to whole DDS RTPS. Tags: atp.Status=candidate

Table 11.88: DdsSecureGovernance

Class	DdsDomainRange			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication			
Note	DDS Domain ID range.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	DdsSecureGovernance.domainId			
Attribute	Type	Mult.	Kind	Note
max	PositiveInteger	0..1	attr	Upper bound of the DdsDomainRange.
min	PositiveInteger	0..1	attr	Lower bound of the DdsDomainRange.

Table 11.89: DdsDomainRange

Enumeration	DdsProtectionKindEnum			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::SecureCommunication			
Note	Supported cryptographic transformations (extended).			
Aggregated by	DdsSecureGovernance.discoveryProtectionKind , DdsSecureGovernance.livelinessProtectionKind , DdsSecureGovernance.rtpsProtectionKind , DdsTopicAccessRule.dataProtectionKind , DdsTopicAccessRule.metadataProtectionKind			
Literal	Description			
encryptAndSign	encryption and MAC transformations (in that precise order) are applied Tags: atp.EnumerationLiteralIndex=2			
encryptAndSign WithOrigin Authentication	similar to "EncryptAndSign" but with additional authentication codes produced under different secret keys, which prevents receiving peers from impersonating a specific sender Tags: atp.EnumerationLiteralIndex=4			
none	no transformation is applied Tags: atp.EnumerationLiteralIndex=0			
sign	Message Authentication Code (MAC) is applied, no encryption Tags: atp.EnumerationLiteralIndex=1			
signWithOrigin Authentication	similar to "sign" but with additional authentication codes produced under different secret keys, which prevents receiving peers from impersonating a specific sender Tags: atp.EnumerationLiteralIndex=3			

Table 11.90: DdsProtectionKindEnum

[constr_3679]{DRAFT} Existence of attributes for DdsSecureGovernance [The following attributes of `DdsSecureGovernance` shall exist **at the time when the creation of the manifest is finished**

- at least one `domainId`
- `identityCertificateAuthority`
- `permissionCertificateAuthority`
- `allowUnauthenticatedParticipants`
- `enableJoinAccessControl`
- `discoveryProtectionKind`
- `livelinessProtectionKind`
- `rtpsProtectionKind`

]()

[constr_3682]{DRAFT} Values of DdsDomainRange.min and DdsDomainRange.max [The value of `DdsDomainRange.min` shall be less than or equal to the value of `DdsDomainRange.max` **at the time when the creation of the manifest is finished.**]()

12 Raw Data Stream Manifest

12.1 Raw Data Stream Deployment

[TPS_MANI_01285]{DRAFT} Purpose of meta-class [RawDataStreamDeployment](#) [Meta-class [RawDataStreamDeployment](#) has the ability to further qualify an existing [AbstractRawDataStreamInterface](#) on deployment level.] ([RS_MANI_00067](#))

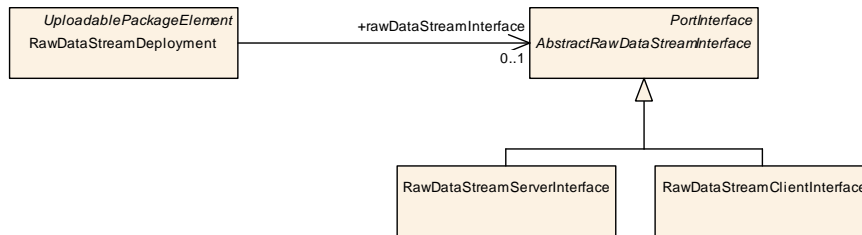


Figure 12.1: Modeling of the [RawDataStreamDeployment](#)

Class	RawDataStreamDeployment			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class represents the ability to model deployment-level information for a raw data stream Tags: atp.recommendedPackage=RawDataStreamDeployments			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
rawDataStreamInterface	AbstractRawDataStreamInterface	0..1	ref	This reference identifies the corresponding RawData StreamInterface,

Table 12.1: RawDataStreamDeployment

12.2 Raw Data Stream Mapping

[TPS_MANI_01287]{DRAFT} Semantics of [RawDataStreamMapping](#) [On the deployment side, the access to a raw data stream requires the provision of actual transport for the raw data.

In principle, it would be possible to implement the transport on top of various technologies.

Therefore, abstract meta-class [RawDataStreamMapping](#) exists to provide the principle ability to map to an [RPortPrototype](#) and to a [Process](#).

The mapping to a concrete transport technology is left to sub-classes of [RawDataStreamMapping](#).] ([RS_MANI_00067](#))

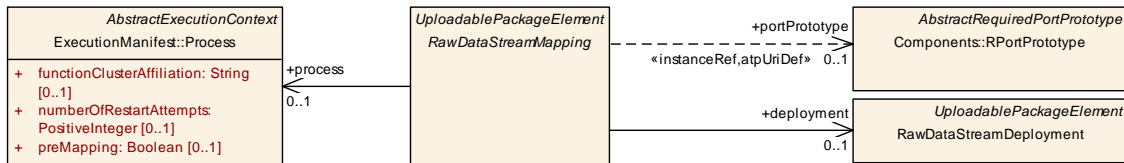


Figure 12.2: Modeling of the `RawDataStreamMapping`

Class	<i>RawDataStreamMapping</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class acts as an abstract base class for mapping raw data streams to the application software.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Subclasses	EthernetRawDataStreamMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
deployment	RawDataStreamDeployment	0..1	ref	This reference identifies the applicable RawDataStream Deployment.
portPrototype	RPortPrototype	0..1	iref	Reference to a specific PortPrototype that represents the raw data stream to the application. Stereotypes: <code>atpUriDefInstanceRef</code> implemented by: <code>RPortPrototypeInExecutableInstanceRef</code>
process	Process	0..1	ref	Reference to the Process in which the Executable that contains the SoftwareComponent and the referenced Port Prototype is executed.

Table 12.2: RawDataStreamMapping

12.3 Raw Data Streams over Ethernet

The configuration of raw data streams over Ethernet is done by means of the subclasses of meta-class [AbstractRawDataStreamEthernetCredentials](#) as well as meta-class [EthernetRawDataStreamMapping](#).

The obvious requirement to the configuration of the Ethernet credentials is that both ends of the communication have to be configured sufficiently, such that a connection between the two ends can be established.

The modeling of the configuration of Ethernet credentials uses different concepts for the description of the **local** end vs. the description of the **remote** end, see [\[TPS_MANI_01354\]](#).

[TPS_MANI_01354]{DRAFT} Rationale for the existence of meta-class [AbstractRawDataStreamEthernetCredentials](#) [On the *AUTOSAR adaptive platform*, the configuration of Ethernet credentials is typically modeled by means of the combination of [NetworkEndpoint](#) and [ApApplicationEndpoint](#).

This approach is also used for the unicast raw data stream communication, but only for the **local** configuration of unicast Ethernet credentials.

The credentials of the **remote** end (unicast and multicast) are configured in a simplified way by means of sub-classes of meta-class `AbstractRawDataStreamEthernetCredentials`.

This approach also supports the configuration of credentials for a remote end that is not running an AUTOSAR stack and that is therefore not contributing its credentials inside an AUTOSAR model in a more approachable way. *(RS_MANI_00067)*

Please note that, from the point of view of the application software and in the case of raw data stream communication both communication ends, i.e. the client side **and** the server side are implemented using an `RPortPrototype`.

This (from an AUTOSAR perspective) seemingly counter-intuitive aspect is also depicted in Figure 12.4, i.e. `RawDataStreamMapping` does only define a reference to an `RPortPrototype`.

Meta-class `AbstractRawDataStreamEthernetCredentials` and its subclasses (see Figure 12.3) have the ability to define IP addresses (either V4 or V6) and transport protocol (UDP and/or TCP).

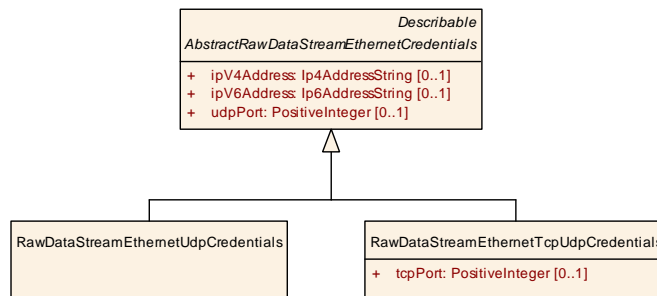


Figure 12.3: Modeling of the `AbstractRawDataStreamEthernetCredentials`

[constr_10076]{DRAFT} Existence of `RawDataStreamEthernetUdpCredentials.udpPort` [In the context of `RawDataStreamEthernetUdpCredentials`, the attribute `udpPort` shall exist **at the time when the creation of the manifest is finished.** *()*

Class	<code>AbstractRawDataStreamEthernetCredentials</code> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class serves as an abstract base class for the configuration of network credentials.			
Base	<code>ARObject</code> , <code>Describable</code>			
Subclasses	<code>RawDataStreamEthernetTcpUdpCredentials</code> , <code>RawDataStreamEthernetUdpCredentials</code>			
Attribute	Type	Mult.	Kind	Note
ipV4Address	Ip4AddressString	0..1	attr	This attribute describes the IP V4 address of the remote server.
ipV6Address	Ip6AddressString	0..1	attr	This attribute describes the IP V6 address of the remote server.
udpPort	PositiveInteger	0..1	attr	This attribute represents the configuration of a UDP port number.

Table 12.3: AbstractRawDataStreamEthernetCredentials

Class	RawDataStreamEthernetUdpCredentials			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This-meta-class represents the ability to create a configuration of network credentials for a raw data stream connection over UDP.			
Base	ARObject, AbstractRawDataStreamEthernetCredentials , Describable			
Aggregated by	EthernetRawDataStreamRemoteClientConfig.multicastCredentials , EthernetRawDataStreamRemoteClientConfig.unicastUdpCredentials , EthernetRawDataStreamRemoteServerConfig.multicastCredentials			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 12.4: RawDataStreamEthernetUdpCredentials

Class	RawDataStreamEthernetTcpUdpCredentials			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This-meta-class represents the ability to create a configuration of network credentials for a raw data stream connection over TCP and UDP (inherited from base class).			
Base	ARObject, AbstractRawDataStreamEthernetCredentials , Describable			
Aggregated by	EthernetRawDataStreamRemoteServerConfig.unicastCredentials			
Attribute	Type	Mult.	Kind	Note
tcpPort	PositiveInteger	0..1	attr	This attribute represents the configuration of a TCP port number.

Table 12.5: RawDataStreamEthernetTcpUdpCredentials

[constr_10077]{DRAFT} Existence of [ipV4Address](#) and [ipV6Address](#) within [AbstractRawDataStreamEthernetCredentials](#) [Within the context of a [AbstractRawDataStreamEthernetCredentials](#), either the attribute [ipV4Address](#) or the attribute [ipV6Address](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10078]{DRAFT} Existence of [RawDataStreamEthernetTcpUdpCredentials.tcpPort](#) and [udpPort](#) [In the context of a [RawDataStreamEthernetTcpUdpCredentials](#), either the attribute [tcpPort](#) **or** [udpPort](#) shall exist **at the time when the creation of the manifest is finished.**]()

[TPS_MANI_01355]{DRAFT} Definition of local Ethernet credentials [The definition of the **local** Ethernet credentials is done by means of the aggregation of meta-class [EthernetRawDataStreamLocalEndpointConfig](#) in the role [localEndpointConfig](#).

[EthernetRawDataStreamLocalEndpointConfig](#), in turn, defines the following aggregations for the configuration of local Ethernet credentials:

- a reference to [EthernetCommunicationConnector](#) in the role [localCommunicationConnector](#), that in turn refers to [NetworkEndpoint](#).
- references to [ApApplicationEndpoint](#) in the roles
 - [EthernetRawDataStreamLocalEndpointConfig.localUdpPort](#)
 - [EthernetRawDataStreamLocalEndpointConfig.localTcpPort](#)

] ([RS_MANI_00067](#))

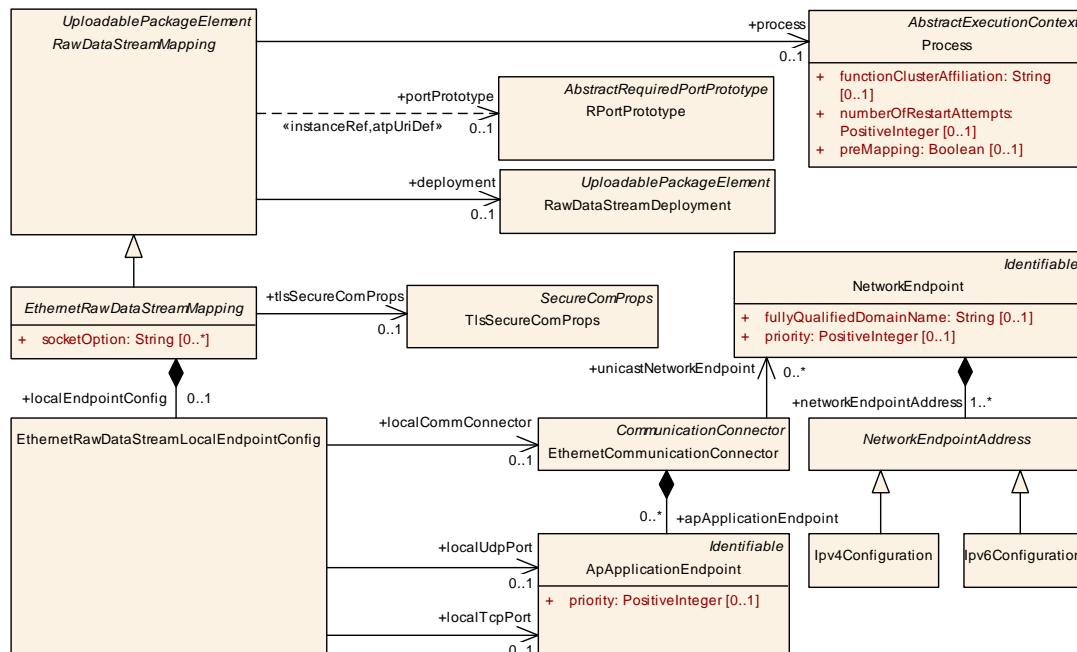


Figure 12.4: Modeling of the [EthernetRawDataStreamMapping](#)

Please note that the configuration of the corresponding remote end depends on the question whether the remote end represents a server (see [TPS_MANI_01356] in section 12.3.1) or a client (see [TPS_MANI_01357] in section 12.3.2).

Class	<i>EthernetRawDataStreamMapping</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class serves as the abstract bases class for the ability to map a PortPrototype to a Ethernet-based communication channel.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , RawDataStreamMapping , Referrable , UploadablePackageElement			
Subclasses	EthernetRawDataStreamClientMapping , EthernetRawDataStreamServerMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
localEndpoint Config	EthernetRawDataStreamLocalEndpointConfig	0..1	aggr	This aggregation is used to configure the credentials of the endpoint.
socketOption	String	*	attr	This attribute represents the ability to specify non-formal socket options that might only be valid for specific platforms. AUTOSAR does not define a standardized meaning for the possible values of this attribute.
tlsSecureCom Props	TlsSecureComProps	0..1	ref	This reference provides the ability to define TLS-related properties for the enclosing SocketRawDataStream Mapping.

Table 12.6: EthernetRawDataStreamMapping

Class	EthernetRawDataStreamLocalEndpointConfig			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class has the ability to act as a wrapper for the configuration of the remote endpoint in the context of a raw data stream mapping.			
Base	ARObject			
Aggregated by	EthernetRawDataStreamMapping.localEndpointConfig			
Attribute	Type	Mult.	Kind	Note
localCommConnector	EthernetCommunicationConnector	0..1	ref	This attribute represents the CommunicationConnector taken for socket-based data communication.
localTcpPort	ApApplicationEndpoint	0..1	ref	This aggregation represents the configuration of a local TCP port number.
localUdpPort	ApApplicationEndpoint	0..1	ref	This aggregation represents the configuration of a local unicast UDP port number.

Table 12.7: EthernetRawDataStreamLocalEndpointConfig

[constr_10079]{DRAFT} Existence of [EthernetRawDataStreamMapping.localTcpPort](#) and [localUdpPort](#) [In the context of a [EthernetRawDataStreamMapping.localCommConnector](#), only **one** attribute out of

- [localTcpPort](#)
- [localUdpPort](#)

shall exist **at the time when the creation of the manifest is finished.**]()

12.3.1 Ethernet Raw Data Stream Client Mapping

A raw data stream client may be prepared to receive data via unicast or multicast communication, but it shall only send requests via unicast to exactly one server.

[TPS_MANI_01356]{DRAFT} Definition of remote server's Ethernet credentials [The definition of the **remote** server's Ethernet credentials is done by means of attributes of meta-class [EthernetRawDataStreamRemoteServerConfig](#):

multicast If multicast configuration shall be supported, then the aggregation [EthernetRawDataStreamRemoteServerConfig.multicastCredentials](#) shall exist and the attribute [udpPort](#) shall be configured.

unicast If unicast configuration shall be supported, then the aggregation [EthernetRawDataStreamRemoteServerConfig.unicastUdpCredentials](#) shall exist and either the attribute [udpPort](#) **or** attribute [tcpPort](#) shall be configured.

] ([RS_MANI_00067](#))

The mutual existence of attributes [udpPort](#) and [tcpPort](#) is also addressed by [\[constr_10078\]](#).

Note that it is also possible for the client to use ephemeral ports for the communication. In this case, the `EthernetRawDataStreamLocalEndpointConfig.localTcpPort` – by convention – would be configured to value 0.

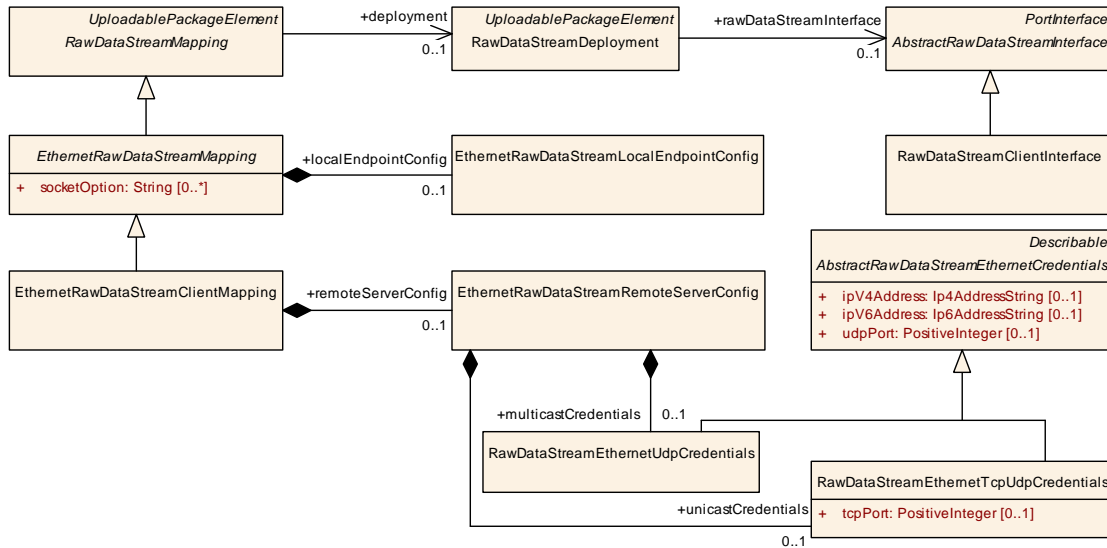


Figure 12.5: Modeling of the `EthernetRawDataStreamClientMapping`

Class	EthernetRawDataStreamClientMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class represents the ability to map a client PortPrototype to a Ethernet-based communication channel. Tags: atp.recommendedPackage=RawDataStreamingMappings			
Base	ARElement , ARObject , CollectableElement , EthernetRawDataStreamMapping , Identifiable , MultilanguageReferrable , PackageableElement , RawDataStreamMapping , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
remoteServer Config	EthernetRawDataStreamRemoteServerConfig	0..1	aggr	This aggregation is used to configure the credentials of the remote server.

Table 12.8: EthernetRawDataStreamClientMapping

Class	EthernetRawDataStreamRemoteServerConfig			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class has the ability to act as a wrapper for the configuration of the remote server in the context of a raw data stream client mapping.			
Base	ARObject			
Aggregated by	EthernetRawDataStreamClientMapping.remoteServerConfig			
Attribute	Type	Mult.	Kind	Note
multicast Credentials	RawDataStreamEthernetUdpCredentials	0..1	aggr	This aggregation represents the configuration of multicast credentials for communication with a remote raw data stream server.





Class	EthernetRawDataStreamRemoteServerConfig			
unicast Credentials	RawDataStream EthernetTcpUdp Credentials	0..1	aggr	This meta-class represents the ability to map a server PortPrototype to a Ethernet-based communication channel.

Table 12.9: EthernetRawDataStreamRemoteServerConfig

12.3.2 Ethernet Raw Data Stream Server Mapping

A raw data stream server shall *either* communicate via unicast *or* via multicast, as expressed in [constr_10086]. A switch between the two approaches depending on the evaluation of conditions at runtime, as possible in the SOME/IP communication, is not supported for raw data streams.

[TPS_MANI_01357]{DRAFT} Definition of remote client’s Ethernet credentials

[The definition of the **remote** client’s Ethernet credentials is done by means of attributes of meta-class `EthernetRawDataStreamRemoteClientConfig`:

multicast If multicast configuration shall be supported, then the aggregation `EthernetRawDataStreamRemoteClientConfig.multicastCredentials` shall exist and the attribute `udpPort` shall be configured.

unicast If unicast configuration shall be supported, then the aggregation `EthernetRawDataStreamRemoteClientConfig.unicastUdpCredentials` shall exist and attribute `udpPort` shall be configured.

](RS_MANI_00067)

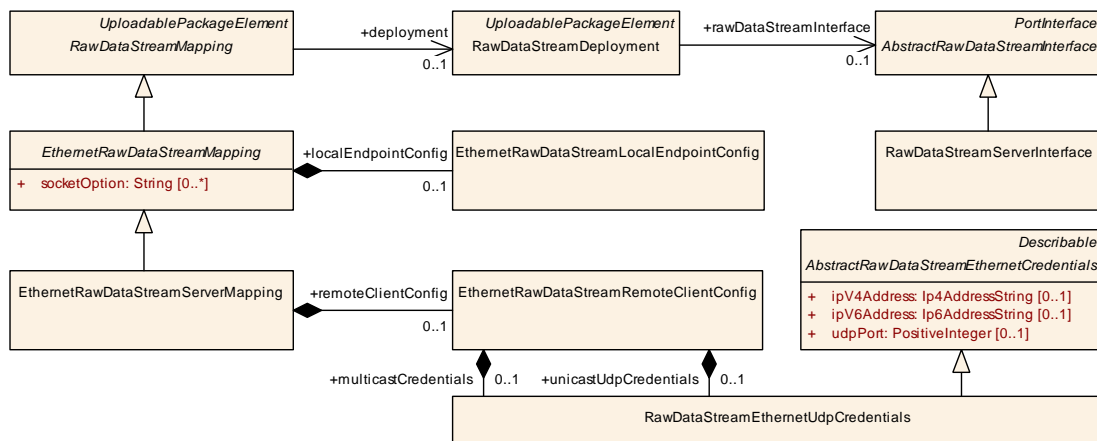


Figure 12.6: Modeling of the EthernetRawDataStreamServerMapping

Please note that a raw data stream server does not need to configure a TCP port of the client because the information about the TCP port of the client is conveyed as part of the TCP protocol.

[constr_10086]{DRAFT} Existence of `unicastUdpCredentials` and `multicastCredentials` in the context of a `EthernetRawDataStreamServerMapping` [In

the context of a [EthernetRawDataStreamServerMapping](#), only one aggregation out of

- [remoteClientConfig.multicastCredentials](#)
- [remoteClientConfig.unicastUdpCredentials](#)

shall exist **at the time when the creation of the manifest is finished.**]()

Class	EthernetRawDataStreamServerMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class represents the ability to map a server PortPrototype to a Ethernet-based communication channel. Tags: atp.recommendedPackage=RawDataStreamingMappings			
Base	ARElement , ARObject , CollectableElement , EthernetRawDataStreamMapping , Identifiable , MultilanguageReferrable , PackageableElement , RawDataStreamMapping , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
remoteClient Config	EthernetRawDataStreamRemoteClientConfig	0..1	aggr	This aggregation is used to configure the credentials of the remote client.

Table 12.10: EthernetRawDataStreamServerMapping

Class	EthernetRawDataStreamRemoteClientConfig			
Package	M2::AUTOSARTemplates::AdaptivePlatform::RawDataStreamMapping			
Note	This meta-class has the ability to act as a wrapper for the configuration of the remote server in the context of a raw data stream client mapping.			
Base	ARObject			
Aggregated by	EthernetRawDataStreamServerMapping.remoteClientConfig			
Attribute	Type	Mult.	Kind	Note
multicast Credentials	RawDataStreamEthernetUdpCredentials	0..1	aggr	This aggregation represents the configuration of multicast credentials for communication with a remote raw data stream client.
unicastUdp Credentials	RawDataStreamEthernetUdpCredentials	0..1	aggr	This aggregation represents the configuration of a remote raw data stream client that communicates via unicast over UDP.

Table 12.11: EthernetRawDataStreamRemoteClientConfig

12.3.3 Ethernet Raw Data Stream Configuration Examples

12.3.3.1 Preamble

The examples discussed in this section of the document are based on the modeling of two [EthernetCommunicationConnectors](#), one for the client (see Listing 12.1) and one for the server (see Listing 12.2)

```
<ETHERNET-COMMUNICATION-CONNECTOR>
  <SHORT-NAME>ClientConn</SHORT-NAME>
```

```

<AP-APPLICATION-ENDPOINTS>
  <AP-APPLICATION-ENDPOINT>
    <SHORT-NAME>ClientUnicastAEP</SHORT-NAME>
    <TP-CONFIGURATION>
      <UDP-TP>
        <UDP-TP-PORT>
          <PORT-NUMBER>3333</PORT-NUMBER>
        </UDP-TP-PORT>
      </UDP-TP>
    </TP-CONFIGURATION>
  </AP-APPLICATION-ENDPOINT>
  <AP-APPLICATION-ENDPOINT>
    <SHORT-NAME>ClientMulticastAEP</SHORT-NAME>
    <TP-CONFIGURATION>
      <UDP-TP>
        <UDP-TP-PORT>
          <PORT-NUMBER>7654</PORT-NUMBER>
        </UDP-TP-PORT>
      </UDP-TP>
    </TP-CONFIGURATION>
  </AP-APPLICATION-ENDPOINT>
</AP-APPLICATION-ENDPOINTS>
<UNICAST-NETWORK-ENDPOINT-REFS>
  <UNICAST-NETWORK-ENDPOINT-REF DEST="NETWORK-ENDPOINT">/
    CommunicationClusters/Ether/VLAN1/ClientEP</UNICAST-NETWORK-ENDPOINT
    -REF>
</UNICAST-NETWORK-ENDPOINT-REFS>
</ETHERNET-COMMUNICATION-CONNECTOR>
    
```

Listing 12.1: Definition of [EthernetCommunicationConnector](#) for the client

```

<ETHERNET-COMMUNICATION-CONNECTOR>
  <SHORT-NAME>ServerConn</SHORT-NAME>
  <AP-APPLICATION-ENDPOINTS>
    <AP-APPLICATION-ENDPOINT>
      <SHORT-NAME>ServerUnicastAEP</SHORT-NAME>
      <TP-CONFIGURATION>
        <UDP-TP>
          <UDP-TP-PORT>
            <PORT-NUMBER>7777</PORT-NUMBER>
          </UDP-TP-PORT>
        </UDP-TP>
      </TP-CONFIGURATION>
    </AP-APPLICATION-ENDPOINT>
    <AP-APPLICATION-ENDPOINT>
      <SHORT-NAME>ServerMulticastAEP</SHORT-NAME>
      <TP-CONFIGURATION>
        <UDP-TP>
          <UDP-TP-PORT>
            <PORT-NUMBER>7654</PORT-NUMBER>
          </UDP-TP-PORT>
        </UDP-TP>
      </TP-CONFIGURATION>
    </AP-APPLICATION-ENDPOINT>
  </AP-APPLICATION-ENDPOINTS>
  <UNICAST-NETWORK-ENDPOINT-REFS>
    
```

```

<UNICAST-NETWORK-ENDPOINT-REF DEST="NETWORK-ENDPOINT"/>
  CommunicationClusters/Ether/VLAN1/ServerEP</UNICAST-NETWORK-ENDPOINT
  -REF>
</UNICAST-NETWORK-ENDPOINT-REFS>
</ETHERNET-COMMUNICATION-CONNECTOR>
    
```

Listing 12.2: Definition of [EthernetCommunicationConnector](#) for the server

On top of that, the definition of a [EthernetPhysicalChannel](#) is also considered, see Listing 12.3.

```

<ETHERNET-PHYSICAL-CHANNEL>
  <SHORT-NAME>VLAN1</SHORT-NAME>
  <NETWORK-ENDPOINTS>
    <NETWORK-ENDPOINT>
      <SHORT-NAME>ClientEP</SHORT-NAME>
      <NETWORK-ENDPOINT-ADDRESSES>
        <IPV-4-CONFIGURATION>
          <IPV-4-ADDRESS>192.168.2.240</IPV-4-ADDRESS>
        </IPV-4-CONFIGURATION>
      </NETWORK-ENDPOINT-ADDRESSES>
    </NETWORK-ENDPOINT>
    <NETWORK-ENDPOINT>
      <SHORT-NAME>ServerEP</SHORT-NAME>
      <NETWORK-ENDPOINT-ADDRESSES>
        <IPV-4-CONFIGURATION>
          <IPV-4-ADDRESS>192.168.2.223</IPV-4-ADDRESS>
        </IPV-4-CONFIGURATION>
      </NETWORK-ENDPOINT-ADDRESSES>
    </NETWORK-ENDPOINT>
  </NETWORK-ENDPOINTS>
</ETHERNET-PHYSICAL-CHANNEL>
    
```

Listing 12.3: Definition of [EthernetPhysicalChannel](#) for connection between client and server

12.3.3.2 Fully formalized Model Example

A scenario where both the raw data stream client and raw data stream server are fully formalized inside an AUTOSAR model is depicted in Figure 12.7.

In the case of a fully formalized model it may be possible to derive the client configuration (that also consists of the credentials of the remote server) from the server's model if the server model is accessible.

The AUTOSAR meta-model foresees the specification of the server credentials in the client's configuration by means of the aggregation [EthernetRawDataStream-ClientMapping.remoteServerConfig](#).

If multicast communication from server to client is foreseen, then the aggregation in the role [EthernetRawDataStreamClientMapping.remoteServerConfig.multicastCredentials](#) also needs to exist.

For the sake of simplicity, this example has been created to communicate the general idea of the configuration approach rather than to demonstrate a true-to-the-meta-model representation.

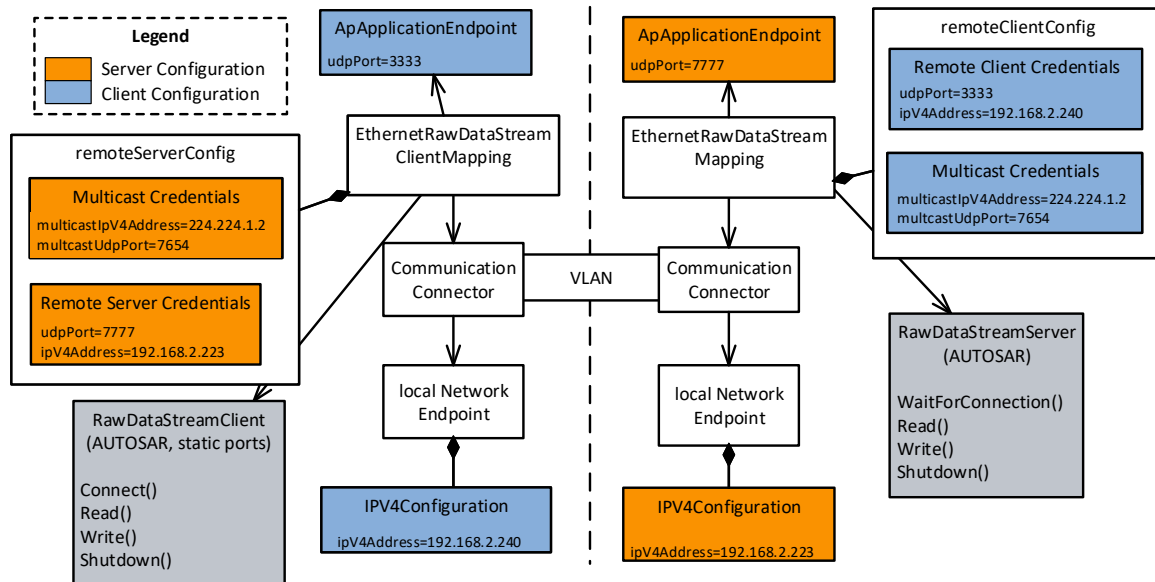


Figure 12.7: Scenario where both the raw data stream client and raw data stream server are fully formalized inside an AUTOSAR model

Please note that this example utilizes UDP communication only. If the unicast communication were based on TCP, the server’s configuration would (as mentioned in section 12.3.2) not need the client’s TCP credentials, i.e. `EthernetRawDataStreamServerMapping.remoteClientConfig` (the “Remote Client Credentials” in Figure 12.7) would not exist.

In a fully formalized model, the configuration of the multicast credentials shall be identical for all affected communication ends. The simplified (the focus is on the Ethernet configuration, based on the modeling described in section 12.3.3.1) modeling of the client mapping is sketched in Listing 12.4.

```

<SHORT-NAME>MachineDesigns</SHORT-NAME>
<ELEMENTS>
  <MACHINE-DESIGN>
    <SHORT-NAME>Mach</SHORT-NAME>
    <COMMUNICATION-CONNECTORS>
<!-- line 13 -->
<ETHERNET-COMMUNICATION-CONNECTOR>
  <SHORT-NAME>ClientConn</SHORT-NAME>
  <AP-APPLICATION-ENDPOINTS>
    <AP-APPLICATION-ENDPOINT>
      <SHORT-NAME>ClientUnicastAEP</SHORT-NAME>
      <TP-CONFIGURATION>
        <UDP-TP>
          <UDP-TP-PORT>
            <PORT-NUMBER>3333</PORT-NUMBER>
          </UDP-TP-PORT>

```



```

        </UDP-TP>
    </TP-CONFIGURATION>
</AP-APPLICATION-ENDPOINT>
<AP-APPLICATION-ENDPOINT>
    <SHORT-NAME>ClientMulticastAEP</SHORT-NAME>
    <TP-CONFIGURATION>
        <UDP-TP>
            <UDP-TP-PORT>
                <PORT-NUMBER>7654</PORT-NUMBER>
            </UDP-TP-PORT>
        </UDP-TP>
    </TP-CONFIGURATION>
</AP-APPLICATION-ENDPOINT>
</AP-APPLICATION-ENDPOINTS>
<UNICAST-NETWORK-ENDPOINT-REFS>
    <UNICAST-NETWORK-ENDPOINT-REF DEST="NETWORK-ENDPOINT">/
        CommunicationClusters/Ether/VLAN1/ClientEP</UNICAST-NETWORK-ENDPOINT
        -REF>
</UNICAST-NETWORK-ENDPOINT-REFS>
</ETHERNET-COMMUNICATION-CONNECTOR>
<!-- line 42 -->
<!-- line 43 -->
<ETHERNET-COMMUNICATION-CONNECTOR>
    <SHORT-NAME>ServerConn</SHORT-NAME>
    <AP-APPLICATION-ENDPOINTS>
        <AP-APPLICATION-ENDPOINT>
            <SHORT-NAME>ServerUnicastAEP</SHORT-NAME>
            <TP-CONFIGURATION>
                <UDP-TP>
                    <UDP-TP-PORT>
                        <PORT-NUMBER>7777</PORT-NUMBER>
                    </UDP-TP-PORT>
                </UDP-TP>
            </TP-CONFIGURATION>
        </AP-APPLICATION-ENDPOINT>
        <AP-APPLICATION-ENDPOINT>
            <SHORT-NAME>ServerMulticastAEP</SHORT-NAME>
            <TP-CONFIGURATION>
                <UDP-TP>
                    <UDP-TP-PORT>
                        <PORT-NUMBER>7654</PORT-NUMBER>
                    </UDP-TP-PORT>
                </UDP-TP>
            </TP-CONFIGURATION>
        </AP-APPLICATION-ENDPOINT>
    </AP-APPLICATION-ENDPOINTS>
    <UNICAST-NETWORK-ENDPOINT-REFS>
        <UNICAST-NETWORK-ENDPOINT-REF DEST="NETWORK-ENDPOINT">/
            CommunicationClusters/Ether/VLAN1/ServerEP</UNICAST-NETWORK-ENDPOINT
            -REF>
    </UNICAST-NETWORK-ENDPOINT-REFS>
</ETHERNET-COMMUNICATION-CONNECTOR>
<!-- line 72 -->
    </COMMUNICATION-CONNECTORS>
</MACHINE-DESIGN>
</ELEMENTS>

```

```

</AR-PACKAGE>
<AR-PACKAGE>
  <SHORT-NAME>CommunicationClusters</SHORT-NAME>
  <ELEMENTS>
    <ETHERNET-CLUSTER>
      <SHORT-NAME>Ether</SHORT-NAME>
      <ETHERNET-CLUSTER-VARIANTS>
        <ETHERNET-CLUSTER-CONDITIONAL>
          <PHYSICAL-CHANNELS>
<!-- line 85-->
<ETHERNET-PHYSICAL-CHANNEL>
  <SHORT-NAME>VLAN1</SHORT-NAME>
  <NETWORK-ENDPOINTS>
    <NETWORK-ENDPOINT>
      <SHORT-NAME>ClientEP</SHORT-NAME>
      <NETWORK-ENDPOINT-ADDRESSES>
        <IPV-4-CONFIGURATION>
          <IPV-4-ADDRESS>192.168.2.240</IPV-4-ADDRESS>
        </IPV-4-CONFIGURATION>
      </NETWORK-ENDPOINT-ADDRESSES>
    </NETWORK-ENDPOINT>
    <NETWORK-ENDPOINT>
      <SHORT-NAME>ServerEP</SHORT-NAME>
      <NETWORK-ENDPOINT-ADDRESSES>
        <IPV-4-CONFIGURATION>
          <IPV-4-ADDRESS>192.168.2.223</IPV-4-ADDRESS>
        </IPV-4-CONFIGURATION>
      </NETWORK-ENDPOINT-ADDRESSES>
    </NETWORK-ENDPOINT>
  </NETWORK-ENDPOINTS>
</ETHERNET-PHYSICAL-CHANNEL>
<!-- line 107 -->
  </PHYSICAL-CHANNELS>
  </ETHERNET-CLUSTER-CONDITIONAL>
  </ETHERNET-CLUSTER-VARIANTS>
  </ETHERNET-CLUSTER>
</ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
  <SHORT-NAME>RawDataStreamingMappings</SHORT-NAME>
  <ELEMENTS>
<!-- line 117 -->
<ETHERNET-RAW-DATA-STREAM-CLIENT-MAPPING>
  <SHORT-NAME>ClientMap</SHORT-NAME>
  <LOCAL-ENDPOINT-CONFIG>
    <LOCAL-COMM-CONNECTOR-REF DEST="ETHERNET-COMMUNICATION-CONNECTOR"/>
      MachineDesigns/Mach/ClientConn</LOCAL-COMM-CONNECTOR-REF>
    <LOCAL-UDP-PORT-REF DEST="AP-APPLICATION-ENDPOINT"/>MachineDesigns/Mach
      /ClientConn/ClientUnicastAEP</LOCAL-UDP-PORT-REF>
  </LOCAL-ENDPOINT-CONFIG>
  <REMOTE-SERVER-CONFIG>
    <MULTICAST-CREDENTIALS>
      <IP-V-4-ADDRESS>224.224.1.2</IP-V-4-ADDRESS>
      <UDP-PORT>7654</UDP-PORT>
    </MULTICAST-CREDENTIALS>
    <UNICAST-CREDENTIALS>

```

```

        <IP-V-4-ADDRESS>192.168.2.223</IP-V-4-ADDRESS>
        <UDP-PORT>7777</UDP-PORT>
    </UNICAST-CREDENTIALS>
</REMOTE-SERVER-CONFIG>
</ETHERNET-RAW-DATA-STREAM-CLIENT-MAPPING>
    
```

Listing 12.4: Modeling of the client mapping

The simplified (the focus is on the Ethernet configuration, based on the modeling described in section 12.3.3.1) modeling of the server mapping is sketched in Listing 12.5.

```

<ETHERNET-RAW-DATA-STREAM-SERVER-MAPPING>
  <SHORT-NAME>ServerMap</SHORT-NAME>
  <LOCAL-ENDPOINT-CONFIG>
    <LOCAL-COMM-CONNECTOR-REF DEST="ETHERNET-COMMUNICATION-CONNECTOR"/>
      MachineDesigns/Mach/ServerConn</LOCAL-COMM-CONNECTOR-REF>
    <LOCAL-UDP-PORT-REF DEST="AP-APPLICATION-ENDPOINT"/>MachineDesigns/Mach
      /ServerConn/ServerUnicastAEP</LOCAL-UDP-PORT-REF>
  </LOCAL-ENDPOINT-CONFIG>
  <REMOTE-CLIENT-CONFIG>
    <UNICAST-UDP-CREDENTIALS>
      <IP-V-4-ADDRESS>192.168.2.240</IP-V-4-ADDRESS>
      <UDP-PORT>3333</UDP-PORT>
    </UNICAST-UDP-CREDENTIALS>
  </REMOTE-CLIENT-CONFIG>
</ETHERNET-RAW-DATA-STREAM-SERVER-MAPPING>
    
```

Listing 12.5: Modeling of the server mapping

12.3.3.3 Only Client is formalized

The case that **only** the client is formalized (and the server does not appear in the form of an [EthernetRawDataStreamServerMapping](#)) can be represented by a subset of the modeling described in section 12.3.3.2 as well as the model sketched in Listing 12.4.

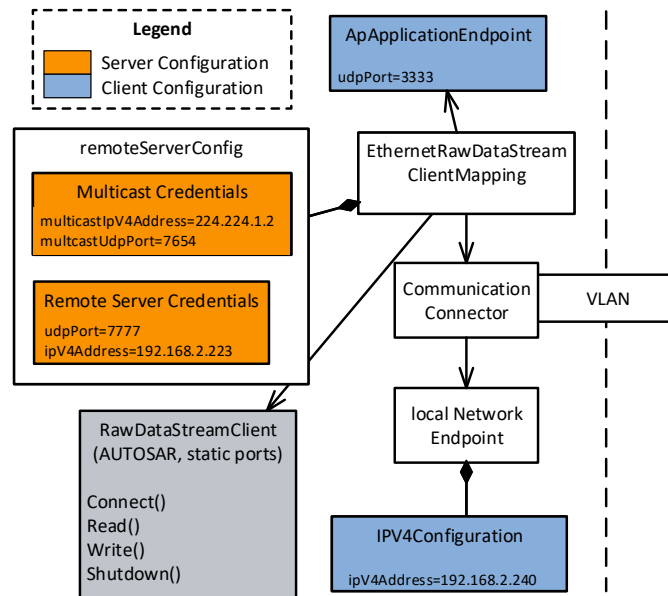


Figure 12.8: Scenario where only the raw data stream client is fully formalized inside an AUTOSAR model

12.3.3.4 Only Server is formalized

The case that **only** the server is formalized (and the client does not appear in the form of an `EthernetRawDataStreamClientMapping`) can be represented by a subset of the modeling described in section 12.3.3.2 as well as the model sketched in Listing 12.5.

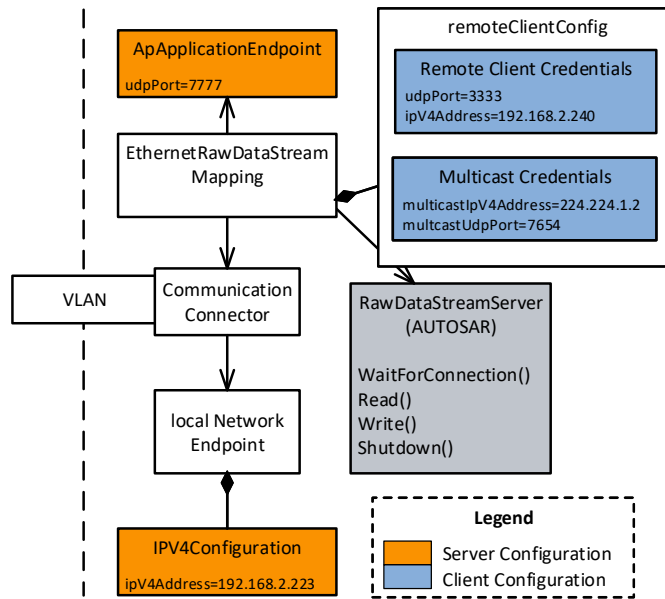


Figure 12.9: Scenario where only the raw data stream server is fully formalized inside an AUTOSAR model

13 Signal-based communication

13.1 Overview

The applications on the adaptive platform communicate with each other in a service-oriented manner. But there is also a use case where applications on the *AUTOSAR adaptive platform* need to communicate with software-components running on the *AUTOSAR classic platform*.

If the remote ECU on the *AUTOSAR classic platform* communicates via SOME/IP in a service-oriented manner and uses the SOME/IP transformer to serialize its data, then the communication with the *Machine* on the *AUTOSAR adaptive platform* can be established directly without any adaptations of neither the ECU nor the *Machine*.

If the counterpart on the *AUTOSAR classic platform* ECU communicates using signal-based communication over, e.g., CAN or FlexRay, the translation of the signal-based content into *ServiceInterfaces* needs to be established. The preconditions for this use-case are defined in section 13.2.

Such a *signal/service translation* may happen in a Gateway that is implemented on an ECU on the *AUTOSAR classic platform*. Such a solution is out of scope of this document since it is handled using the *AUTOSAR classic platform* configuration means. This approach is defined in the System Template specification for the Classic platform [19]. It is up to the vehicle architecture design to choose whether the *signal/service translation* shall be implemented on a Classic platform ECU or on an Adaptive platform Machine.

Another alternative for this translation is to happen directly on the *Machine* on the *AUTOSAR adaptive platform* by an Application that is running in the Process, as sketched in Figure 13.1.

This Application communicates with other applications on the *AUTOSAR adaptive platform* in the service-oriented way over *ara::com*; but it is also able to transmit and receive *ISignals* as well as communicate signal-based with remote ECUs on the *AUTOSAR classic platform*.

In order to make this possible, software that conforms to the specification of the COM stack on the *AUTOSAR classic platform* needs to be executed on the *Machine* on the *AUTOSAR adaptive platform*.

For the configuration of this software, the System Description based on the System Template on the *AUTOSAR classic platform* is used that contains a communication matrix description with *Pdus* and *ISignals*.

This chapter introduces a modeling that creates a bridge between the service-oriented communication based on *ServiceInterfaces* of the *AUTOSAR adaptive platform* and the signal-based communication involving the definition of *Pdus* and *ISignals* that are used on the *AUTOSAR classic platform*.

The [signal/service translation](#) mapping, together with the *AUTOSAR classic platform* System Description, allows to configure the communication between a *Machine* on the *AUTOSAR adaptive platform* and an ECU on the *AUTOSAR classic platform*. Please note that in a setup like the one sketched in [Figure 13.1](#), the *AUTOSAR classic platform* System Description would also contain a Pdu or Signal Gateway configuration between the Ethernet and the CAN network to forward the PDUs between the networks.

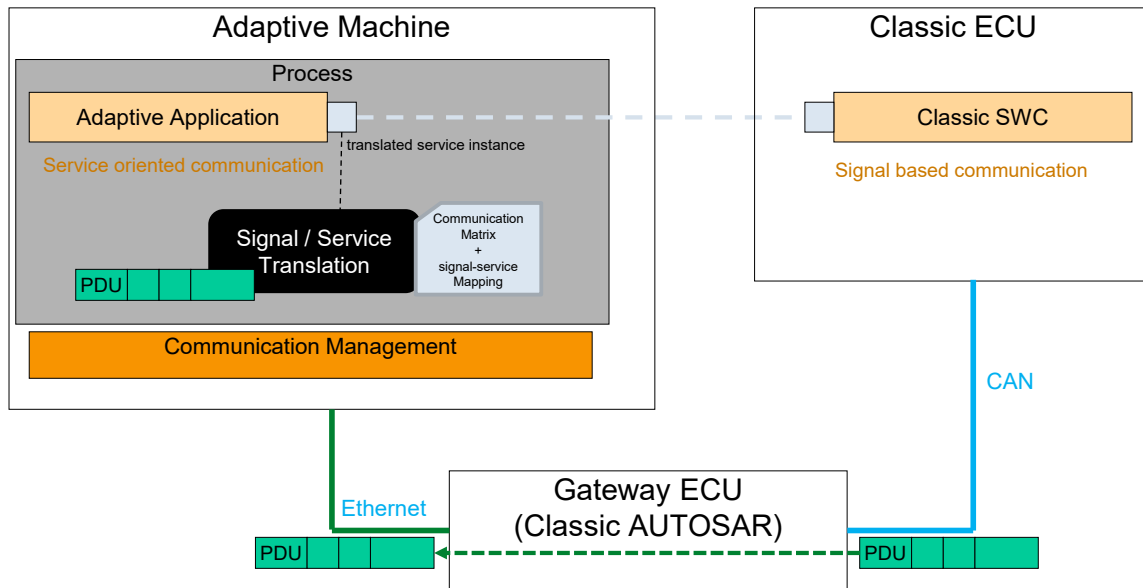


Figure 13.1: Signal-service-translation in Application on Adaptive Machine

The *translated service instance* is accessed from the application software using the `ara::com` API. The translation is designed as a `network binding` similar to the binding of `SOME/IP`. So the communication direction is

- if the signal-based payload is received by the *Machine* then the application software has a `RPortPrototype`
- if the signal-based payload is sent by the *Machine* then the application software has a `PPortPrototype`.

Another approach for the usage of [signal/service translation](#) is the interaction of a Classic AUTOSAR Instance and an Adaptive AUTOSAR Instance running on the same virtualization technology.

In such a setup, the IPC technology is able to transport `ISignalIPdus` between the two platform instances. It is not defined whether the IPC technology requires any Message Header (according to section [13.2.1](#)) being part of the payload. Thus, no dedicated configuration for this Message Header (specifically the configuration of the Header ID) is required in case this information can already be derived from the protocol information of the underlying IPC technology (e.g. dedicated IPC channels for different messages).

Figure 13.2 sketches an example setup where a virtualization technology enables the transport of messages between a Classic and an Adaptive Platform instance.

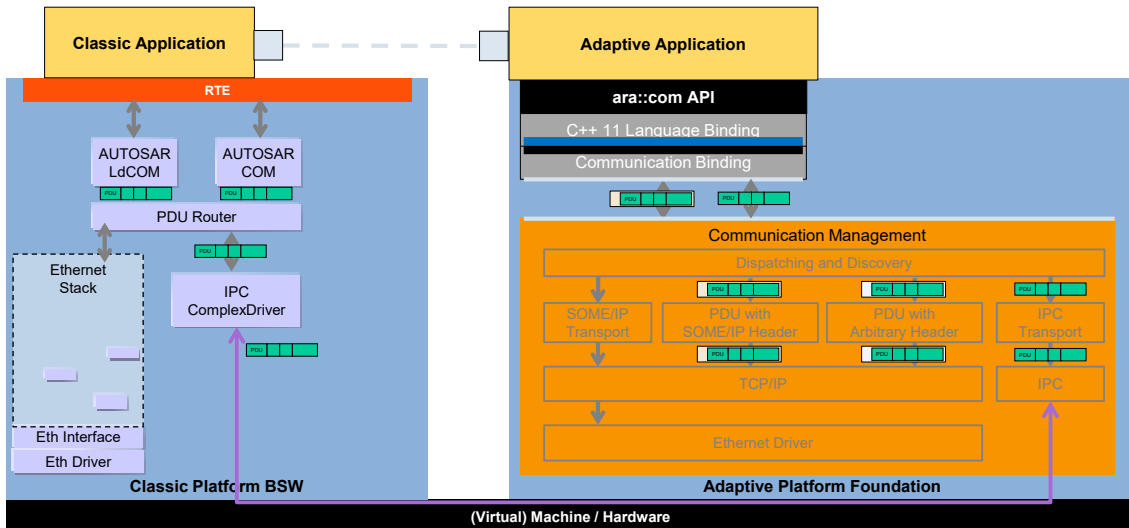


Figure 13.2: Signal/service translation using IPC technology

Based on the [signal/service translation](#) network binding there are several approaches for further processing the translated information (illustrated in figure 13.3):

- The application software on the *AUTOSAR adaptive platform* directly consumes/produces¹ the translated service (1)
This is the typical approach if there is only one piece of application software on the *AUTOSAR adaptive platform* interested in the translated data.
- The application software on the *AUTOSAR adaptive platform* manages and performs a functional routing (2)
This is the approach if the translated data shall be available as a service again for further processing. Here it is up to the implementation of the application software on the *AUTOSAR adaptive platform* how the translated data is routed to the secondary service, especially whether data combination and data conversion are applied.
- Pass Through Connectors: The translated service is passed through to be available to further application software on the *AUTOSAR adaptive platform*. This is the approach if there exist several further application software on the *AUTOSAR adaptive platform* which are using the translated service. In this case the translation only has to be performed once. Two cases can be distinguished:
 - The translated service and the secondary service use the same [ServiceInterface](#) (3)

¹In the explanations the direction [signal-service-translation](#) is usually used, the [service-signal-translation](#) direction is supported as well. For simplicity this is only mentioned explicitly if the mapping behavior is not symmetrical.

- The translated service and the secondary service use different (but compatible) `ServiceInterfaces` (4)

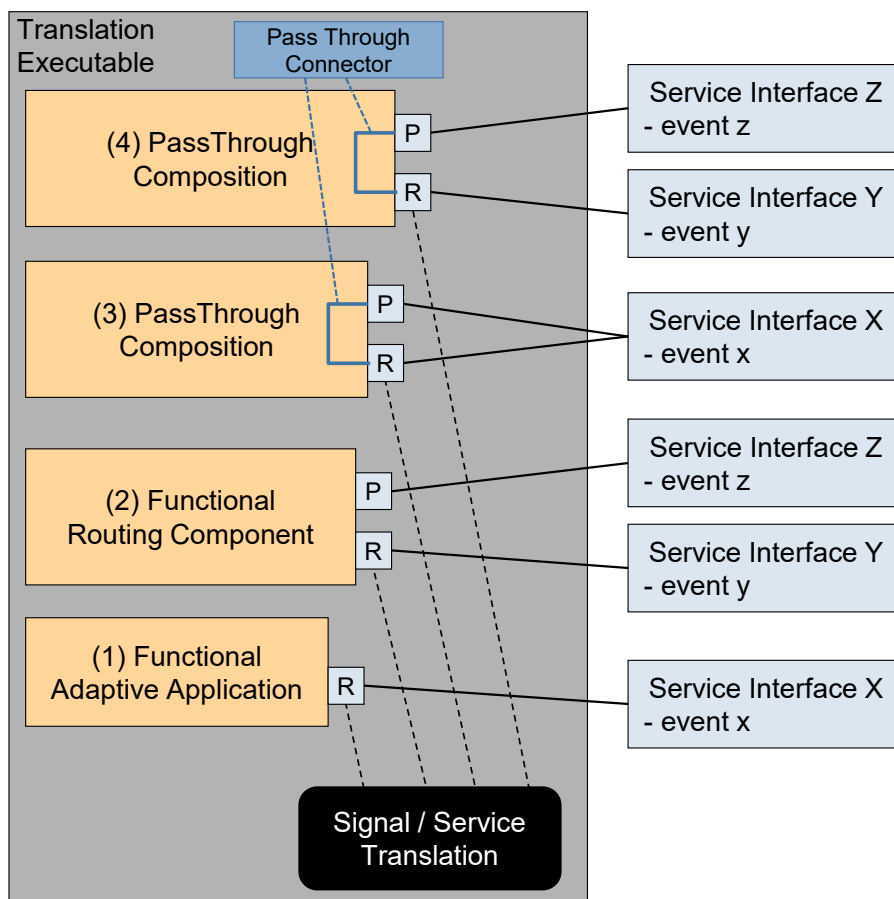


Figure 13.3: Signal/service translation and PassThroughConnector

The methodological approach is that out of the `signal/service translation` mapping descriptions it is possible to automatically generate the network binding code for the `signal/service translation`.

If there is a `CompositionSwComponentType` defined with `PassThroughSwConnectors` then also the `AdaptiveApplicationSwComponentType` implementing the pass through behavior can be generated (see section 13.7).

Please note that the configuration of such signal-based communication on an adaptive machine may be solved in two different ways:

1. The communication matrix definition (ARXML System Description) and the `signal/service translation` mapping is available on the target machine and is interpreted at run-time (like the manifest approach).
2. The communication matrix definition (ARXML System Description) and the `signal/service translation` mapping is built off-board and the application executable gets uploaded to the target `Machine` in response to changes in the communication matrix.

The `Executable` utilizing the `signal/service translation` and/or implementing the `PassThroughSwConnectors` is considered to belong to the `APPLICATION_LEVEL` domain as defined in [constr_1605]. This also applies to cases where the code implementing the `PassThroughSwConnectors` has been generated automatically by some tooling.

[TPS_MANI_03643]{DRAFT} Translation-Executable category [The `category` value of the `Executable` utilizing the `signal/service translation` and/or implementing the `PassThroughSwConnectors` shall be set to `APPLICATION_LEVEL`.] (*RS_MANI_00063*)

The following terminology is used in the context of `signal/service translation`:

Signal/service translation defines the feature this chapter is concerned with. It does not prescribe a specific translation direction.

Signal-service-translation defines the translation direction from a signal-based to a service oriented representation.

Service-signal-translation defines the translation direction from a service oriented to a signal-based representation.

13.2 Signal-based prerequisites

The identification of the received and sent messages and their actual length needs to be determined for each individual `Pdu`. Depending on the transport technology and configuration, a Message Header might be required. If the transport technology can determine the kind of `Pdu` and the length out of its protocol information, then the Message Header may be omitted.

If a custom transport technology is used (e.g. IPC between a Classic Platform instance and an Adaptive Platform instance), it depends on that specific transport technology whether a Message Header and length information is required or not.

As the sole communication network currently supported is `Ethernet`, the `Pdus` have to be transported on that network.

Although there is in theory the possibility to directly put the `Pdu` on the `Ethernet`, this approach would require an individual `Socket` per `Pdu`. This is an approach where especially Classic platform ECUs do not have enough resources available to allow individual `Sockets` per `Pdu`. Nevertheless, there is also support by the `signal/service translation` to have no Message Header defined for `Ethernet` transport.

In case of `Ethernet` transport and the approach of several `Pdus` sharing a `Socket`, there is a need to use a dedicated Message Header per `Pdu`. This is illustrated in figure 13.4. The Classic Platform ECU routes the `Pdus` from a `CAN` network to the `Ethernet`.

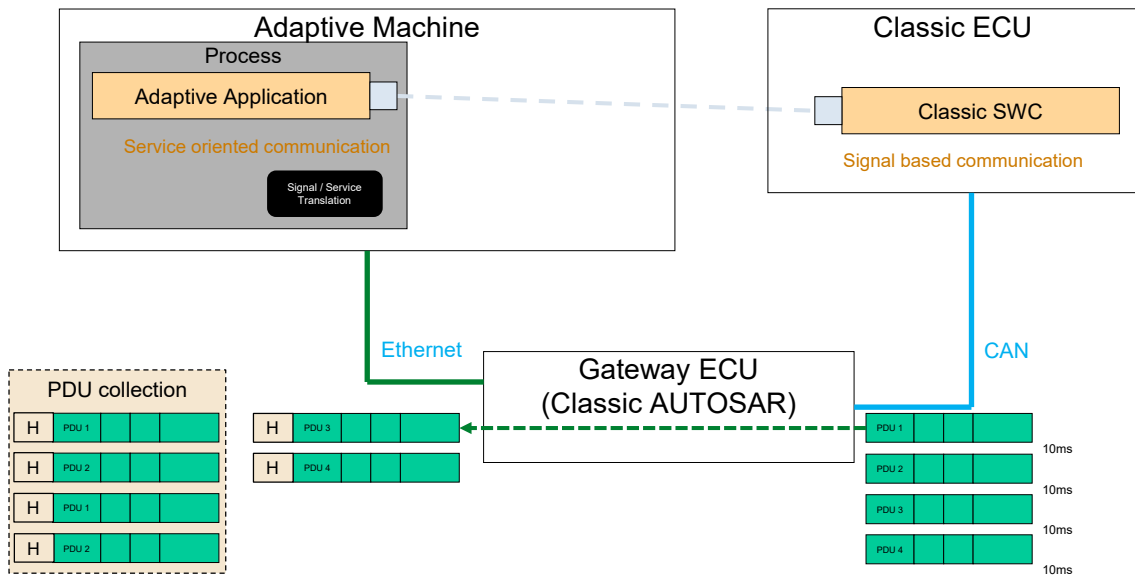


Figure 13.4: Network architecture for signal-service-translation

In order to have efficient transport of many Pdus on Ethernet additionally the SOME/–IP collection mechanism may be used (i.e. definition of `pduCollectionTrigger`, `pduCollectionSemantics`, `pduCollectionPduTimeout`).

13.2.1 Message Header

In case of Ethernet transport and the approach of several Pdus sharing a Socket, the identification of the received and sent messages is done using a 64 bit wide Message Header. This Message Header is composed of a 32 bit wide Message ID and a 32 bit wide Message Length field.

[TPS_MANI_03652]{DRAFT} Signal/service translation header format [If a Message Header is used then the message-transporting signal-based Pdus shall have a 32 bit wide Message ID field and a 32 bit wide Message Length field.] (*RS_MANI_00063*)

[TPS_MANI_03653]{DRAFT} Signal/service translation header endianness [The header of a message-transporting signal-based Pdus shall be encoded in big endian.] (*RS_MANI_00063*)

There are three variants supported by the `signal/service translation` approach how the Message Header is interpreted:

Partial SOME/IP Header : 32 bit wide Message ID field and 32 bit wide Length field (just Message ID and Length, then signal-based payload. Message ID according to the rules of SOME/IP: `ServiceId` and `MethodId` [PRS_SOMEIP_00245])

Arbitrary Message Header : 32 bit wide Message ID field and 32 bit wide Length field (e.g. CAN-Id taken as Message Id) with signal-based payload

No Message Header : No standardized Message Header is defined.

In figure 13.5, the *Full SOME/IP Header* is shown for illustration purposes. In the context of *signal/service translation* the *Full SOME/IP Header* is not used. The *Signal-Based Header* can either be configured according to the *Partial SOME/IP Header*, the *Arbitrary Message Header*, or the *No Message Header* approach.

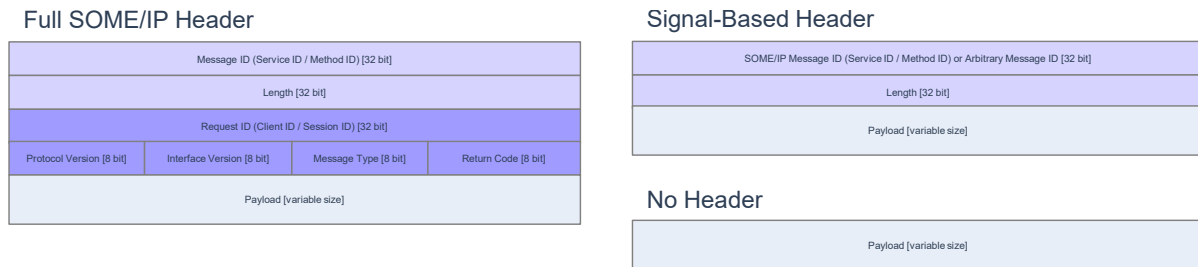


Figure 13.5: SOME/IP Message Header Format

Which Message Header variant is used for a dedicated message is defined according to the input configuration:

[TPS_MANI_03654]{DRAFT} Definition of Partial SOME/IP Header ID [If there is a `RequiredSomeipServiceInstance` of category `SIGNAL-BASED_WITH_HEADER` defined for the `signal-service-translation` (resp. `ProvidedSomeipServiceInstance` for the `service-signal-translation`), then the Message ID shall be interpreted according to the SOME/IP Message ID rules [PRS_SOMEIP_00245]. Namely the Message ID is composed of the `SomeipServiceInterfaceDeployment.serviceInterfaceId` and the `SomeipEventDeployment.eventId + 0x8000`.] ([RS_MANI_00063](#))

[TPS_MANI_03577]{DRAFT} Definition of Arbitrary Message Header ID [If there is a `RequiredUserDefinedServiceInstance` of category `SIGNAL-BASED_WITH_HEADER` defined for the `signal-service-translation` (resp. `ProvidedUserDefinedServiceInstance` for the `service-signal-translation`), then the Message ID shall be taken from the `SocketConnectionIpduIdentifier.headerId` attribute.] ([RS_MANI_00063](#))

[constr_3650]{DRAFT} headerId required in case of Arbitrary Message Header [If [TPS_MANI_03577] applies, then the respective `SocketConnectionIpduIdentifier.headerId` shall be defined.] ()

There is also the possibility to define the *No Message Header* option:

[TPS_MANI_03655]{DRAFT} Definition of No Message Header - implicit SOME/IP Message Identification [If there is a `RequiredSomeipServiceInstance` of category `SIGNALBASED_NO_HEADER` defined for the `signal-service-translation` (resp. `ProvidedSomeipServiceInstance` for the `service-signal-translation`), then no Message Header shall be used.

In this case it is either possible to derive the Message identification from the assignment to unambiguous communication channels or the Message identification is derived from protocol information of the underlying IPC technology. [\(RS_MANI_00063\)](#)

[TPS_MANI_03656]{DRAFT} Definition of No Message Header - implicit Arbitrary Message Identification [If there is a [RequiredUserDefinedServiceInstance](#) of category `SIGNALBASED_NO_HEADER` defined for the [signal-service-translation](#) (resp. [ProvidedUserDefinedServiceInstance](#) for the [service-signal-translation](#)), then no Message Header shall be used.

In this case it is either possible to derive the Message identification from the assignment to unambiguous communication channels or the Message identification is derived from protocol information of the underlying IPC technology. [\(RS_MANI_00063\)](#)

13.3 Signal-based Deployment

The signal-service-translation is embedded in the `SOME/IP` deployment using [SomeipServiceInterfaceDeployment](#). The attribute [SomeipEventDeployment.serializer](#) defines whether the `someip` or the `signalBased` serialization shall be used for a specific `event` (see also figure 11.4).

[TPS_MANI_03578]{DRAFT} Signal-based ServiceInterface binding over Ethernet [In case of signal-based communication over Ethernet the [SomeipServiceInterfaceDeployment](#) is used to define the `Pdu` transport over the network. [\(RS_MANI_00063\)](#)

This aspect is described in section 13.2.

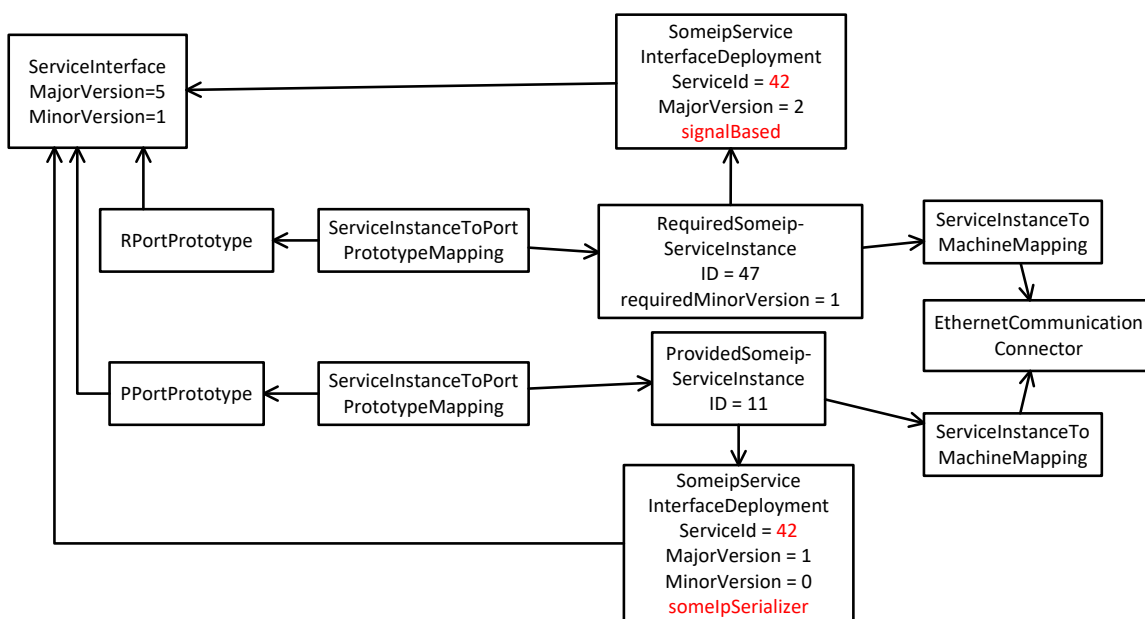


Figure 13.6: Example of 1 PPortPrototype mapped to one VLAN

[TPS_MANI_03579]{DRAFT} Signal-based ServiceEventDeployment over Ethernet [If the attribute `SomeipEventDeployment.serializer` equals `signalBased` then the `event` referenced by `ServiceEventDeployment.event` shall be handled using signal-service-translation.]([RS_MANI_00063](#))

Figure 13.6 illustrates a use-case where a `ServiceInterface` has two `SomeipServiceInterfaceDeployments`, one with `signalBased` serializer technology and one with `someip`.

The translation use-case is defined by having one `RPortPrototype` receiving the `signalBased` serialized messages and one `PPortPrototype` providing the `someip` serialized service.

13.4 Signal/Service Translation Mapping

This chapter describes the mapping of `ServiceInterface` elements of a specific `AdaptivePlatformServiceInstance` to `ISignalTriggerings`.

Note that according to [\[TPS_MANI_03555\]](#) the same Ethernet socket (via `ISignalTriggering`, `PduTriggering`, and `SocketConnection`) may be used for signal-based and service-oriented communication at the same time.

This allows to define one service instance which consists of events with different serialization technologies (i.e. `someip` and `signalBased`).

[TPS_MANI_03627]{DRAFT} No signal/service translation for methods [As Methods and Field getter/setter are already serialized using the `someip` serialization there is no need for `signal/service translation` for them.]([RS_MANI_00029](#))

Therefore, Methods and Field getter/setter are directly accessible using `ara::com` via the *Signal Based Network Binding* as defined in Communication Management [\[9\]](#). For passing methods through refer to section [13.7](#).

A `ServiceInstanceToSignalMapping` refers to an `AdaptivePlatformServiceInstance` in the role `ServiceInstanceToSignalMapping.serviceInstance`. While it would be possible to define the mappings for all the `events`, `fields`, and `triggers` of an `AdaptivePlatformServiceInstance` in the scope of one `ServiceInstanceToSignalMapping`, it is rather advised to create several `ServiceInstanceToSignalMappings` referring to the same `AdaptivePlatformServiceInstance`, one for each service member.

[advisory_02000]{DRAFT} Define a ServiceInstanceToSignalMapping per member of an AdaptivePlatformServiceInstance [If an `AdaptivePlatformServiceInstance` is referenced by a `ServiceInstanceToSignalMapping` in the role `ServiceInstanceToSignalMapping.serviceInstance`, then there should be one instance of `ServiceInstanceToSignalMapping` defined for every

member of the corresponding `ServiceInterface` (`event`, `field`, `method`, `trigger`).]()

13.4.1 Handling of `ISignalGroups`

`ISignalGroups` are used in the definition of `ISignalIPdus` to express that certain `ISignals` belong together and form a consistent set of data. The definition of `ISignalGroups` is part of the signal based communication matrix definition.

`ISignalGroups` do not need to be explicitly mapped when defining the `ServiceInstanceToSignalMappings`, they are implicitly covered in the mapping of the individual `ISignals` belonging to the `ISignalGroup`.

[advisory_02001]{DRAFT} No explicit signal/service translation for `ISignalGroups` [The mapping elements of a `ServiceInstanceToSignalMapping`:

- `SignalBasedEventElementToISignalTriggeringMapping.iSignalTriggering`
- `SignalBasedTriggerToISignalTriggeringMapping.iSignalTriggering`
- `SignalBasedFieldToISignalTriggeringMapping.notifierSignalTriggering`
- `SignalBasedFieldToISignalTriggeringMapping.setterCallSignal`
- `SignalBasedFieldToISignalTriggeringMapping.setterReturnSignal`
- `SignalBasedFieldToISignalTriggeringMapping.getterCallSignal`
- `SignalBasedFieldToISignalTriggeringMapping.getterReturnSignal`
- `SignalBasedMethodToISignalTriggeringMapping.callSignalTriggering`
- `SignalBasedMethodToISignalTriggeringMapping.returnSignalTriggering`

should not refer to an `ISignalTriggering` that in turn refers to an `ISignalGroup`.]
()

13.4.2 Direction of **Signal/Service Translation Mapping**

The definition of the translation mappings has no explicitly modeled direction (has no source or target point of view). Each individual mapping ([AbstractSignalBasedToSignalTriggeringMapping](#)) takes one element from a [ServiceInterface](#) and one [ISignalTriggering](#).

[TPS_MANI_03635]{DRAFT} Determination of translation direction [The translation direction is determined by

- the [communicationDirection](#) of the referenced [ISignalPort](#) which is referenced by the [ISignalTriggering](#)
- the kind of service instance which is referenced from the [ServiceInstanceToSignalMapping](#) in the role [serviceInstance](#). It can be either a [ProvidedApServiceInstance](#) or a [RequiredApServiceInstance](#).

] ([RS_MANI_00029](#))

[constr_3636]{DRAFT} Consistent [ISignal](#) communication direction **in and **RequiredApServiceInstance**** [If the [ServiceInstanceToSignalMapping.serviceInstance](#) refers to a [RequiredApServiceInstance](#) then any [ServiceInstanceToSignalMapping.eventElementMapping](#) (respectively [ServiceInstanceToSignalMapping.fieldMapping](#)) shall refer to an [ISignalTriggering](#) which in turn refers to an [ISignalPort](#) with [communicationDirection](#) equal to [in](#).]()

[constr_3637]{DRAFT} Consistent [ISignal](#) communication direction **out and **ProvidedApServiceInstance**** [If the [ServiceInstanceToSignalMapping.serviceInstance](#) refers to a [ProvidedApServiceInstance](#) then any [ServiceInstanceToSignalMapping.eventElementMapping](#) (respectively [ServiceInstanceToSignalMapping.fieldMapping](#)) shall refer to an [ISignalTriggering](#) which in turn refers to an [ISignalPort](#) with [communicationDirection](#) equal to [out](#).]()

Class	ServiceInstanceToSignalMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SignalBasedCommunication			
Note	This meta-class is defined for a specific ServiceInstance and contains the mappings of elements of a ServiceInterface for which the ServiceInstance is defined to individual ISignalTriggerings . Tags: atp.Status=candidate atp.recommendedPackage=ServiceInstanceToSignalMapping			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
eventElementMapping	SignalBasedEventElementToSignalTriggeringMapping	*	aggr	Mapping of an event or an element inside of the event to an ISignalTriggering . Tags: atp.Status=candidate





Class	ServiceInstanceToSignalMapping				
fieldMapping	SignalBasedFieldToSignalTriggeringMapping	*	aggr		Mapping of a field to ISignalTriggerings. Tags: atp.Status=candidate
fireAndForgetMethodMapping	SignalBasedFireAndForgetMethodToSignalTriggeringMapping	*	aggr		Mapping of an ISignalTriggering being part of a fire and forget message to a ClientServerOperation. Tags: atp.Status=candidate
methodMapping	SignalBasedMethodToSignalTriggeringMapping	*	aggr		Mapping of a method to ISignalTriggerings. Tags: atp.Status=candidate
serviceInstance	AdaptivePlatformServiceInstance	0..1	ref		Reference to a ServiceInstance from which the corresponding ServiceInterface elements will be transported in the signal-based way over a communication medium. Tags: atp.Status=candidate
triggerMapping	SignalBasedTriggerToSignalTriggeringMapping	*	aggr		Mapping of a trigger to an ISignalTriggering. Tags: atp.Status=candidate

Table 13.1: ServiceInstanceToSignalMapping

[constr_3733]{DRAFT} Upper multiplicity of aggregation in the role `ServiceInstanceToSignalMapping.methodMapping` [In the context of `ServiceInstanceToSignalMapping`, the aggregation in the role `methodMapping` shall exist at most once **at the time when the creation of the manifest is finished.**] ()

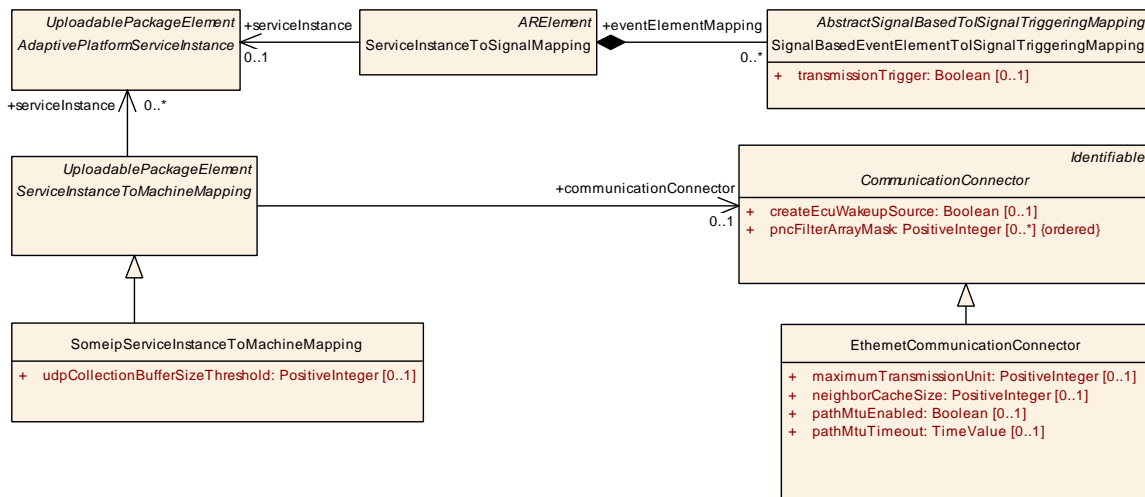


Figure 13.7: Relation of `ServiceInstanceToSignalMapping` and `CommunicationConnector`

The `ServiceInstanceToSignalMapping` refers to an `AdaptivePlatformServiceInstance` and thereby defines which `serviceInterfaceDeployment` elements will be mapped by the aggregated `eventElementMapping`, `methodMapping` and/or `fieldMapping` to `ISignalTriggerings`. This is described in detail in the following chapters.

The `ServiceInstanceToMachineMapping` which refers to the `AdaptivePlatformServiceInstance` (which in turn is referenced by the `ServiceInstanceToSignalMapping`) defines on which `CommunicationConnector` (i.e. network / VLAN) the signal based communication shall be performed.

[TPS_MANI_03629]{DRAFT} Relation of `ServiceInstanceToSignalMapping` and `CommunicationConnector` [The `ServiceInstanceToMachineMapping` referring to the `AdaptivePlatformServiceInstance` defines on which `CommunicationConnector` the `AdaptivePlatformServiceInstance` shall be communicated. If a `ServiceInstanceToSignalMapping` refers to the same `AdaptivePlatformServiceInstance` then the signal based communication shall be performed on the referenced `CommunicationConnector`.] (*RS_MANI_00029*)

13.4.3 SignalBasedEvent Mapping

It is required that every `event` with `signalBased` serialization has a `ServiceInstanceToSignalMapping` defined.

[constr_3550]{DRAFT} Existence of `ServiceInstanceToSignalMapping` for an `event` with `signalBased` serialization [If

- an `event` is referenced by a `SomeipEventDeployment` in the role `event` and
- the attribute `SomeipEventDeployment.serializer` is set to `signalBased`,

then a `ServiceInstanceToSignalMapping` shall exist with `eventElementMapping` referring to the `event` in the role `dataPrototypeInServiceInterfaceRef`.] ()

In case of composite payload it is important that the mapping definition is complete from the target point of view:

[constr_3551]{DRAFT} Full mapping of target `ISignalGroup` [If

- an `ISignalTriggering` is part of a `ServiceInstanceToSignalMapping` and
- the `ISignalTriggering` refers to an `ISignalPort` with `communicationDirection` equals `out` and
- the `ISignalTriggering` refers to an `ISignalGroup` in the role `iSignalGroup`,

then a `SignalBasedEventElementToISignalTriggeringMapping` shall exist for every `ISignal` referenced by the `ISignalGroup` in the role `iSignal`.] ()

[constr_3552]{DRAFT} Full mapping of target `event` [If

- the `ServiceInstanceToSignalMapping` refers to a `ProvidedSomeipServiceInstance` and

- the `dataPrototypeInServiceInterfaceRef` refers to a `DataPrototype` which is part of a composite data type,
- then a `SignalBasedEventElementToISignalTriggeringMapping` shall exist for every `DataPrototype` that is part of the composite data type.]()

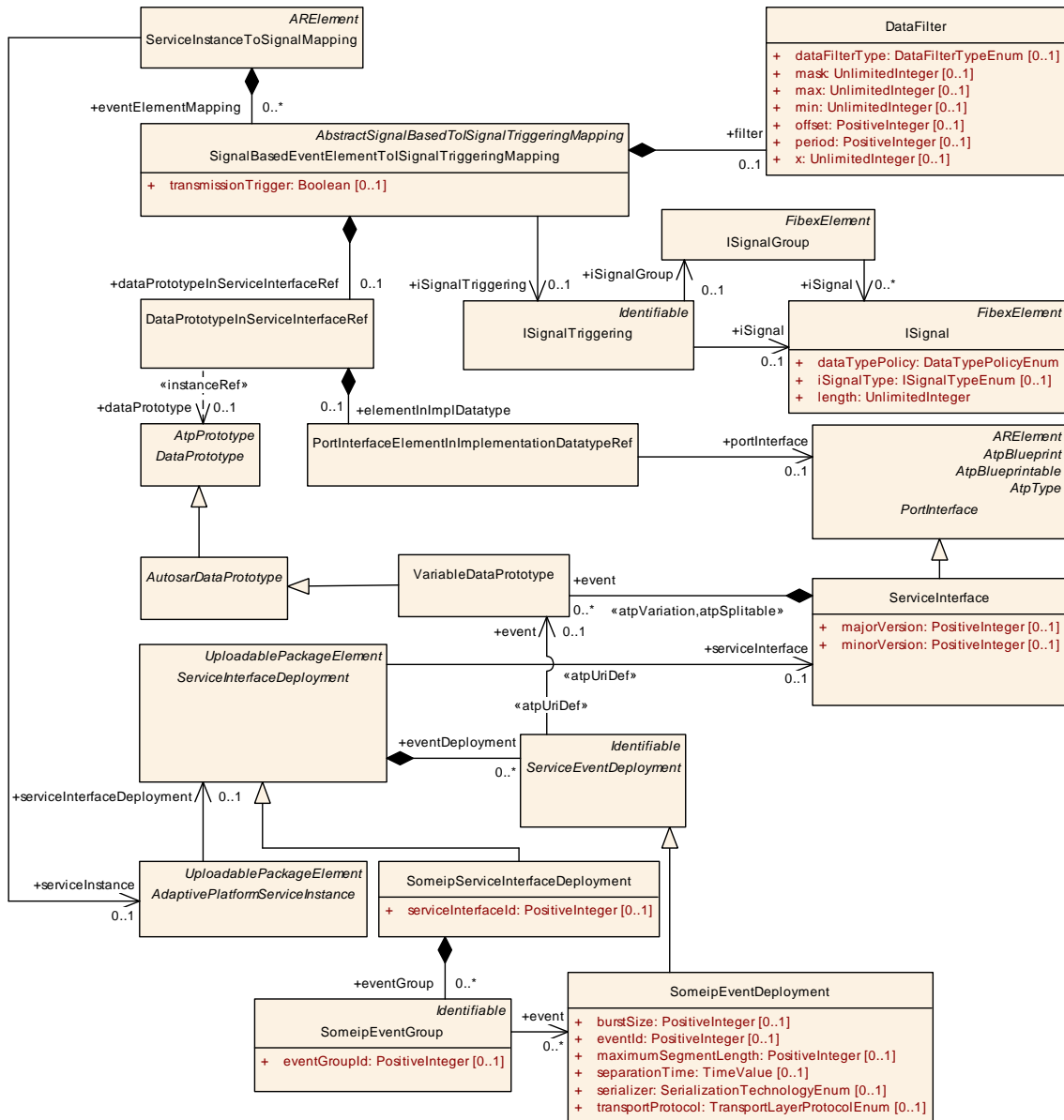


Figure 13.8: Mapping of Event elements to ISignals

[TPS_MANI_03124]{DRAFT} **ServiceInterface.event** to **ISignalTriggering** mapping [The `SignalBasedEventElementToISignalTriggeringMapping` meta-class provides the ability to map a `DataPrototype` defined in the context of a `ServiceInterface` to one `ISignalTriggering` of the `ISignal` or `ISignalGroup`.] ([RS_MANI_00029](#))

Class	SignalBasedEventElementToSignalTriggeringMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SignalBasedCommunication			
Note	This meta-class defines the mapping of a ServiceInterface event or an element that is defined inside of the event in case that the datatype is composite to an ISignalTriggering. Tags: atp.Status=candidate			
Base	ARObject, AbstractSignalBasedToSignalTriggeringMapping , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	ServiceInstanceToSignalMapping.eventElementMapping			
Attribute	Type	Mult.	Kind	Note
dataPrototypeInServiceInterfaceRef	DataPrototypeInServiceInterfaceRef	0..1	aggr	Reference to a DataPrototype or to an internal structure of a DataPrototype in the context of a ServiceInterface. Tags: atp.Status=candidate
filter	DataFilter	0..1	aggr	Defines an optional filter to be applied during translation. Tags: atp.Status=candidate
iSignalTriggering	ISignalTriggering	0..1	ref	Reference to the ISignalTriggering that is used to transport a piece of data of an event that is defined in a ServiceInterface in a signal-based way over a communication channel. Tags: atp.Status=candidate
transmissionTrigger	Boolean	0..1	attr	Defines whether the source element triggers the sending of the respective payload. Tags: atp.Status=candidate

Table 13.2: SignalBasedEventElementToSignalTriggeringMapping

[constr_10252]{DRAFT} Multiplicity of attribute [SignalBasedEventElementToSignalTriggeringMapping.dataPrototypeInServiceInterfaceRef](#)
 [For each [SignalBasedEventElementToSignalTriggeringMapping](#), the attribute [dataPrototypeInServiceInterfaceRef](#) shall exist **at the time when the creation of the manifest is finished.**]()

Class	AbstractSignalBasedToSignalTriggeringMapping (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SignalBasedCommunication			
Note	This meta-class is the common class for all SignalBased to ISignalTriggering mappings. Tags: atp.Status=candidate			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Subclasses	SignalBasedEventElementToSignalTriggeringMapping , SignalBasedFieldToSignalTriggeringMapping , SignalBasedFireAndForgetMethodToSignalTriggeringMapping , SignalBasedMethodToSignalTriggeringMapping , SignalBasedTriggerToSignalTriggeringMapping			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 13.3: AbstractSignalBasedToSignalTriggeringMapping

In the example sketched in [Figure 13.9](#) the *TestEvent* in the *TestServiceInterface* is of type *struct1* that consists of a primitive element *a* and struct *b*. The struct *b* consists of the primitive elements *x*, *y* and *z*.

A [ServiceInstanceToSignalMapping](#) with several [SignalBasedEventElementToSignalTriggeringMappings](#) is used to map the data leaves of *TestEvent* to the corresponding [ISignalTriggerings](#).

13.4.4 SignalBasedTrigger Mapping

It is required that every `trigger` with `signalBased` serialization has a `ServiceInstanceToSignalMapping` defined:

[constr_5318]{DRAFT} Existence of `ServiceInstanceToSignalMapping` for an `trigger` with `signalBased` serialization [If a `trigger` is referenced by a `SomeipEventDeployment` in the role `trigger` and the attribute `SomeipEventDeployment.serializer` is set to `signalBased` then a `ServiceInstanceToSignalMapping` shall exist with `triggerMapping` referring to the `trigger` in the role `trigger`.]()

[TPS_MANI_03287]{DRAFT} `ServiceInterface.trigger` to `ISignalTriggering` mapping [The `SignalBasedTriggerToISignalTriggeringMapping` meta-class provides the ability to map a `trigger` defined in the context of a `ServiceInterface` to one `ISignalTriggering` of the `ISignal`.] (*RS_MANI_00063*)

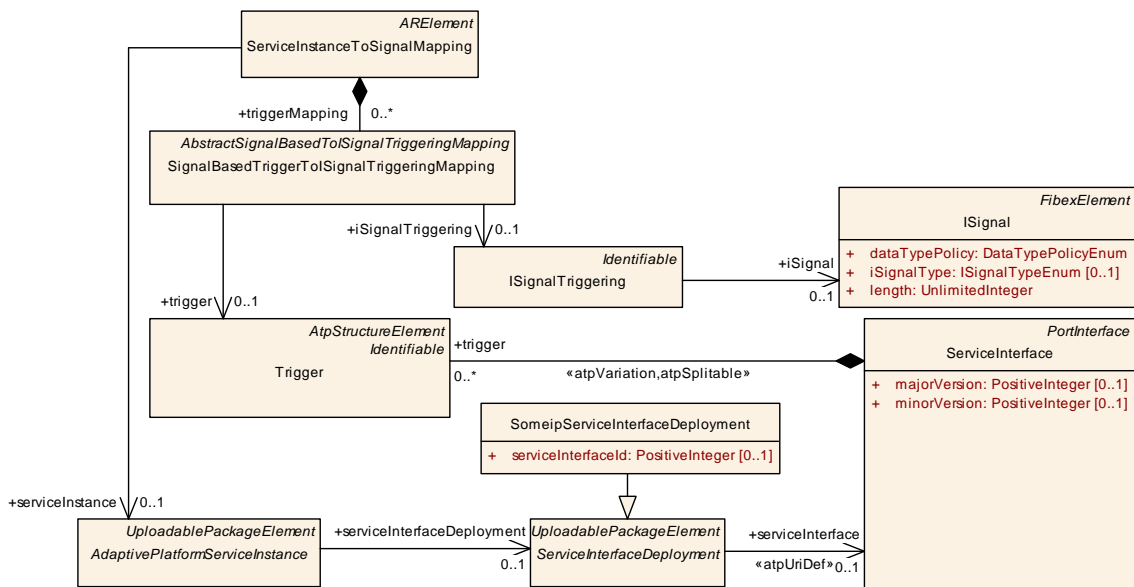


Figure 13.10: Mapping of a Trigger to an ISignal

Please note that [constr_1198] and [constr_1199] that are defined in the System Template specification [19] apply for the `ISignal` to which the `trigger` is mapped via the `ISignalTriggering` by the `SignalBasedTriggerToISignalTriggeringMapping`. This means that the `length` of the `ISignal` shall be 0 and an update bit shall be defined for the `ISignal` in case that no `DataTransformation` is used.

Class	SignalBasedTriggerToSignalTriggeringMapping
Package	M2::AUTOSARTemplates::AdaptivePlatform::SignalBasedCommunication
Note	This meta-class defines the mapping of a <code>ServiceInterface</code> trigger to an <code>ISignalTriggering</code> . Tags: atp.Status=candidate
Base	<code>ARObject</code> , <code>AbstractSignalBasedToSignalTriggeringMapping</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>





Class	SignalBasedTriggerToSignalTriggeringMapping			
Aggregated by	ServiceInstanceToSignalMapping.triggerMapping			
Attribute	Type	Mult.	Kind	Note
iSignalTriggering	ISignalTriggering	0..1	ref	Reference to the ISignalTriggering that is used to transport the trigger that is defined in a ServiceInterface in a signal-based way over a communication channel. Tags: atp.Status=candidate
trigger	Trigger	0..1	ref	Reference to a trigger defined in the context of a Service Interface. Tags: atp.Status=candidate

Table 13.4: SignalBasedTriggerToSignalTriggeringMapping

13.4.5 SignalBasedField Mapping

[advisory_02002]{DRAFT} **ServiceInterface.field** mapping to **ISignalTriggerings** for **primitive data type fields** [One `SignalBasedFieldToSignalTriggeringMapping` should be used to map a primitive data type field:

- if `Field.hasNotifier` equals true: to one `ISignalTriggering` for the `ISignal` representing the primitive Notifier element using the role `notifierSignalTriggering`
- if `Field.hasGetter` equals true: to one `ISignalTriggering` for the `ISignal` representing the Getter-Call using the role `getterCallSignal` and one `ISignalTriggering` for the `ISignal` representing the Getter-Return using the role `getterReturnSignal`
- if `Field.hasSetter` equals true: to one `ISignalTriggering` for the `ISignal` representing the Setter-Call using the role `setterCallSignal` and one `ISignalTriggering` for the `ISignal` representing the Setter-Return using the role `setterReturnSignal`.

]()

[advisory_02003]{DRAFT} **ServiceInterface.field** mapping to **ISignalTriggerings** for **composite data type fields** [Several `SignalBasedFieldToSignalTriggeringMappings` should be used to map a composite data type field.

One `SignalBasedFieldToSignalTriggeringMapping` should be used to map the getter and setter `ISignals`:

- if `Field.hasGetter` equals true: to one `ISignalTriggering` for the `ISignal` representing the Getter-Call using the role `getterCallSignal` and one `ISignalTriggering` for the `ISignal` representing the Getter-Return using the role `getterReturnSignal`

- if `Field.hasSetter` equals true: to one `ISignalTriggering` for the `ISignal` representing the Setter-Call using the role `setterCallSignal` and one `ISignalTriggering` for the `ISignal` representing the Setter-Return using the role `setterReturnSignal`.

If `Field.hasNotifier` equals true: a separate `SignalBasedFieldToISignalTriggeringMapping` should be used to map each `ISignal` belonging to the `ISignalGroup` used for the transport of the notifier using the role `notifierSignalTriggering`.]()

It means that several `SignalBasedFieldToISignalTriggeringMappings` may be necessary to map a `field` to the corresponding `ISignalTriggerings`.

It is required that every `field` using a `SomeipFieldDeployment.notifier` with `signalBased` serialization has a `ServiceInstanceToSignalMapping` defined:

[constr_3553]{DRAFT} Existence of `ServiceInstanceToSignalMapping` for an `field` with `signalBased` serialization [If a `field` is referenced by a `SomeipFieldDeployment` in the role `field` and that `SomeipFieldDeployment` aggregates a `SomeipEventDeployment` in the role `notifier` and the `SomeipEventDeployment` has an attribute `SomeipEventDeployment.serializer` set to `signalBased` then there shall exist a `ServiceInstanceToSignalMapping` with a `fieldMapping` referring to the `field` in the role `dataPrototypeInServiceInterfaceRef` and the `SignalBasedFieldToISignalTriggeringMapping` shall refer to a `ISignalTriggering` in the role `notifierSignalTriggering`.]()

In the example sketched in Figure 13.12 the `testField` in the `testServiceInterface` is of type `struct1` that consists of the primitive elements `a` and `b`. The `testField` defines a notifier and a setter method.

[constr_10228]{DRAFT} Multiplicity of attribute `SignalBasedFieldToISignalTriggeringMapping.dataPrototypeInServiceInterfaceRef` [For each `SignalBasedFieldToISignalTriggeringMapping`, the attribute `dataPrototypeInServiceInterfaceRef` shall exist **at the time when the creation of the manifest is finished**.]()

One `SignalBasedFieldToISignalTriggeringMapping` maps the `TestField` to `ISignalTriggerings` for the Setter-Call and Setter-Return. Here the `dataPrototype` role of `DataPrototypeInServiceInterfaceRef` is used to refer to the `targetDataPrototype` (`field`) according to the rules defined in [TPS_MANI_01136] and [TPS_MANI_01137].

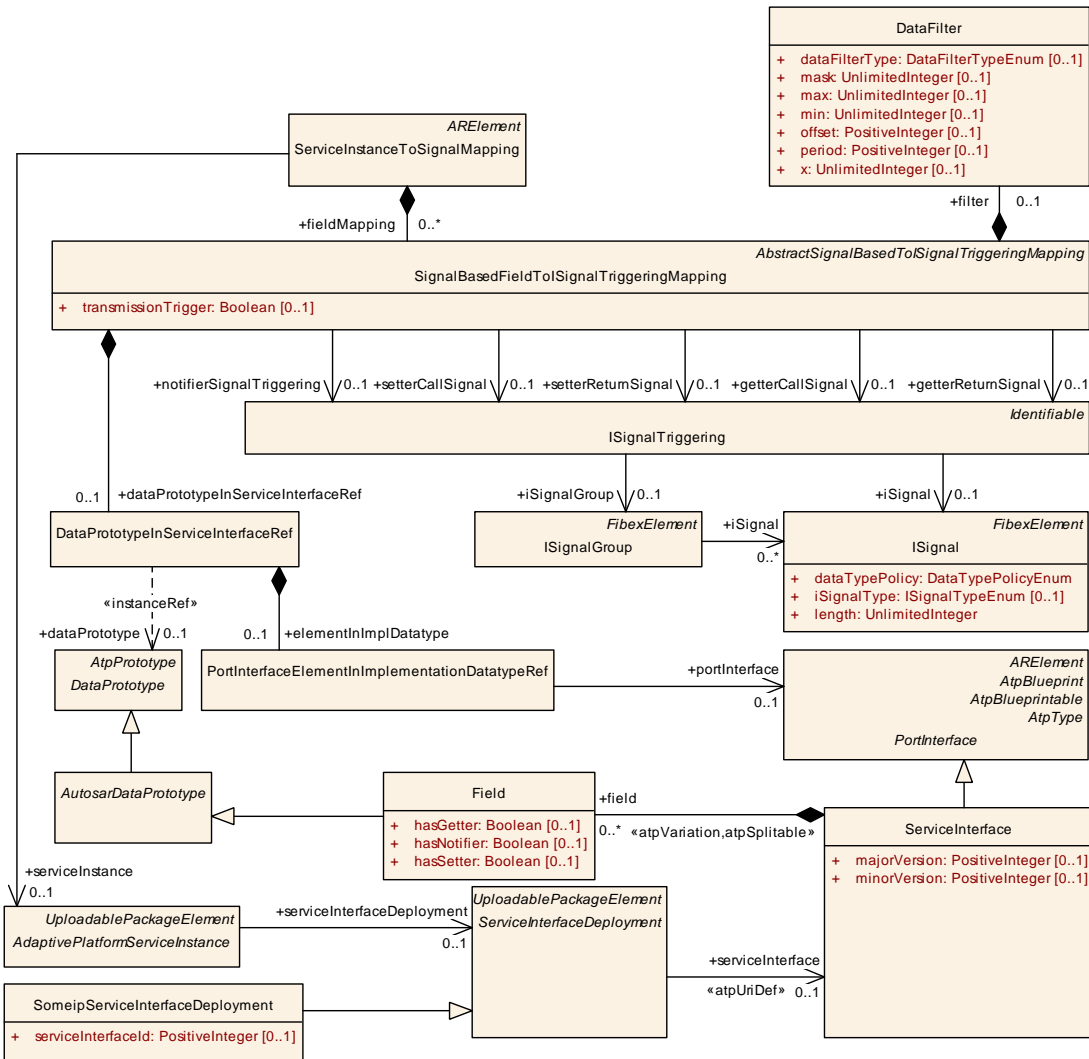


Figure 13.11: Mapping of Fields to ISignals

Class	SignalBasedFieldToSignalTriggeringMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SignalBasedCommunication			
Note	This meta-class defines the mapping of a ServiceInterface field to ISignalTriggerings that represent the notifier elements, the getter call and response, the setter call and response on a signal-based communication channel. . Tags: atp.Status=candidate			
Base	ARObject, AbstractSignalBasedToSignalTriggeringMapping, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	ServiceInstanceToSignalMapping.fieldMapping			
Attribute	Type	Mult.	Kind	Note
dataPrototypeInServiceInterfaceRef	DataPrototypeInServiceInterfaceRef	0..1	aggr	Reference to a DataPrototype or to an internal structure of a DataPrototype in the context of a ServiceInterface. Tags: atp.Status=candidate





Class	SignalBasedFieldToSignalTriggeringMapping			
filter	DataFilter	0..1	aggr	Defines an optional filter to be applied during translation. Tags: atp.Status=candidate
getterCallSignal	ISignalTriggering	0..1	ref	Reference to the ISignalTriggering that is used to transport the getter method call in a signal-based way over a communication channel. Tags: atp.Status=candidate
getterReturnSignal	ISignalTriggering	0..1	ref	Reference to the ISignalTriggering that is used to transport the getter method response in a signal-based way over a communication channel. Tags: atp.Status=candidate
notifierSignalTriggering	ISignalTriggering	0..1	ref	Reference to the ISignalTriggering that is used to transport a piece of data of a notifier in a signal-based way over a communication channel. Tags: atp.Status=candidate
setterCallSignal	ISignalTriggering	0..1	ref	Reference to the ISignalTriggering that is used to transport the setter method call in a signal-based way over a communication channel. Tags: atp.Status=candidate
setterReturnSignal	ISignalTriggering	0..1	ref	Reference to the ISignalTriggering that is used to transport the setter method response in a signal-based way over a communication channel. Tags: atp.Status=candidate
transmissionTrigger	Boolean	0..1	attr	Defines whether the source notifier element triggers the sending of the respective payload. Tags: atp.Status=candidate

Table 13.5: SignalBasedFieldToSignalTriggeringMapping

Additional [SignalBasedFieldToISignalTriggeringMappings](#) are necessary to map the field notifier to the corresponding [ISignalTriggerings](#).

The primitive [DataPrototypes](#) *a* and *b* are mapped by additional [SignalBasedFieldToISignalTriggeringMappings](#) to [ISignalTriggerings](#) of [ISignals](#) located in the [ISignalGroup](#).

Here, the [elementInImplDatatype](#) role of [DataPrototypeInServiceInterfaceRef](#) is used to refer to the [targetDataPrototype](#) since it refers to the internal structure of an [AutosarDataPrototype](#) which is typed by a [CppImplementationDatatype](#). The context of this reference is defined by the *testField*.

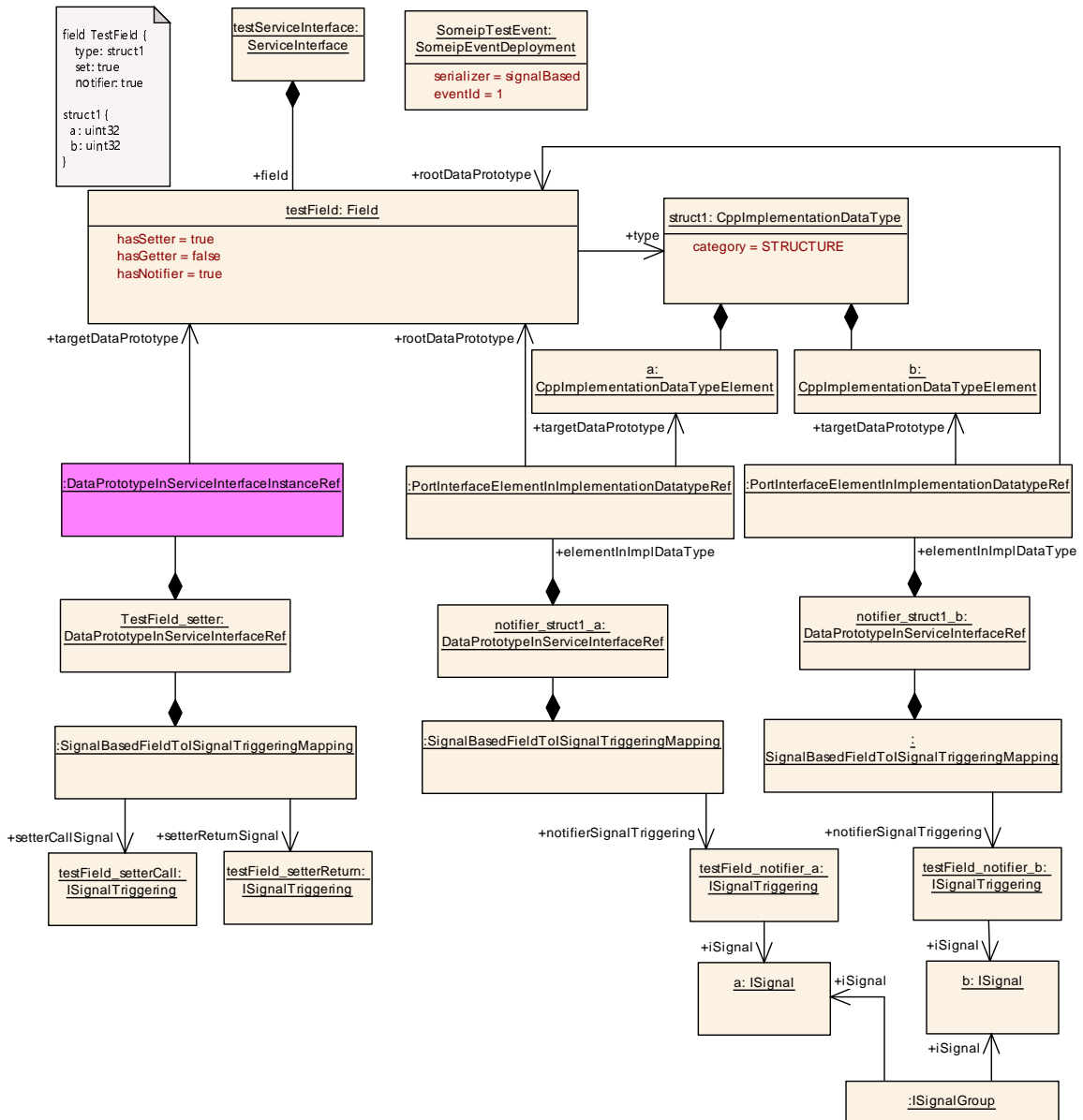


Figure 13.12: Example for a mapping of a field to Signals

13.4.6 SignalBasedMethod Mapping

[TPS_MANI_03125]{DRAFT} **ServiceInterface.method to ISignalTriggerings mapping** [The `SignalBasedMethodToISignalTriggeringMapping` meta-class provides the ability to map a `method` to one `ISignalTriggering` for the `ISignal` representing the Method-Call and one `ISignalTriggering` for the `ISignal` representing the Method-Return.] (*RS_MANI_00029*)

Class	SignalBasedMethodToSignalTriggeringMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SignalBasedCommunication			
Note	This meta-class defines the mapping of a ServiceInterface method to a ISignalTriggering. Tags: atp.Status=candidate			
Base	<i>ARObject</i> , <i>AbstractSignalBasedToSignalTriggeringMapping</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	<i>ServiceInstanceToSignalMapping.methodMapping</i>			
Attribute	Type	Mult.	Kind	Note
callSignalTriggering	<i>ISignalTriggering</i>	0..1	ref	Reference to the ISignalTriggering that is used to transport the method call in a signal-based way over a communication channel. Tags: atp.Status=candidate
method	<i>ClientServerOperation</i>	0..1	ref	Reference to a method defined in the context of a Service Interface. Tags: atp.Status=candidate
returnSignalTriggering	<i>ISignalTriggering</i>	0..1	ref	Reference to the ISignalTriggering that is used to transport the method response in a signal-based way over a communication channel. Tags: atp.Status=candidate

Table 13.6: SignalBasedMethodToSignalTriggeringMapping

[constr_10229]{DRAFT} Multiplicity of reference in the role **SignalBasedMethodToSignalTriggeringMapping.method** [For each **SignalBasedMethodToSignalTriggeringMapping**, the reference in the role **method** shall exist **at the time when the creation of the manifest is finished.**]()

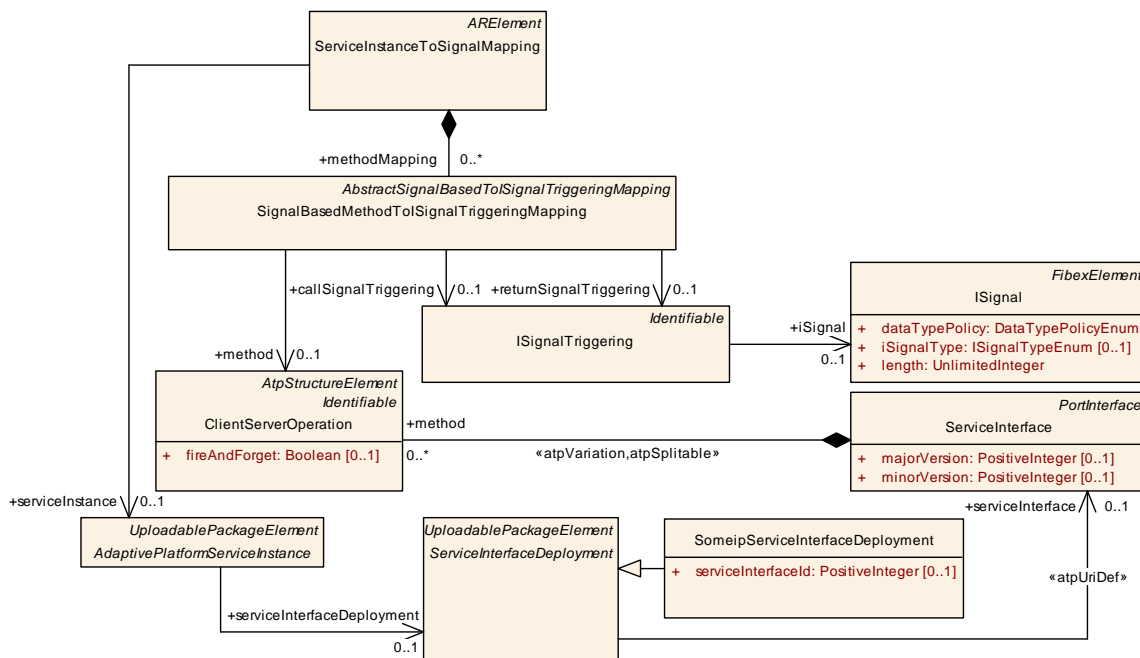


Figure 13.13: Mapping of Methods to ISignals

In the example sketched in [Figure 13.14](#) the *Calibrate* method in the *TestServiceInterface2* is mapped with a single **SignalBasedMethodToSignalTriggeringMapping** to *ISignalTriggerings* for the Call and Return.

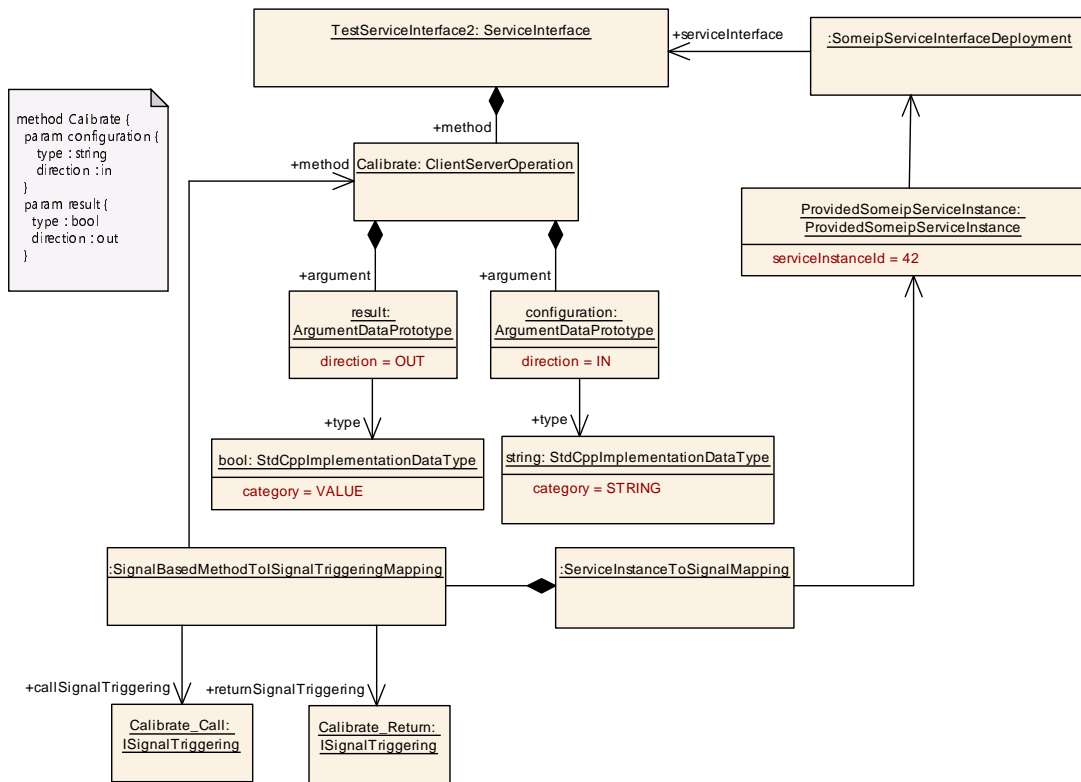


Figure 13.14: Example for a mapping of a method to Signals

13.4.7 SignalBased Fire and Forget Method Mapping

[TPS_MANI_03665]{DRAFT} **ServiceInterface.method** with **fireAndForget** equals true to **ISignalTriggerings** mapping [The **SignalBasedFireAndForgetMethodToISignalTriggeringMapping** meta-class provides the ability to map a part of a **method** with **ClientServerOperation.fireAndForget** equals true to one **ISignalTriggering** for the **ISignal** representing one part of the “fire & forget” method message.] (*RS_MANI_00029*)

[constr_3692]{DRAFT} **DataPrototypeInServiceInterfaceInstanceRef.targetDataPrototype** in the context of a **SignalBasedFireAndForgetMethodToISignalTriggeringMapping** [If a **DataPrototypeInServiceInterfaceInstanceRef** is aggregated by a **SignalBasedFireAndForgetMethodToISignalTriggeringMapping** in the role **dataPrototypeInMethodArgumentInstanceRef**, then the reference **DataPrototypeInServiceInterfaceInstanceRef.targetDataPrototype** shall refer to an **ArgumentDataPrototype** at the time when the creation of the manifest is finished.]
 ()

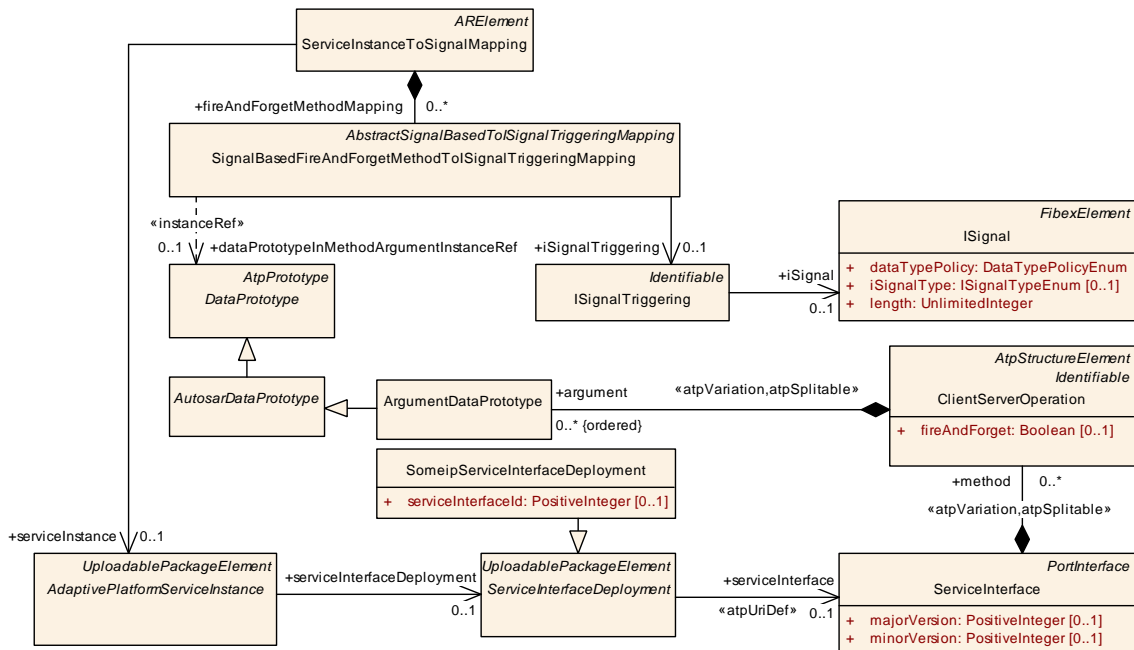


Figure 13.15: Mapping of “fire & forget” methods to ISignals

Class	SignalBasedFireAndForgetMethodToSignalTriggeringMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SignalBasedCommunication			
Note	This meta-class defines the mapping of a ServiceInterface fire and forget method part to an ISignal Triggering. Tags: atp.Status=candidate			
Base	ARObject, AbstractSignalBasedToSignalTriggeringMapping, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	ServiceInstanceToSignalMapping.fireAndForgetMethodMapping			
Attribute	Type	Mult.	Kind	Note
dataPrototypeInMethodArgumentInstanceRef	DataPrototype	0..1	iref	Instance reference to a (potentially structured) member of a ClientServerOperation. Tags: atp.Status=candidate InstanceRef implemented by: DataPrototypeInServiceInterfaceInstanceRef
iSignal Triggering	ISignalTriggering	0..1	ref	Reference to an ISignalTriggering being part of a fire and forget message. Tags: atp.Status=candidate

Table 13.7: SignalBasedFireAndForgetMethodToSignalTriggeringMapping

13.5 Service Discovery and Static Communication Configuration

Although the `ISignalIPdus`, which are candidate for `signal/service translation`, may be communicated to/from CAN or FlexRay networks (where there is no service discovery support available) the messages still might be candidate for service discovery and event subscription on the Ethernet network. In such cases the gateway ECU connecting the Can/FlexRay networks to the Ethernet network is responsible to

provide service discovery and event subscription support as part of the gateway operation.

Only SOME/IP supports service discovery in combination with `signal/service translation`. Whether or not service discovery shall be done in case of the `Partial SOME/IP Header` approach is defined by the `category` of the `RequiredSomeipServiceInstance` or `ProvidedSomeipServiceInstance`.

Even in cases where SOME/IP service discovery defined by the `category` of the `RequiredSomeipServiceInstance` or `ProvidedSomeipServiceInstance` is configured there may still be a static configurations applied as defined in [TPS_MANI_03295] and [TPS_MANI_03298].

If no SOME/IP service discovery is used, then there is the possibility to define a static configuration as described in section 13.5.4.

[TPS_MANI_03657]{DRAFT} Signal-service-translation SOME/IP Service Discovery Find [If there is a `RequiredSomeipServiceInstance` of `category` `SIGNAL-BASED_WITH_HEADER` defined for the `signal-service-translation`, then this `RequiredSomeipServiceInstance` shall be handled using SOME/IP service discovery.] (*RS_MANI_00063*)

[TPS_MANI_03658]{DRAFT} Service-signal-translation SOME/IP Service Discovery Offer [If there is a `ProvidedSomeipServiceInstance` of `category` `SIGNAL-BASED_WITH_HEADER` defined for the `service-signal-translation`, then this `ProvidedSomeipServiceInstance` shall be handled using SOME/IP service discovery.] (*RS_MANI_00063*)

If the source `ISignalIPdu` in a `signal-service-translation` scenario is composed of several parts (`ISignalGroups` and/or individual `ISignals`) and these parts shall be mapped to several `events` or field notifiers (according to [TPS_MANI_03667]) and a service discovery shall be performed, then a specific configuration of the `SomeipServiceInterfaceDeployment` and `SomeipEventDeployment` is required.

As in case of [TPS_MANI_03654] the SOME/IP Message ID is derived from the `SomeipServiceInterfaceDeployment.serviceInterfaceId` and the `SomeipEventDeployment.eventId`, all the `events` mapped from one `ISignalIPdu` shall have identical `SomeipServiceInterfaceDeployment.serviceInterfaceIds` and `SomeipEventDeployment.eventIds`.

[TPS_MANI_03666]{DRAFT} Service Discovery for multi-event ISignalIPdus [If the `ISignals` of one `ISignalIPdu` are mapped to more than one `events` (using `SignalBasedEventElementToISignalTriggeringMapping.iSignalTriggering`) or field notifiers (using `SignalBasedFieldToISignalTriggeringMapping.notifierSignalTriggering`),

then each of the `SignalBasedEventElementToISignalTriggeringMappings` and `SignalBasedFieldToISignalTriggeringMappings` referring to `ISignals`

of that `ISignalIPdu` shall be aggregated by one or more `ServiceInstanceToSignalMappings` where the reference `ServiceInstanceToSignalMapping.serviceInstance` refers to a `RequiredSomeipServiceInstance`

and that `RequiredSomeipServiceInstance` shall refer to a `SomeipServiceInterfaceDeployment` where

- each of the referenced `SomeipServiceInterfaceDeployments` has the identical value for `SomeipServiceInterfaceDeployment.serviceInterfaceId` defined
- every event taking part in that `signal-service-translation` has the attribute `SomeipEventDeployment.serializer` set to `SerializationTechnologyEnum.signalBased` and has the identical value for:
 - `SomeipEventDeployment.eventId`
 - `SomeipEventDeployment.transportProtocol`

]([RS_MANI_00063](#))

[TPS_MANI_03659]{DRAFT} No `signal-service-translation` SOME/IP Service Discovery Find [If there is a `RequiredSomeipServiceInstance` of category `SIGNALBASED_NO_HEADER` defined for the `signal-service-translation`, then this `RequiredSomeipServiceInstance` shall not be handled using SOME/IP service discovery.]([RS_MANI_00063](#))

[TPS_MANI_03660]{DRAFT} No `signal-service-translation` SOME/IP Service Discovery Offer [If there is a `ProvidedSomeipServiceInstance` of category `SIGNALBASED_NO_HEADER` defined for the `service-signal-translation`, then this `ProvidedSomeipServiceInstance` shall not be handled using SOME/IP service discovery.]([RS_MANI_00063](#))

13.5.1 Service discovery control

The `signal/service translation` needs to determine when the translated service (service which originates in signal-based messages) shall actually be offered/subscribed.

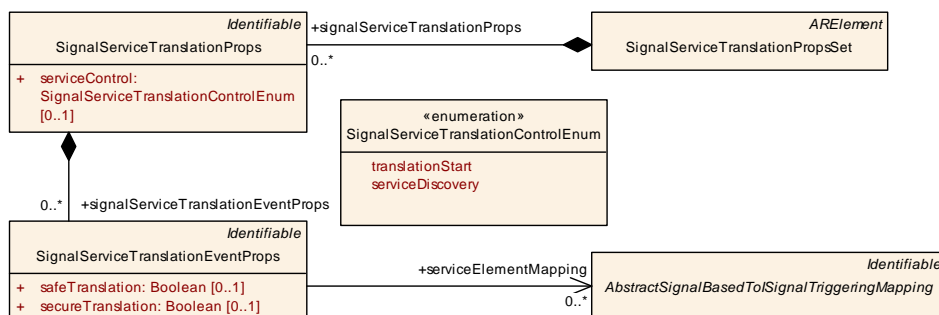


Figure 13.16: Signal/service translation properties

Attributes defining the behavior of `signal/service translation` are available at the `SignalServiceTranslationProps`. The reference `serviceElementMapping` determines to which service instance these settings apply.

Class	SignalServiceTranslationPropsSet			
Package	M2::AUTOSARTemplates::CommonStructure::SignalServiceTranslation			
Note	Collection of <code>SignalServiceTranslationProps</code> . Tags: atp.recommendedPackage=SignalServiceTranslationProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
signalServiceTranslationProps	SignalServiceTranslationProps	*	aggr	Collection of <code>SignalServiceTranslationProps</code> .

Table 13.8: SignalServiceTranslationPropsSet

Class	SignalServiceTranslationProps			
Package	M2::AUTOSARTemplates::CommonStructure::SignalServiceTranslation			
Note	This element allows to define the properties which are applicable for the signal/service translation service.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	SignalServiceTranslationPropsSet.signalServiceTranslationProps			
Attribute	Type	Mult.	Kind	Note
serviceControl	SignalServiceTranslationControlEnum	0..1	attr	Defines how the service instance control shall behave.
signalServiceTranslationEventProps	SignalServiceTranslationEventProps	*	aggr	Defines properties for a single translated event.

Table 13.9: SignalServiceTranslationProps

[constr_10255]{DRAFT} Multiplicity of attribute `SignalServiceTranslationProps.serviceControl` [For each `SignalServiceTranslationProps`, the attribute `serviceControl` shall exist **at the time when the creation of the manifest is finished.**]()

Class	SignalServiceTranslationEventProps			
Package	M2::AUTOSARTemplates::CommonStructure::SignalServiceTranslation			
Note	This element allows to define the properties which are applicable for the signal/service translation event.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	SignalServiceTranslationProps.signalServiceTranslationEventProps			
Attribute	Type	Mult.	Kind	Note
safeTranslation	Boolean	0..1	attr	Defined whether the translation shall happen in a safe way.
secureTranslation	Boolean	0..1	attr	Defined whether the translation shall happen in a secure way.





Class	SignalServiceTranslationEventProps			
serviceElement Mapping	AbstractSignalBasedToSignalTriggering Mapping	*	ref	Reference to the collection of SignalBased to ISignal Triggerung mappings the properties apply to. Tags: atp.Status=candidate

Table 13.10: SignalServiceTranslationEventProps

[constr_10230]{DRAFT} Multiplicity of attribute [SignalServiceTranslationEventProps.safeTranslation](#) [For each [SignalServiceTranslationEventProps](#), the attribute [safeTranslation](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10231]{DRAFT} Multiplicity of attribute [SignalServiceTranslationEventProps.secureTranslation](#) [For each [SignalServiceTranslationEventProps](#), the attribute [secureTranslation](#) shall exist **at the time when the creation of the manifest is finished.**]()

At which point in time a specific service instance (originating from [signal/service translation](#)) is actually offered / subscribed at the service discovery can be defined per service instance:

Possible approaches for service availability/subscription are:

- [translationStart](#) - right after translation software is started
- [serviceDiscovery](#) - availability of related service instance

The attribute [SignalServiceTranslationProps.serviceControl](#) defines the service instance control behavior.

Enumeration	SignalServiceTranslationControlEnum
Package	M2::AUTOSARTemplates::CommonStructure::SignalServiceTranslation
Note	This enumeration allows to define how the service instance offer/subscribe control shall behave.
Aggregated by	SignalServiceTranslationProps.serviceControl
Literal	Description
serviceDiscovery	Defines the start of service control when other service is available. Tags: atp.EnumerationLiteralIndex=2
translationStart	Defines the start of service control at translation start. Tags: atp.EnumerationLiteralIndex=0

Table 13.11: SignalServiceTranslationControlEnum

13.5.2 Service control right after translation start

If the availability of the signal-based PDUs is not controlled then the respective translated services offers/subscriptions may be activated immediately at start of the translation software.

[TPS_MANI_03580]{DRAFT} **Service offer at startup** [For a provided translated service instance, if the `SignalServiceTranslationProps.serviceControl` equals `translationStart` then the translation software shall - right after translation software start - *offer* the respective translated service instance.] ([RS_MANI_00063](#))

[TPS_MANI_03581]{DRAFT} **Service find at startup** [For a required translated service instance, if the `SignalServiceTranslationProps.serviceControl` equals `translationStart` then the translation shall right after translation software start issue the *find* of the respective translated service instance and *subscribe* to its event groups.] ([RS_MANI_00063](#))

13.5.3 Service control due to availability of related service instance

There are scenarios where the signal-based PDUs are actually controlled using SOME/IP Service Discovery. So there are services defined using events/methods/fields and the service instances are offered / subscribed using the SOME/IP Service Discovery, just the payload of such services is not serialized according to the SOME/IP transformer rules (or a subset of events uses signal-based serialization). Therefore, a `signal/service translation` is required for the payload.

13.5.3.1 Signal-service-translation

[TPS_MANI_03582]{DRAFT} **Service find for required signal** [For a required translated service instance, if the `SignalServiceTranslationProps.serviceControl` equals `serviceDiscovery` then upon startup the translation software component shall issue a *service find* for the `RequiredSomeipServiceInstance` which is referenced by the `ServiceInstanceToSignalMapping` in the role `serviceInstance`.] ([RS_MANI_00063](#))

[TPS_MANI_03583]{DRAFT} **Service subscribe for required signal** [For a required translated service instance, if the `SignalServiceTranslationProps.serviceControl` equals `serviceDiscovery` and the *service find* of [TPS_MANI_03582] was successful then the translation software component shall issue a *subscribe* to all `SomeipServiceInterfaceDeployment.eventGroups`.] ([RS_MANI_00063](#))

13.5.3.2 Service-signal-translation

[TPS_MANI_03606]{DRAFT} **Service offer for provided signal** [For a provided translated service instance, if the `SignalServiceTranslationProps.serviceControl` equals `serviceDiscovery` then upon startup the translation software component shall issue an *offer* for the `ProvidedSomeipServiceInstance` which is referenced by the `ServiceInstanceToSignalMapping` in the role `serviceInstance`.] ([RS_MANI_00063](#))

13.5.4 Static Communication Configuration

In case no service discovery shall be applied, it is possible to define a static configuration for non SOME/IP communication. The actual representation of the required information is not standardized, thus the information can be provided using the model extension mechanism, as exemplified in appendix B.

13.5.4.1 Static Communication Configuration for the Server

If a `ProvidedUserDefinedServiceInstance` shall be statically configured for communication on Ethernet, then several elements need to be defined:

- `localUdpPortNumber`: a port number for the local UDP port needs to be defined on which the service will be provided using UDP protocol.
- `localTcpPortNumber`: a port number for the local TCP port needs to be defined on which the service will be provided using TCP protocol.
- `UserDefinedServiceInstanceToMachineMapping`: a mapping needs to be defined (for the local connection where the service will be provided) that associates the `ProvidedUserDefinedServiceInstance` to an `EthernetCommunicationConnector` (VLAN).
- `remotePeers`: a list of remote IP-Address and Port combinations needs to be defined where the messages will be sent to. A mix of unicast and multicast IP-Addresses is supported.
- `udpCollectionBufferTimeout`: Maximum time, an outgoing message may be delayed, due to data collection.
- `udpCollectionTrigger`: Defines whether the element contributes to the triggering of the UDP data transmission if data collection is enabled.
- `udpCollectionBufferSizeThreshold`: Specifies the amount of data in bytes that shall be buffered for data transmission over the UDP connection in case data collection is enabled.

13.5.4.2 Static Communication Configuration for the Client

If a `RequiredUserDefinedServiceInstance` shall be statically configured for communication on Ethernet, then several elements need to be defined:

- `localUdpPortNumber`: a port number for the local UDP port needs to be defined on which the service will be consumed using UDP protocol.
- `localTcpPortNumber`: a port number for the local TCP port needs to be defined on which the service will be consumed using TCP protocol.

- `UserDefinedServiceInstanceToMachineMapping`: a mapping needs to be defined (for the local connection where the service will be consumed) that associates the `RequiredUserDefinedServiceInstance` to an `Ethernet-CommunicationConnector` (VLAN).
- `eventMulticastUdpPort`: a port number for the local UDP port in case of multicast reception may be defined.
- `multicastIpAddress`: an IP-Address where the events will be consumed in case of multicast reception.
- `remotePeer`: an IP-Address and Port combination needs to be defined for the remote provider of the service.

13.6 Translation behavior

The `signal/service translation` is defined as a network binding for the Communication Management [9] and it is not specified at which exact point in time or in which context the data transformation (i.e. `signal-service-translation` or `service-signal-translation`) will be executed.

The behavior of `signal-service-translation` is governed by the application software which calls `ara::com-APIs` to interact with the communication management.

13.6.1 `ServiceInterface` representation of translation data

Due to update-bits (see section 13.6.2) and data filtering (see section 13.6.3), the `ServiceInterface` – which is used to represent the `signal/service translated` information – needs to be able to represent partially available information. For such cases, the AUTOSAR data type systems has defined the `isOptional` feature of structured data (see also the Software Component Template [1] for details).

For `ApplicationDataTypes`, the optionality is configured at the `Application-RecordElement.isOptional` attribute.

For `CppImplementationDataTypes`, the optionality is configured at the `CppImplementationDataTypeElement.isOptional` attribute.

The goal of the `signal/service translation` mapping is to define the proper `ServiceInterface` representation for the corresponding `ISignalIPdu`, respecting update bits and filtering.

13.6.1.1 Optional elements in case `signal-service-translation`

The approach for the `signal-service-translation` direction is: if a received `ISignal` or `ISignalGroup` has an update-bit defined (see section 13.6.2) or the

reception is guarded by a reception-filter (see section 13.6.3), then the corresponding element in the `ServiceInterface` event shall be defined as `ApplicationRecordElement.isOptional` (resp. `CppImplementationDataTypeElement.isOptional`).

Figure 13.17 illustrates the usage of update-bits in the source `ISignalIPdu` as the cause for the definition of `isOptional` members of the event.

The left part of figure 13.17 shows that the *signal group x1*, *signal y*, and *signal z* have update-bits defined and thus the resulting event definition for the `ServiceInterface` needs to respect this. In this example the event `xyz` is defined as an `ApplicationRecordDataType` containing 3 `ApplicationRecordElements` where each `element` has the attribute `isOptional` set to true.

The right part of figure 13.17 takes one specific `ISignalIPdu` instance with only the `updateBit_y` set to 1, thus only the *signal y* shall be considered as updated. Therefore the resulting event notification contains an event `xyz` where only the member `y` is defined. The other two members of `xyz` are not set in this example.

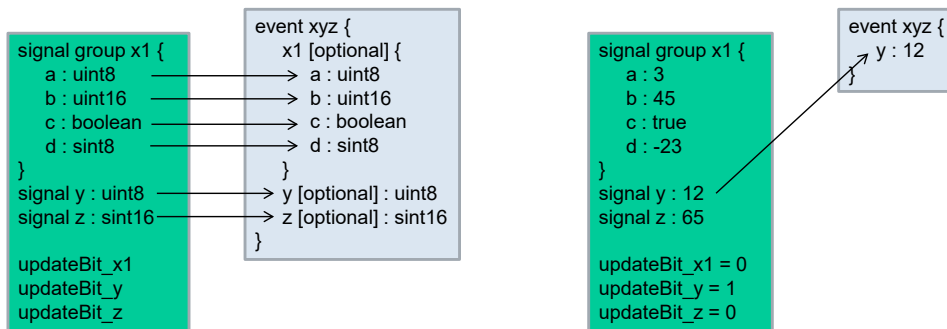


Figure 13.17: Example of update-bits for `signal-service-translation`

13.6.1.2 Optional elements in case `service-signal-translation`

The approach for the `service-signal-translation` direction is: if the `ServiceInterface` event has a member with `CppImplementationDataTypeElement.isOptional`, then the corresponding `ISignal` or `ISignalGroup` shall have an update-bit defined. During runtime, it will be checked which optional elements are actually defined in the event / field and the corresponding values are put into the `ISignalIPdu`. Also the update-bits are set accordingly.

Figure 13.18 illustrates the usage of `isOptional` elements in the event / field definition as the cause for the definition of update-bits in the target `ISignalIPdu`.

The left part of figure 13.18 shows that the *event klm* has two optional members (*k* and *l*) and one mandatory member (*m*). These are mapped into an `ISignalIPdu` with two update-bits (`updateBit_k` and `updateBit_l`).

The right part of figure 13.18 takes one specific *event klm* instance with values defined for *l* (which is optional but present) and *m* (which is not optional and therefore has to be present). There is no value defined for the optional member *k*. The resulting *ISignalIPdu* takes the values for *l* and *m* and sets the update-bits accordingly (*updateBit_k=0* and *updateBit_l=1*). The values for the not-set optional members stay unchanged.

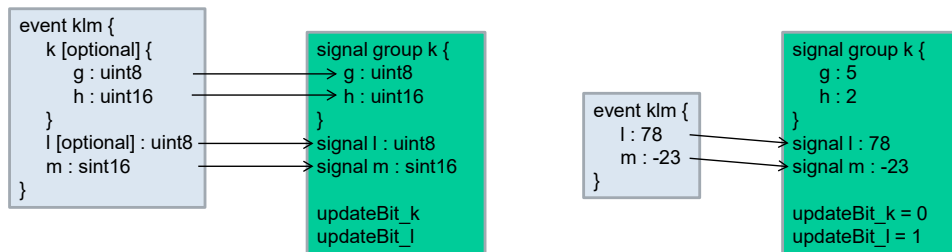


Figure 13.18: Example of update-bits for *service-signal-translation*

13.6.2 Event and update-bit semantics

A variety of sources may exist where the *ISignalIPdus* originate that are candidates for *signal/service translation*. And the *ISignalIPdus* produced by the *signal/service translation* may be routed to many different targets in the vehicle network. It is essential to understand the semantics of the received and sent data in the scope of the *signal/service translation*.

Often *ISignalIPdus* are transported using periodic transmission in order to not only transport data but also have a liveness indication of the information producer and the communication path. If the sender would just transmit an *ISignalIPdu* when the value changes, a receiver would not be able to detect whether the sender just did not send anything because there is no new information or whether the sender (or the transport path) has a malfunction and therefore an intended sent message was not able to get through.

In the simplest case, the arrival of one *ISignalIPdu* actually represents the functional reception of all the included information. This means that the resulting event (resp. field) for the application software can be derived from the reception of that *ISignalIPdu*. In the opposite direction, the notification of an event (resp. field) from the application software results in the sending of the *signal/service translation ISignalIPdu*.

But there are scenarios where the layout of the *ISignalIPdu* is composed of information from different sources or are produced at different points in time. In order to indicate which parts of the *ISignalIPdu* actually have been updated and which parts have just been sent because they are part of the *ISignalIPdu*, the *update-bits* are used. These update-bits are part of the *ISignalIPdu* payload and indicate whether the associated information has actually been sent intentionally or just has been sent because the *ISignalIPdu* was sent as a whole.

If no update-bits are used, then every arrival of an `ISignalIPdu` has to be considered as being updated by the producer as a whole.

If update-bits are used, then not all of the included information may actually have been produced by the sender. In an extreme case – if all information of the `ISignalIPdu` has associated update-bits – all of the update-bits might not be set, resulting in reception of an `ISignalIPdu` but without any effect to the `signal-service-translation`.

Another way to influence the translation behavior is the usage of reception data filters during `signal-service-translation` (see also section 13.6.3). This also may lead to the situation that the reception of an `ISignalIPdu` only triggers a subset of the contained information (or none at all).

The third check during `signal-service-translation` is the evaluation of the `SignalBasedEventElementToISignalTriggeringMapping.transmissionTrigger` (resp. `SignalBasedFieldToISignalTriggeringMapping.transmissionTrigger`). If an `ISignal` was actually taken to update the resulting event, the `transmissionTrigger` defines whether that update actually causes the notification of the mapped event.

One use-case may be to define which `signal-service-translation` elements actually cause the sending of an event. So if – due to update-bits and filters – only least important elements have been translated, it can be defined that in such cases the event will not be triggered.

[constr_3644]{DRAFT} No `transmissionTrigger` support for `service-signal-translation` direction [If a `ServiceInstanceToSignalMapping.serviceInstance` refers to a `ProvidedApServiceInstance` then

- every `SignalBasedEventElementToISignalTriggeringMapping` aggregated in the role `eventElementMapping` and
- every `SignalBasedFieldToISignalTriggeringMapping` aggregated in the role `fieldMapping`

shall not have a `SignalBasedEventElementToISignalTriggeringMapping.transmissionTrigger` (respectively `SignalBasedFieldToISignalTriggeringMapping.transmissionTrigger`) defined.](/)

[TPS_MANI_03646]{DRAFT} Definition of transmission triggers for `signal-service-translation` [The attribute `SignalBasedEventElementToISignalTriggeringMapping.transmissionTrigger`, respectively `SignalBasedFieldToISignalTriggeringMapping.transmissionTrigger`, defines which translation parts contribute to the transmission triggering for the mapped payload.] (*RS_MANI_00063*)

[TPS_MANI_03647]{DRAFT} Full translation before transmission triggering [In case there has been a transmission trigger caused by a source signal, the `signal-service-translation` shall first process all other mapped source signals for that target before sending out the target.] (*RS_MANI_00063*)

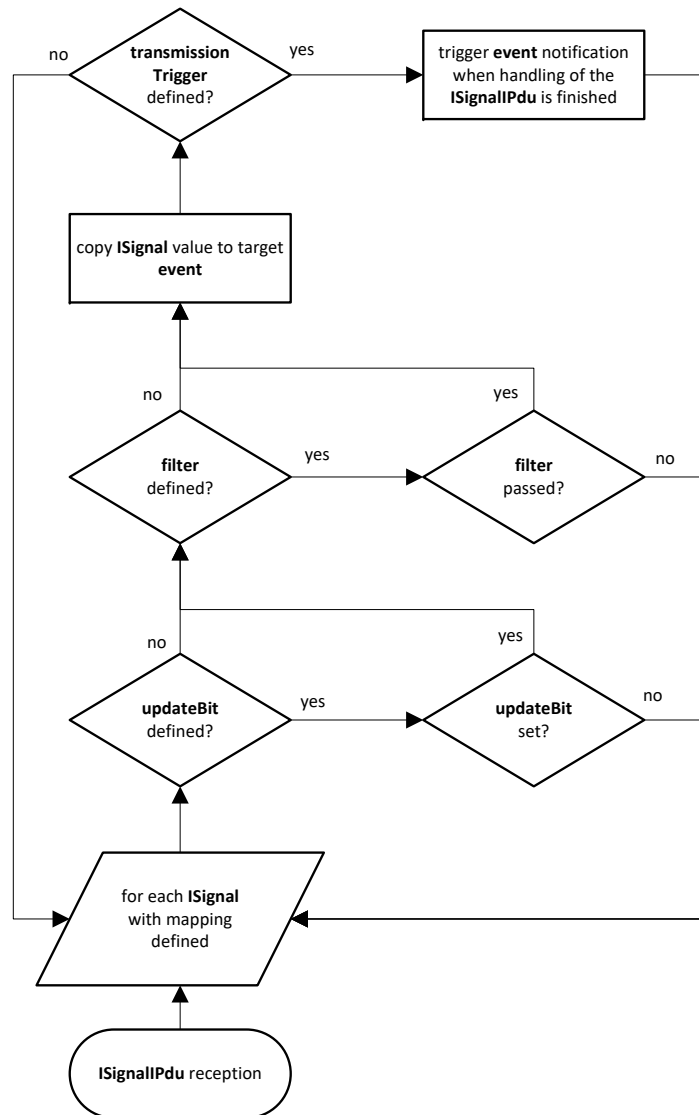


Figure 13.19: Processing order reception

[TPS_MANI_03648]{DRAFT} Transmission trigger for *signal-service-translation* [If the attribute *SignalBasedEventElementToISignalTriggeringMapping.transmissionTrigger*, respectively *SignalBasedFieldToISignalTriggeringMapping.transmissionTrigger*, equals *true* then the translation of the respective source signal causes the sending of the target (after all mapped sources have been processed, see [TPS_MANI_03647]).] (*RS_MANI_00063*)

[TPS_MANI_03649]{DRAFT} No transmission trigger for *signal-service-translation* [If the attribute *SignalBasedEventElementToISignalTriggeringMapping.transmissionTrigger*, respectively *SignalBasedFieldToISignalTriggeringMapping.transmissionTrigger*, is not defined or has

the value *false*, then the translation of that respective source signal does not cause the sending of the target.](RS_MANI_00063)

Note that in case none of the `SignalBasedEventElementToISignalTriggeringMapping` or `SignalBasedFieldToISignalTriggeringMapping` contributing to the target of a `signal-service-translation` has the attribute `SignalBasedEventElementToISignalTriggeringMapping.transmissionTrigger` (respectively `SignalBasedFieldToISignalTriggeringMapping.transmissionTrigger`) set to *true* then the translation target will not be sent.

The combination of update-bits, filters, and transmission triggers may be configured for one `ISignal` – resulting in a sequential processing according to figure 13.19.

13.6.3 Data filtering

Filtering can be used to potentially reduce the amount of generated event notifications in case of `signal-service-translation` direction. There is no filtering support available for the `service-signal-translation` direction, although the transmission mode selection can be used to influence the amount of sent `ISignalIPdus` (see section 13.8.5).

[constr_3643]{DRAFT} No filter support for `service-signal-translation` direction [If a `ServiceInstanceToSignalMapping.serviceInstance` refers to a `ProvidedApServiceInstance` then

- every `SignalBasedEventElementToISignalTriggeringMapping` aggregated in the role `eventElementMapping` and
- every `SignalBasedFieldToISignalTriggeringMapping` aggregated in the role `fieldMapping`

shall not have a `SignalBasedEventElementToISignalTriggeringMapping.filter` (resp. `SignalBasedFieldToISignalTriggeringMapping.filter`) defined.](/)

If a data filtering shall be applied during the `signal-service-translation` then it is possible to define a `DataFilter` at the `SignalBasedEventElementToISignalTriggeringMapping` and `SignalBasedFieldToISignalTriggeringMapping` in the role `filter`.

[TPS_MANI_03621]{DRAFT} Data filtering during the `signal-service-translation` [If there is a `SignalBasedEventElementToISignalTriggeringMapping.filter` (resp. `SignalBasedFieldToISignalTriggeringMapping.filter`) defined this filtering shall be implemented during the `signal-service-translation`.

This is the only supported application of `filters` for `signal-service-translation`.](RS_MANI_00063)

[TPS_MANI_03644]{DRAFT} **Supported reception data filters** [The following `DataFilter` settings are supported by the `signal-service-translation`:

- `always`
- `maskedNewEqualsX`
- `maskedNewDiffersX`
- `maskedNewDiffersMaskedOld`

](RS_MANI_00063)

Note that the setting of `maskedNewDiffersMaskedOld` requires the translation software to keep the previous (*old*) value for comparison.

The possibility to define an `always` filter allows to specify a filter for each mapped signal, even if that particular signal shall not contribute to the filter result - as it always yields *passed*. This allows to define a full set of filters and thus gives the possibility to check for complete filter definitions.

The usage of a *never* filter is not supported by the `signal-service-translation`. Such a filter would always yield *not passed*, which is equivalent to not having a `SignalBasedEventElementToISignalTriggeringMapping` defined at all for this specific `ISignal`.

Potentially there could be several `SignalBasedEventElementToISignalTriggeringMapping.filters` (resp. `SignalBasedFieldToISignalTriggeringMapping.filters`) defined in the context of one target element (in the example figure 13.20 the *event xyz* the *x1* and *z*).

In such a case ALL of the defined filters for the `scoped filtered element` have to pass in order to let the `signal/service translation` actually get effective. For the optional element *x1* to actually be set both, the *filter (a)* and *filter (c)*, have to pass. The optional element *z* will only be set if the *filter (z)* passes.

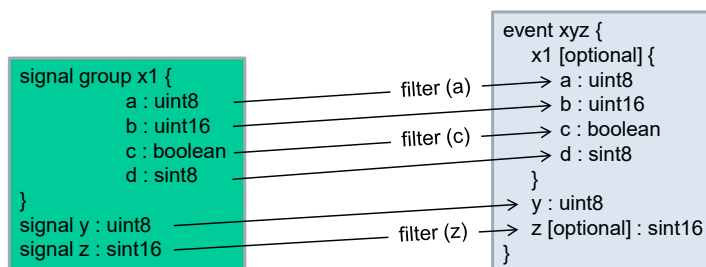


Figure 13.20: Filter example during `signal-service-translation`

In case the target event of the `signal-service-translation` has no optional elements defined and at least one filter does not pass then the whole event is not sent. This is illustrated in figure 13.21, where the *event xyz* is considered to be the `scoped element`.

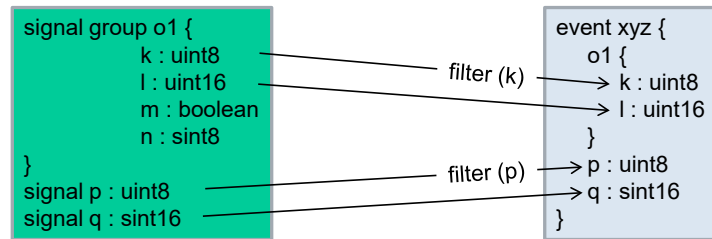


Figure 13.21: Filter example during `signal-service-translation` with no optional target elements

The `scoped filtered element` is defined as either

- the filtered element, if it is defined as *optional*
- the closest *optional* element traversing from the filtered element and going towards the root element
- the root element itself, if there is no *optional* element traversing from the filtered element and going towards the root element.

[TPS_MANI_03645]{DRAFT} Applicability of a filter to the `scoped filtered element` [If a filter does not pass then the `scoped filtered element` shall not be considered for `signal-service-translation`.] (*RS_MANI_00063*)

13.6.4 Translation from one source

The simplest translation approach is a one source translation. If the translation target is primitive then it has by nature only one source. If the translation target is a composite data then it depends on the structure of the sources whether a one source translation is possible.

[TPS_MANI_03620]{DRAFT} Service discovery control [If the service discovery control is enabled for a specific service instance then any payload coming / going to that service instance shall be translated and forwarded to the mapped output(s).] (*RS_MANI_00063*)

Every time an input signal or event arrives it is translated to the mapped output path. Since this is a one source translation the arrival of the input signal or event is the trigger for the translation. Therefore, if all the translation mappings have been performed the target payload can be sent out.

The example in figure 13.22 illustrates the full approach of a `signal-service-translation` with application component forwarding of the payload.

On the reception side, the `ISignalIPdu uv1` is the source of the `signal-service-translation`. The payload of the `ISignalIPdu` is translated into an instance of the `event uv2`. The `event` is part of a `ServiceInterface` that types the `RPort-Prototype` which defines the `ara::com` API at that `RPortPrototype`.

It is the job of the application component code to use the `ara::com` API and fetch the information from the `RPortPrototype` and forward it to the `PPortPrototype`. In this example, it is not further defined how that forwarding is implemented, but for such a simple use-case the usage of a `PassThroughSwConnector` could be used to express the desired forwarding. For further details on this approach, refer to section 13.7. Of course, also a custom code implementation can be used to fetch the data and forward it.

At the `PPortPrototype` a `ServiceInterface` with an event `uv3` is defined. This is the basis to provide the information in a service-oriented manner to further software components. What kind of network binding is used for the transport of the `PPortPrototype` payload is not in scope of this example. However, the `PPortPrototype` could be mapped to any available kind of network binding available (SOME/IP, DDS, IPC, or even another `service-signal-translation`).

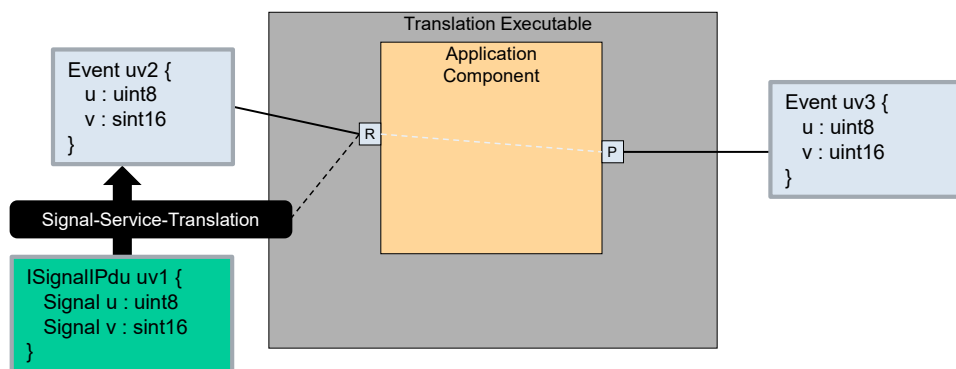


Figure 13.22: Example `signal-service-translation` and forwarding from one source

13.6.5 Translation from several sources

There is also the use-case to support the composition of data from different sources. However, because the sources will most likely not be received in a coordinated way, it would be hard to define an automatic behavior based on the usage of `PassThroughSwConnectors` for this setup. Thus, for the usage of `PassThroughSwConnectors`, it is required by the `signal/service translation` that the input for the `signal/-service translation` comes from one source.

The merging of data from several sources can be implemented on application component level and still utilize the `signal/service translation` features to interface with `ISignals` and `ISignalIPdus`. The code, however, which reads several source data and produces a consistent set of information is considered to be custom code.

The example in figure 13.23 shows a setup where several sources of information are coming from `signal-service-translations`. As the source information is accessed using `ara::com` APIs and the reception semantics is implementing a queue for each input source, the application component is responsible to fetch the data from the various sources and to decide which input data shall be put to the output event `klm`.

As the output event *klm* does not have any optional members defined, it is required to provide all three members *k*, *l*, and *m* with valid values for each instance of *klm*.

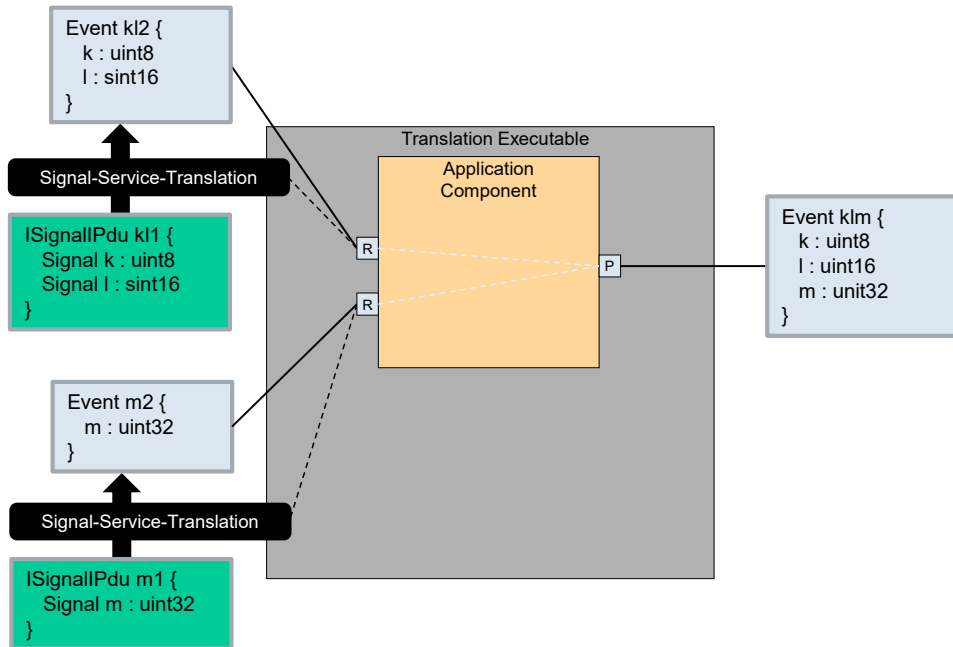


Figure 13.23: Example **signal-service-translation** and forwarding from several sources

Figure 13.24 shows an example for several sources coming from service-oriented communication. The task of the application component is to fetch the input information for the source events *x1*, *y*, and *z*. The output event *xyz1* does not have any optional members, also the output *ISignalIPdu xyz2* does not use any update bits, thus it is required for the application component to provide the full set of information for *a*, *b*, *y*, and *z* when the output event *xyz1* is produced.

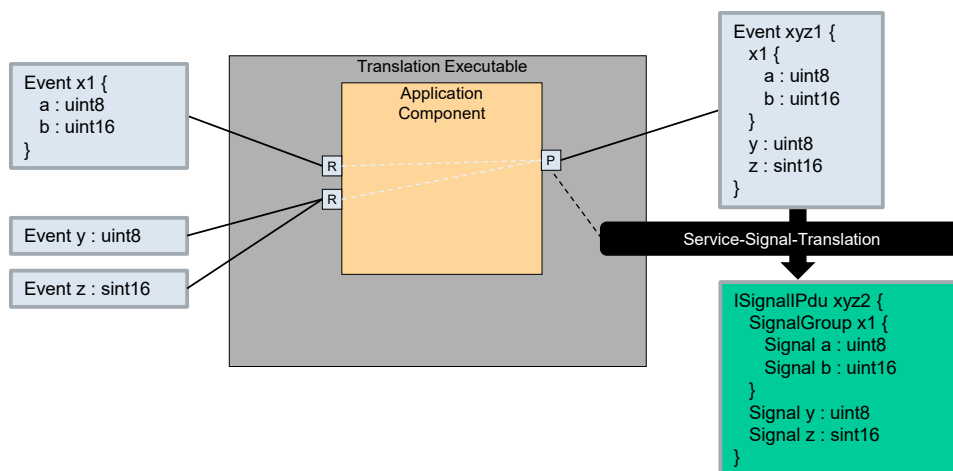


Figure 13.24: Example **service-signal-translation** and forwarding from several sources

13.6.6 Signal-Service-Translation to several targets

If the source `ISignalIPdu` in a `signal-service-translation` scenario is composed of several parts (`ISignalGroups` and/or individual `ISignals`), then it is possible to map the parts of that `ISignalIPdu` to several targets (events or field notifiers).

[TPS_MANI_03667]{DRAFT} Mapping from one `ISignalIPdu` to several events in case of `signal-service-translation` [The `ISignals` of one `ISignalIPdu` can be mapped to one or more events (using `SignalBasedEventElementToISignalTriggeringMapping.iSignalTriggering`) or field notifiers (using `SignalBasedFieldToISignalTriggeringMapping.notifierSignalTriggering`).] (*RS_MANI_00063*)

The individual `SignalBasedEventElementToISignalTriggeringMappings` and `SignalBasedFieldToISignalTriggeringMappings` will define in their `DataPrototypeInServiceInterfaceRef` the target of the `signal-service-translation`.

One scenario mandates the mapping of parts of an `ISignalIPdu` to different events: If the source `ISignalIPdu` is composed of several parts (`ISignalGroups` and/or individual `ISignals`) and at least one of the `ISignalGroups` is end-to-end protected.

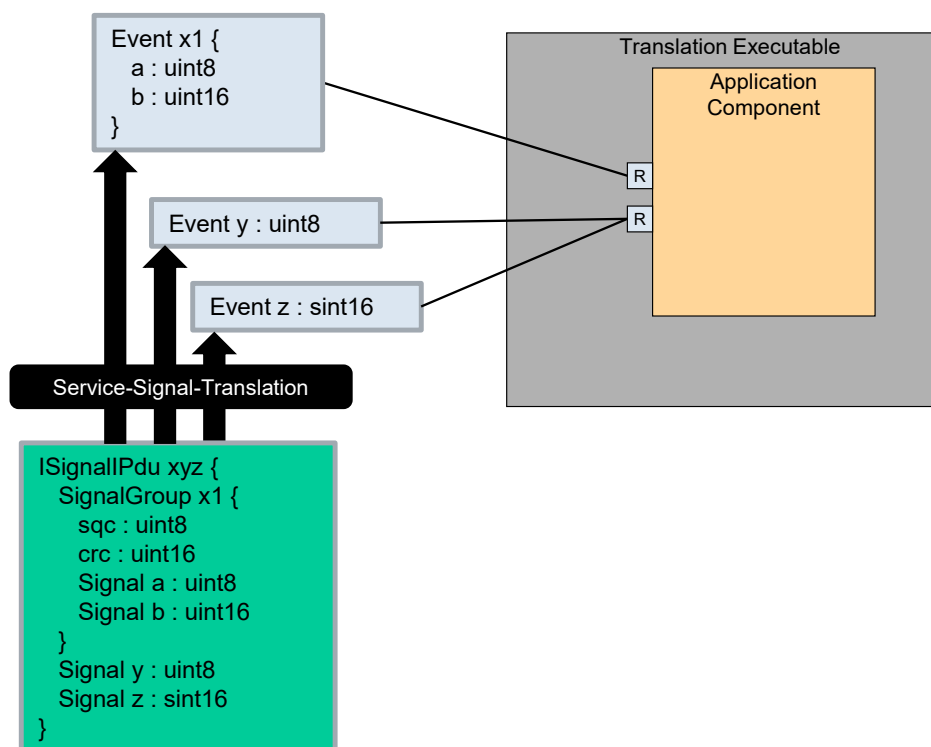


Figure 13.25: Example `signal-service-translation` to several targets

In such cases it is required to get the end-to-end status per protected `ISignalGroup`, thus merging the whole `ISignalIPdu`'s content into one `event` does not suffice, as

only a part of the `ISignalIPdu` is actually end-to-end protected, and the `ara::com` status APIs are available on an `event` level.

An example of such a setup is illustrated in figure 13.25: The `ISignalIPdu xyz` consists of an end-to-end protected `ISignalGroup x1` and two not protected `ISignals y` and `z`.

It is essential for the application component to be able to check the end-to-end status for the `event x1` which holds the end-to-end protected `ISignalGroup` payload. The `event x1` covers just the end-to-end protected part of the `ISignalIPdu` and is handled according to the definitions in section 13.9.1.

The single `events y` and `z` are accessible individually and there is not end-to-end protection involved in their translation.

The modeling approach according to section 13.4.3 results in one or more `Service-InstanceToSignalMappings` which distribute the content of one `ISignalIPdu` to several `events`.

13.7 Translation pass-through composition

In case a *Pass-through Composition* is defined (see figure 13.3) the behavior for the defined pass-through definition shall be implemented. It is well possible to automatically generate the implementation of such a pass-through behavior out of the information given in the *Pass-through Composition*.

The mapping approach is already used in section 3.5 where the `PassThroughSwConnector` is used to define the matching `PortPrototypes` for the *facade* use-case. Specifically [constr_5056] applies as well for the `signal/service translation`.

SOME/IP services may consist of a mixture of events, fields and methods. While events and field notifiers are (potentially) subject to `signal/service translation` it is well-defined that methods (methods, getter- and setter-methods, and fire-and-forget methods) are serialized according to the SOME/IP serialization rules.

However, the mixed nature of a specific service instance makes it necessary that methods also have to be considered in the *Pass-through Composition*. It is not so much about the translation of the payload serialization, but the general wrapping of events, fields and methods in one service instance makes it necessary that methods get *passed through* as well.

13.8 Expected features of Classic platform

Classic AUTOSAR SWS-COM Specification provides a variety of possibilities to pack signals into PDUs - from a structural as well as from a behavioral perspective. Also, the further layers in the COM-Stack may influence the PDUs layout.

The goal of this section is to specify which of these Classic COM-Stack features shall also be available on the Adaptive Platform [signal/service translation](#).

13.8.1 Processing order

For the features of the Classic platform COM-Stack there is a well-defined processing order in which the actions are performed upon Tx and Rx of data. It is required for the [signal/service translation](#) to ensure the same processing order.

[TPS_MANI_03585]{DRAFT} **Processing order of COM-Stack features** [For the COM-Stack features the [signal/service translation](#) supports the processing order shall be the same as on the Classic platform.]([RS_MANI_00063](#))

13.8.2 Reception data filter

The reception filter support for [signal-service-translation](#) is defined in section [13.6.3](#).

The potentially defined reception filters at an [ISignalPort](#) shall be ignored, as [[TPS_MANI_03621](#)] is the only supported way to define [filters](#) for [signal-service-translation](#).

[TPS_MANI_03589]{DRAFT} **Reception data filter of COM-Stack** [If the [ISignalTriggering](#) refers to an [ISignalPort](#) and that [ISignalPort](#) has a [dataFilter](#) defined then the [signal-service-translation](#) shall ignore the filter definition.]([RS_MANI_00063](#))

13.8.3 Reception of invalid signal

[TPS_MANI_03592]{DRAFT} **ISignal invalidation of COM-Stack** [If the [ISignalTriggering](#) refers to an [ISignalPort](#) with [communicationDirection](#) equal [in](#) then the following values for [ISignalPort.handleInvalid](#) shall be supported by the [signal/service translation](#):

- [dontInvalidate](#)
- [replace](#)

]([RS_MANI_00063](#))

[TPS_MANI_03593]{DRAFT} **handleInvalid = dontInvalidate behavior of COM-Stack** [If the [ISignalTriggering](#) refers to an [ISignalPort](#) with [communicationDirection](#) equal [in](#) and the [ISignalPort.handleInvalid](#) equals [dontInvalidate](#) then the [signal/service translation](#) shall not perform any invalidation handling.]([RS_MANI_00063](#))

[TPS_MANI_03594]{DRAFT} **handleInvalid = replace behavior of COM-Stack** [If the `ISignalTriggering` refers to an `ISignalPort` with `communicationDirection` equal `in` and the `ISignalPort.handleInvalid` equals `replace` and the received value of the `ISignal` equals the `ISignal.networkRepresentationProps.invalidValue` then the `signal/service` translation shall *replace* the `invalidValue` with the `ISignal.initValue`.] ([RS_MANI_00063](#))

13.8.4 Update Bit handling

For details on the handling of update bits refer to section [13.6](#).

[TPS_MANI_03595]{DRAFT} **Update Bit support for ISignal** [If the `ISignalTriggering` refers to an `ISignalPort` with `communicationDirection` set to the value `in` and the `ISignalTriggering` refers to an `ISignal` and that `ISignal` is mapped into an `ISignalIPdu` with a `ISignalToIPduMapping.updateIndicationBitPosition` defined, then the following rules apply:

- If the received *update bit* is *true*, then the respective `ISignal` shall be considered for reception.
- If the received *update bit* is *false*, then the respective `ISignal` shall not be considered for reception.

] ([RS_MANI_00063](#))

13.8.5 Transfer properties and transmission modes for Service-Signal-Translation

[TPS_MANI_03590]{DRAFT} **Transfer properties and transmission modes of COM-Stack** [If the `ISignalTriggering` refers to an `ISignalPort` with `communicationDirection` equal `out` and the `ISignalTriggering` refers to an `ISignal` and that `ISignal` is mapped into an `ISignalIPdu` with an `iPduTimingSpecification` and the `IPduTiming` has a `transmissionModeDeclaration` defined and the `TransmissionModeDeclaration` has a `transmissionModeCondition` defined and the following values for `TransmissionModeCondition.dataFilter` shall be supported by the `service-signal-translation`:

- `always`
- `never`
- `maskedNewEqualsX`
- `maskedNewDiffersX`

] ([RS_MANI_00063](#))

Class	TransmissionModeCondition			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication::Timing			
Note	Possibility to attach a condition to each signal within an I-PDU. If at least one condition evaluates to true, TRANSMISSION MODE True shall be used for this I-Pdu. In all other cases, the TRANSMISSION MODE FALSE shall be used.			
Base	ARObject			
Aggregated by	TransmissionModeDeclaration.transmissionModeCondition			
Attribute	Type	Mult.	Kind	Note
dataFilter	DataFilter	1	aggr	Possibilities to define conditions
iSignalInIPdu	ISignalToIPduMapping	1	ref	Reference to a signal to which a condition is attached.

Table 13.12: TransmissionModeCondition

Class	TransmissionModeDeclaration			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication::Timing			
Note	AUTOSAR COM provides the possibility to define two different TRANSMISSION MODES (True and False) for each I-PDU. As TransmissionMode selector the signal content can be evaluated via transmissionModeCondition (implemented directly in the COM module) or mode conditions can be defined with the modeDrivenTrueCondition or modeDrivenFalseCondition (evaluated by BswM and invoking Com_SwitchIpduTxMode COM API). If modeDrivenTrueCondition and modeDrivenFalseCondition are defined they shall never evaluate to true both at the same time. The mixing of Transmission Mode Switch via API and signal value is not allowed.			
Base	ARObject			
Aggregated by	IPduTiming.transmissionModeDeclaration			
Attribute	Type	Mult.	Kind	Note
modeDrivenFalseCondition	ModeDrivenTransmissionModeCondition	*	aggr	Defines the trigger for the Com_SwitchIpduTxMode Transmission Mode switch. Only if all defined modeDrivenFalseConditions evaluate to true (AND associated) the transmissionModeFalseTiming shall be activated. modeDrivenTrueCondition and modeDrivenFalseCondition shall never evaluate to true both at the same time.
modeDrivenTrueCondition	ModeDrivenTransmissionModeCondition	*	aggr	Defines the trigger for the Com_SwitchIpduTxMode Transmission Mode switch. Only if all defined modeDrivenTrueConditions evaluate to true (AND associated) the transmissionModeTrueTiming shall be activated. modeDrivenTrueCondition and modeDrivenFalseCondition shall never evaluate to true both at the same time.
transmissionModeCondition	TransmissionModeCondition	*	aggr	The Transmission Mode Selector evaluates the conditions for a subset of signals and decides which transmission mode should be used. In case only one transmission mode is used there is no need for the "TransmissionModeCondition" and its sub-structure. In case the transmission mode shall be switched using the COM-API "Com_SwitchIpduTxMode" there is no need for the "TransmissionModeCondition" and its sub-structure.
transmissionModeFalseTiming	TransmissionModeTiming	0..1	aggr	Timing Specification if the COM Transmission Mode is false. The Transmission Mode Selector is defined to be false, if all Conditions evaluate to false.
transmissionModeTrueTiming	TransmissionModeTiming	0..1	aggr	Timing Specification if the COM Transmission Mode is true. The Transmission Mode Selector is defined to be true, if at least one Condition evaluates to true.

Table 13.13: TransmissionModeDeclaration

13.8.6 Deadline monitoring

The application software is responsible for the deadline monitoring.

13.8.7 Signal and IPdu Transmission

The application software is responsible for the periodic production of data and triggering of sending.

13.8.8 IPdu multiplexing

On low-payload networks there is the usage of IPdu Multiplexing to handle the limited number of identifiers for the respective network transport (e.g. CAN-Ids). The potential alternatives of a `MultiplexedIPdu` shall be represented as optional alternative `CppImplementationDataType` of category `STRUCTURE` in the `ServiceInterface` event or field.

[TPS_MANI_03597]{DRAFT} **Support for `MultiplexedIPdu`** [The `signal/-service translation` shall support the handling of `MultiplexedIPdu` defined payload. The support shall be available for sending and receiving of `MultiplexedIPdus`.] (*RS_MANI_00063*)

[TPS_MANI_03638]{DRAFT} **Mapping of `MultiplexedIPdu`** [The content of the `MultiplexedIPdu` shall be mapped to a `CppImplementationDataType` of category `STRUCTURE` consisting of the elements:

- `MultiplexedIPdu` static part: directly mapped into the top-level structure
- `MultiplexedIPdu` dynamic part: each dynamic part alternative shall be mapped inside a `CppImplementationDataTypeElement` of category `STRUCTURE`

] (*RS_MANI_00063*)

[TPS_MANI_03639]{DRAFT} **Mapping of `MultiplexedIPdu` static part** [The content of the `MultiplexedIPdu` static part shall be mapped to the a `CppImplementationDataType` of category `STRUCTURE` defined for the whole `MultiplexedIPdu` in [TPS_MANI_03638].] (*RS_MANI_00063*)

[TPS_MANI_03640]{DRAFT} **Mapping of `MultiplexedIPdu` dynamic part** [The content of each `MultiplexedIPdu` dynamic part shall be mapped to one of the optional alternatives of the `CppImplementationDataTypeElement` of category `STRUCTURE` with `CppImplementationDataTypeElement.isOptional` set to `true` for each dynamic part in [TPS_MANI_03638].] (*RS_MANI_00063*)

Note that even in cases where there is just one member mapped from a `MultiplexedIPdu` dynamic part there shall still be a wrapping `CppImplementationDataTypeElement` of category `STRUCTURE` defined according to [TPS_MANI_03640].

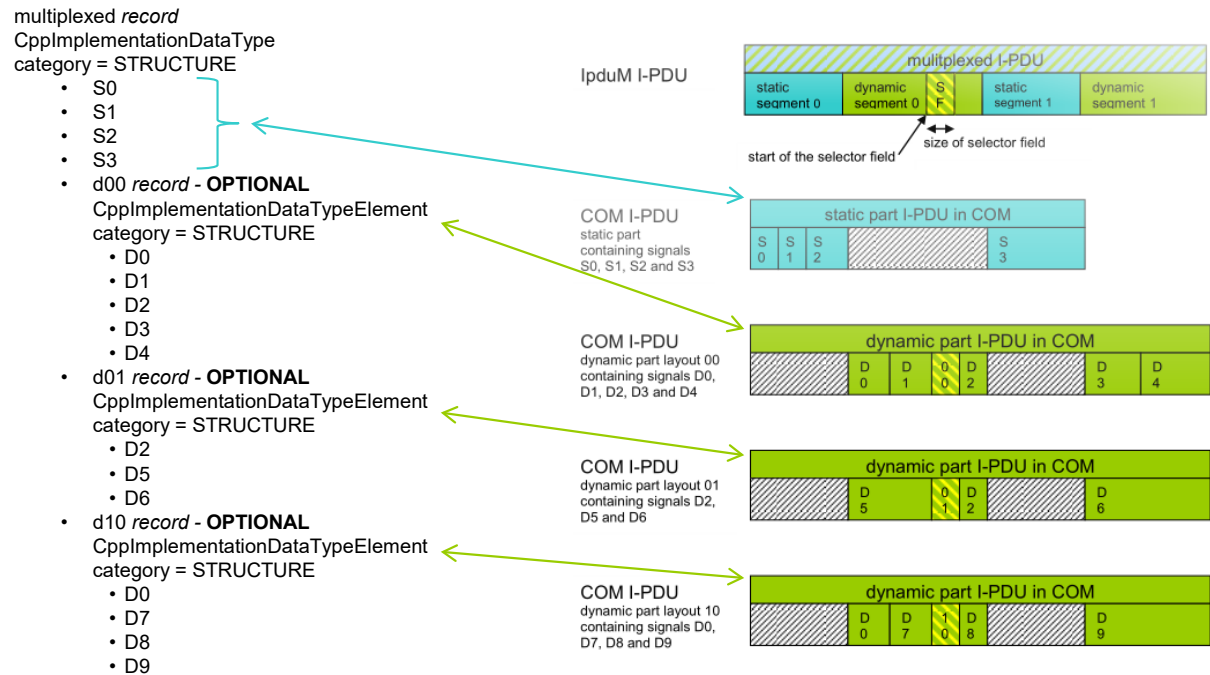


Figure 13.26: Example mapping for `MultiplexedIPdu`

[TPS_MANI_03641]{DRAFT} **No mapping of `MultiplexedIPdu` selector field value** [The selector field value of a `MultiplexedIPdu` shall not be mapped in the context of `signal-service-translation` (or `service-signal-translation`).] (*RS_MANI_00063*)

In order to keep the event or field of the `ServiceInterface` status consistent there shall only be exactly one of the optional alternatives used.

[TPS_MANI_03642]{DRAFT} **Exactly one alternative defined for mapped event / field during runtime** [Exactly one option (as defined in [TPS_MANI_03640] for the dynamic part) shall be defined in the event / field representing the `MultiplexedIPdu` during runtime.] (*RS_MANI_00063*)

In figure 13.26 an example for the mapping between a `MultiplexedIPdu` and the composite data type is illustrated.

13.9 End-to-End considerations

The `signal/service translation` on Adaptive platform follows a single-sided approach on `ara::com`. To the application software there is no difference whether the service is communicated using `SOME/IP` or `DDS`, or whether the service originates

in a [signal/service translation](#). As the translation is running in the same [Process](#) as the application software itself, the application software has direct access to the translated service payload.

In case there is an E2E header attached and/or a secure communication defined the translation software needs to check the validity (for reception) or calculate the CRC/MAC (for sending) of signal-based payload.

The information whether and which E2E / Security profile is configured is defined in the System Template [19] part belonging to the mapping information of sections [13.4.3](#), [13.4.5](#), and [13.4.6](#).

The assignment of the [ISignals](#) to [ISignalIPdus](#) which in turn are assigned to [SecuredIPdus](#) defines the security aspects.

The assignment of [ISignals](#) to [EndToEndTransformationDescriptions](#) define the safety aspects.

13.9.1 Safety

The attribute [SignalServiceTranslationEventProps.safeTranslation](#) is used to explicitly require that the translation shall be configured in a safe transport and that the translation software shall handle the translation activity in an end-to-end preserving way.

[TPS_MANI_03607]{DRAFT} Handling of safe [signal/service translation](#) in one [Executable](#) [It is required that the [signal-service-translation](#) (and [service-signal-translation](#)) of one Service/SignalGroup pair which are mapped to each other, shall be handled in one [Executable](#) to also cover a closed mapping from one E2E profile to another, if necessary.

The [signal/service translation](#) of different (independent) Services/Signal-Groups may be handled by different [Executables](#).] ([RS_MANI_00063](#))

[TPS_MANI_03608]{DRAFT} Support for safe [signal/service translation](#) [The translation of E2E protected data shall be supported in both directions, [signal-service-translation](#) and [service-signal-translation](#).] ([RS_MANI_00063](#))

[TPS_MANI_03609]{DRAFT} Support for safe [signal/service translation](#) with same or different E2E profiles [The translation of E2E protected data shall support the occurrence of

- the same E2E profile on both sides of the communication and
- different E2E profiles on each side of the communication.

] ([RS_MANI_00063](#))

[TPS_MANI_03610]{DRAFT} 1:n mapping for E2E protected data [It shall be possible to map the same E2E protected source data to several E2E protected target data (1:n).] ([RS_MANI_00063](#))

[TPS_MANI_03611]{DRAFT} E2E protected target out of E2E protected sources [The content of one E2E protected target shall only be composed out of data from E2E protected sources.] ([RS_MANI_00063](#))

The rationale for [\[TPS_MANI_03611\]](#) is to support the use-case where target data shall be E2E protected and it is composed of several sources.

[TPS_MANI_03614]{DRAFT} No translation of not OK E2E protected data out of several sources [If a E2E protected source data is mapped into a composed E2E protected target data (according to [\[TPS_MANI_03611\]](#)) and if the E2E-Check for the source data returns any E2E error (not *E_OK*) then this source data shall not be forwarded to the respective target data and (if applicable) shall not trigger the transmission of the target.] ([RS_MANI_00063](#))

If source data is not verified as *E_OK* it is not translated. If the translated E2E protected data comes from several sources there may occur correlation and synchronicity issues during translation.

[TPS_MANI_03612]{DRAFT} Sufficient ASIL level of translation software [If the `SignalServiceTranslationEventProps.safeTranslation` equals true then the implementation of the translation software shall fulfill a sufficient ASIL.] ([RS_MANI_00063](#))

[constr_3554]{DRAFT} E2E protection configuration check [If the `SignalServiceTranslationEventProps.safeTranslation` equals true then the signal-based payload shall have an EndToEnd profile defined.] ()

The current EndToEnd profiles for Classic platform rely on a periodic communication paradigm. For the translation software of the Adaptive platform this requires to know the specified period the payload has to be updated / checked for.

[TPS_MANI_03598]{DRAFT} Expected check period of E2E-Protected payload [If the `RPortPrototype` has a `ReceiverComSpec.receptionProps.dataUpdatePeriod` defined for an `event` then the application software calling the `ara::com` APIs shall check periodically for updates using the specified period.] ([RS_MANI_00063](#))

[TPS_MANI_03599]{DRAFT} Expected update period of E2E-Protected payload [If the `PPortPrototype` has a `SenderComSpec.transmissionProps.dataUpdatePeriod` defined for an `event` then the application software calling the `ara::com` APIs shall periodically update the `event` using the specified period.] ([RS_MANI_00063](#))

Class	ReceptionComSpecProps			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	This meta-class defines a set of reception attributes which the application software is assumed to implement.			
Base	ARObject			
Aggregated by	ReceiverComSpec.receptionProps			
Attribute	Type	Mult.	Kind	Note
dataUpdatePeriod	TimeValue	0..1	attr	This attribute defines the period in which the application shall check for updated data. This attribute is used for the configuration of the E2E protection, but may also indicate a general data reception period.
timeout	TimeValue	0..1	attr	This attribute defines the time interval after which the application shall assume that the to be received data reception has timed out, i.e. the respective data has not been received for that amount of time.

Table 13.14: ReceptionComSpecProps

Class	TransmissionComSpecProps			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	This meta-class defines a set of transmission attributes which the application software is assumed to implement.			
Base	ARObject			
Aggregated by	SenderComSpec.transmissionProps			
Attribute	Type	Mult.	Kind	Note
dataUpdatePeriod	TimeValue	0..1	attr	This attribute defines the period in which the application is assumed to transmit the respective data.
minimumSendInterval	TimeValue	0..1	attr	This attribute defines the minimum interval between two consecutive transmissions of the respective data the application is assumed to ensure.
transmissionMode	TransmissionModeDefinitionEnum	0..1	attr	The attribute defines the mode in which the application is assumed to transmit the respective data.

Table 13.15: TransmissionComSpecProps

Enumeration	TransmissionModeDefinitionEnum
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication
Note	This meta-class defines possible settings for the transmission mode.
Aggregated by	TransmissionComSpecProps.transmissionMode
Literal	Description
cyclic	The data is assumed to be transmitted in a cyclic manner. The cycle is defined by dataUpdatePeriod. Tags: atp.EnumerationLiteralIndex=0
cyclicAndOnChange	The data is assumed to be transmitted in a cyclic manner (with cycle time dataUpdatePeriod) and additionally there may be arbitrary transmission if the data value changes (minimumSendInterval to be respected, if defined). Tags: atp.EnumerationLiteralIndex=2
triggered	The data is assumed to be transmitted in an arbitrary manner (minimumSendInterval to be respected, if defined). Tags: atp.EnumerationLiteralIndex=1

Table 13.16: TransmissionModeDefinitionEnum

13.9.1.1 Signal-service-translation

[TPS_MANI_03600]{DRAFT} Signal-service-translation of E2E protected payload
[Signal-service-translation shall check the end-to-end status of every received signal-based payload. If the E2E-Check returns *E_OK* for the received payload then the data shall be forwarded to the respective sending of the translation software.] ([RS_MANI_00063](#))

Error handling:

[TPS_MANI_03601]{DRAFT} Signal-service-translation of E2E protected payload - timeout handling [If no message is received within the specified message cycle time (timeout is detected), then no data shall be transmitted to the service-based part.] ([RS_MANI_00063](#))

[TPS_MANI_03602]{DRAFT} Signal-service-translation of E2E protected payload - error handling [If the E2E-Check returns any E2E error (not *E_OK*), then the service-based message shall reflect that E2E error.] ([RS_MANI_00063](#))

Note: This is necessary to provide E2E information to the application software and support an End-to-End view on the data exchange from sender to receiver / provider to consumer.

13.9.1.2 Service-signal-translation

[TPS_MANI_03603]{DRAFT} Service-signal-translation of E2E protected payload
[Service-signal-translation shall check the end-to-end status of every received service-oriented payload. If the E2E-Check returns *E_OK* for the received payload then the data can be forwarded to the respective sending of the translation software.] ([RS_MANI_00063](#))

Error handling:

[TPS_MANI_03604]{DRAFT} Service-signal-translation of E2E protected payload - timeout handling [If no message is received within the specified message cycle time (timeout is detected), then no data shall be transmitted to the signal-based part.] ([RS_MANI_00063](#))

[TPS_MANI_03605]{DRAFT} Service-signal-translation of E2E protected payload - error handling [If the service-oriented payload is handed over with any E2E error (not *E_OK*), then the newly created signal-based E2E protected message shall reflect that E2E error.] ([RS_MANI_00063](#))

Note: This is necessary to provide E2E information to the receiving application and support an End-to-End view on the data exchange from sender to receiver/provider to consumer.

13.9.2 Security

In the context of Signal Service Translation the Secure Onboard Communication *SecOC* [36] is the major security technology. Further technologies (like *IPSec* or *TLS*) have not been included in the considerations for [signal/service translation](#).

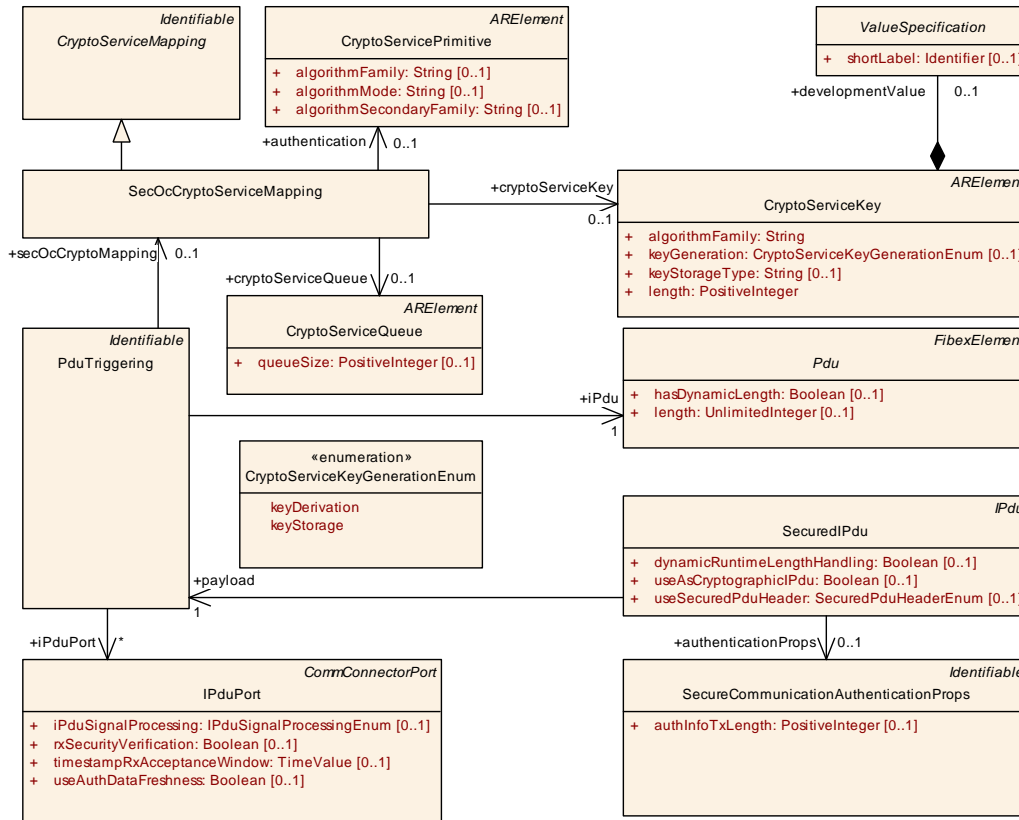


Figure 13.27: SecOC configuration

The configuration of *SecOC* on the signal-based communication is defined by having the *ISignalTriggering* used in one of the [signal/service translation](#) mappings refer to an *ISignal* and that *ISignal* is part of an *ISignalIPdu*. A *PduTriggering* of this *ISignalIPdu* is referenced by a *SecuredIPdu* in the role *payload*.

The *SecuredIPdu* defines all the details which are required to *generate* / *verify* the cryptographic information. The description of the configuration is provided in the System Template of Classic platform [19].

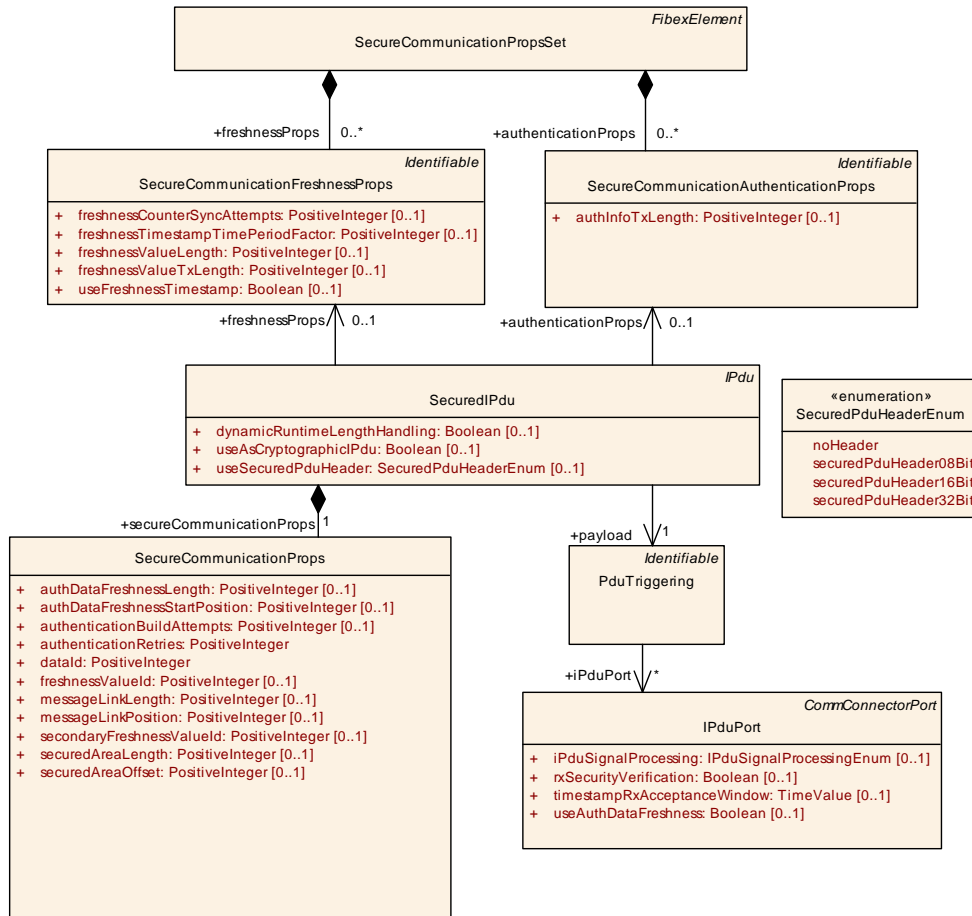


Figure 13.28: Details on SecuredIPdu

As the SecOC is highly embedded into the Classic platform architecture the `signal/-service translation` approach on security is to use the same architecture for its specification.

13.9.2.1 Restrictions on Classic Platform SecOC

[constr_3555]{DRAFT} No support for `useAsCryptographicIPdu` is true
 [The `signal/service translation` does not support the case where the `PduTriggering` is referencing a `SecuredIPdu` where the attribute `useAsCryptographicIPdu` is set to true.]()

The rationale for [constr_3555] is that the separate handling of two PDUs for the transport of one secured message is not supported by the SOME/IP protocol. In such cases the `signal/service translation` has to be performed on a Classic platform gateway ECU.

13.9.2.2 Link between Classic Platform SecOC and CryptoKeySlot

While most of the information how to configure the SecOC behavior are available in the Classic platform model, there is also the need to define which CryptoKeySlot shall be used for the processing of the SecOC message.

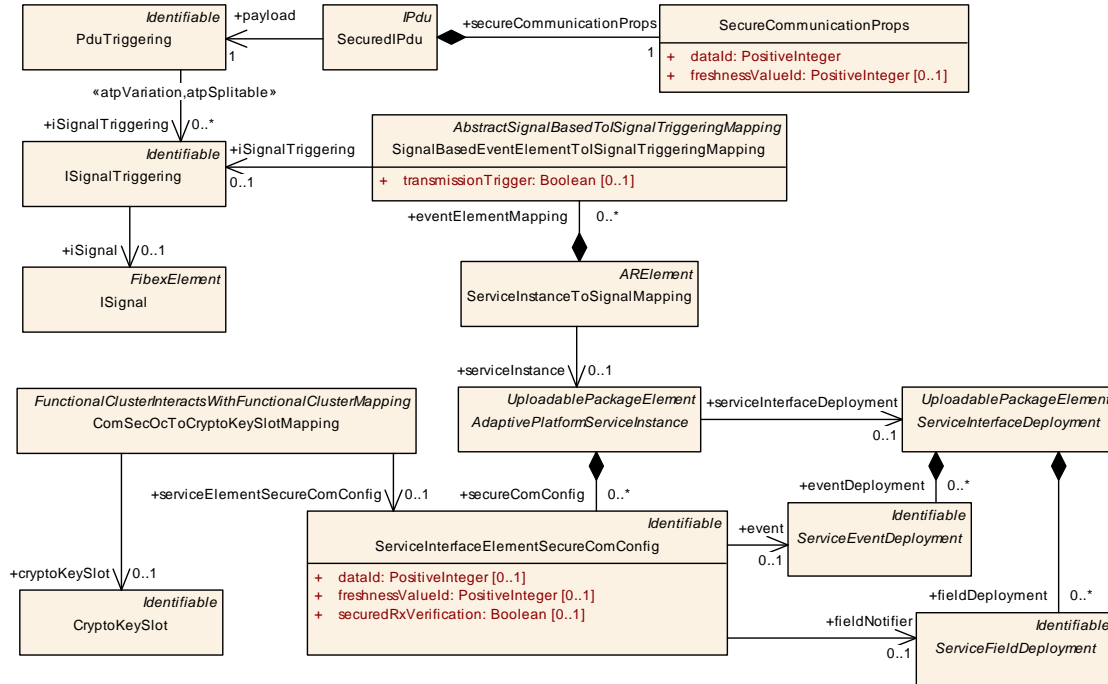


Figure 13.29: Classic SecOC and Adaptive CryptoKeySlot

[TPS_MANI_03636]{DRAFT} Definition of **ServiceInterfaceElementSecureComConfig** in the context of **signal/service translation** [A **ServiceInterfaceElementSecureComConfig** at the **AdaptivePlatformServiceInstance** shall be created for each Event or FieldNotifier if the following conditions apply:

- the **AdaptivePlatformServiceInstance** is target of a **ServiceInstanceToSignalMapping** in the role **serviceInstance**
- the **ServiceInstanceToSignalMapping** has a **SignalBasedEventElementToISignalTriggeringMapping** (resp. **SignalBasedFieldToISignalTriggeringMapping**) that refers to an **ISignalTriggering** that are part of an **ISignalIPdu**
- that **ISignalIPdu** is referenced by a **PduTriggering** which in turn is referenced by a **SecuredIPdu** in the role **payload**
- the **SecuredIPdu** is referenced by a **PduTriggering** and that **PduTriggering** refers to an **IPduPort** that has the attribute **rxSecurityVerification** set to true.

](RS_MANI_00063)

[TPS_MANI_03637]{DRAFT} Ignored attributes of **ServiceInterfaceElementSecureComConfig** in the context of **signal/service translation** [If a **ServiceInterfaceElementSecureComConfig** qualifies according to [TPS_MANI_03636] then any attributes (e.g. **dataId** and **freshnessValueId**) - except the reference in the role **event** or **fieldNotifier** - shall be ignored. The information how to configure the SecOC shall be taken from the **SecuredIPdu**.] (*RS_MANI_00063*)

[TPS_MANI_03663]{DRAFT} Ignored references of **ServiceInstanceToMachineMapping** in the context of **signal/service translation** [If an **AdaptivePlatformServiceInstance** qualifies according to [TPS_MANI_03636] and a **ServiceInstanceToMachineMapping** exists that refers to that **AdaptivePlatformServiceInstance** in the role **serviceInstance** and in the context of that **ServiceInstanceToMachineMapping** any of the following references exist:

- **ServiceInstanceToMachineMapping.secureComPropsForUdp**
- **ServiceInstanceToMachineMapping.secureComPropsForTcp**
- **ServiceInstanceToMachineMapping.secOcComPropsForMulticast**,

they shall be ignored.] (*RS_MANI_00063*)

The information of **SecOcSecureComProps** is available from the **SecuredIPdu** description in:

- **SecureCommunicationAuthenticationProps.authInfoTxLength**
- **SecureCommunicationFreshnessProps.freshnessValueLength**
- **SecureCommunicationFreshnessProps.freshnessValueTxLength**
- **SecOcCryptoServiceMapping.authentication**.

14 Cross-FunctionalCluster interaction

[TPS_MANI_03268]{DRAFT} **Semantics of `FunctionalClusterInteractsWithFunctionalClusterMapping`** [Abstract meta-class `FunctionalClusterInteractsWithFunctionalClusterMapping` provides an anchor for the specification of interaction between two functional clusters.

The identification of the interaction use case towards the functional cluster implementation is done by using an `InstanceSpecifier` of the concrete subclass of `FunctionalClusterInteractsWithFunctionalClusterMapping` that is used to define the concrete interaction.](*RS_MANI_00023*)

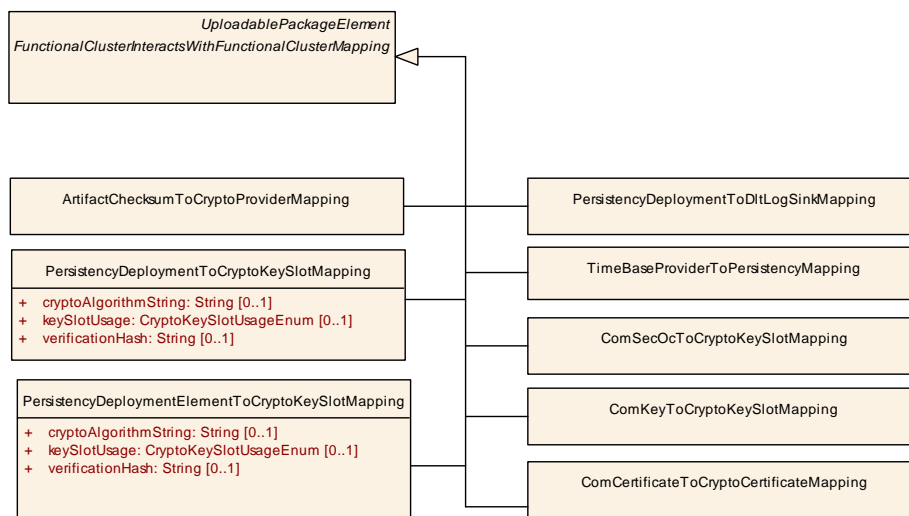


Figure 14.1: FunctionalClusterInteractsWithFunctionalClusterMapping Overview

Class	<i>FunctionalClusterInteractsWithFunctionalClusterMapping</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::FunctionalClusterInteractsWithFunctionalClusterMapping			
Note	This meta-class identifies a relation between functional clusters on the adaptive platform such one functional cluster can call APIs of the other functional cluster.			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i> , <i>UploadablePackageElement</i>			
Subclasses	<i>ArtifactChecksumToCryptoProviderMapping</i> , <i>ComCertificateToCryptoCertificateMapping</i> , <i>ComKeyToCryptoKeySlotMapping</i> , <i>ComSecOcToCryptoKeySlotMapping</i> , <i>DeterministicSyncMasterToTimeBaseConsumerMapping</i> , <i>FunctionalClusterInteractsWithPersistencyDeploymentMapping</i> , <i>PersistencyDeploymentElementToCryptoKeySlotMapping</i> , <i>PersistencyDeploymentToCryptoKeySlotMapping</i> , <i>PersistencyDeploymentToDltLogSinkMapping</i> , <i>TimeBaseProviderToPersistencyMapping</i> , <i>UcmToTimeBaseResourceMapping</i>			
Aggregated by	<i>ARPackageElement</i>			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 14.1: FunctionalClusterInteractsWithFunctionalClusterMapping

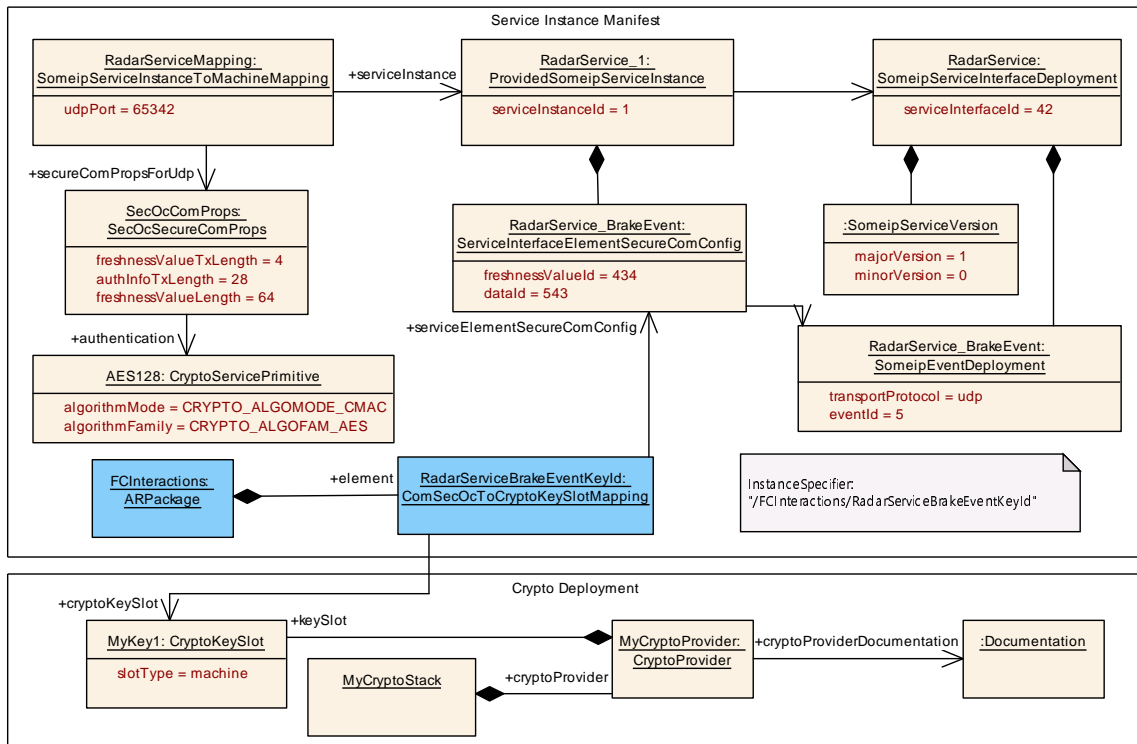


Figure 14.2: Example for the usage of `FunctionalClusterInteractsWithFunctionalClusterMapping`

In case of an application the model-path to an `PortPrototype` that is referencing a specific `PortInterface` defines the `InstanceSpecifier` that is used as identification towards the functional cluster implementation.

In case of a `FunctionalCluster` interaction the `PortPrototype` is not available. Therefore the path to a mapping element that is derived from `FunctionalClusterInteractsWithFunctionalClusterMapping` is used to define the `InstanceSpecifier` that is used in the API call.

The following figure shows the supported `FunctionalClusterInteractsWithFunctionalClusterMapping` subclasses that are available in the model.

The following **Figure 14.2** shows an example for the usage of `FunctionalClusterInteractsWithFunctionalClusterMapping`. In this example, the Service Instance Manifest describes a configuration for a `ProvidedSomeipServiceInstance` that contains an `Event` that is protected by SecOC.

Inside of the Service Instance Manifest the “`RadarServiceBrakeEventKeyId`” represents the `FunctionalClusterInteractsWithFunctionalClusterMapping` that is located in the `ARPpackage` “`FCInteractions`”.

These two elements in the manifest define the `InstanceSpecifier` “`*/FCInteraction-s/RadarServiceBrakeEventKeyId`” that is used in the Crypto API call from the Communication Management. This `InstanceSpecifier` is resolved to a concrete `CryptoKeySlot` with the information that is available in the Crypto Deployment.

14.1 Com Certificate To Crypto Certificate Mapping

[TPS_MANI_03269]{DRAFT} **Semantics of ComCertificateToCryptoCertificateMapping** [The meta-class `ComCertificateToCryptoCertificateMapping` provides an anchor for the specification of interaction between the COM FunctionalCluster and the Crypto FunctionalCluster and is used to map a `CryptoServiceCertificate` defined in COM to a `CryptoCertificate` defined in the Crypto Stack.] (*RS_MANI_00023*)

Class	ComCertificateToCryptoCertificateMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class maps the <code>CryptoServiceCertificate</code> defined in the COM deployment to the <code>CryptoCertificate</code> defined in the Crypto Stack. Tags: atp.recommendedPackage=FCInteractions			
Base	<i>ARElement, ARObject, CollectableElement, FunctionalClusterInteractsWithFunctionalClusterMapping, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, UploadablePackageElement</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
cryptoCertificate	<code>CryptoCertificate</code>	0..1	ref	Reference to the <code>CryptoCertificate</code> in the Crypto Stack.
cryptoServiceCertificate	<code>CryptoServiceCertificate</code>	0..1	ref	Reference to the <code>cryptoServiceCertificate</code> in the Com deployment

Table 14.2: ComCertificateToCryptoCertificateMapping

Figure 14.3 shows the `ComCertificateToCryptoCertificateMapping` used to assign a `CryptoServiceCertificate` defined in the TLS configuration to a `CryptoCertificate` in the Crypto Stack.

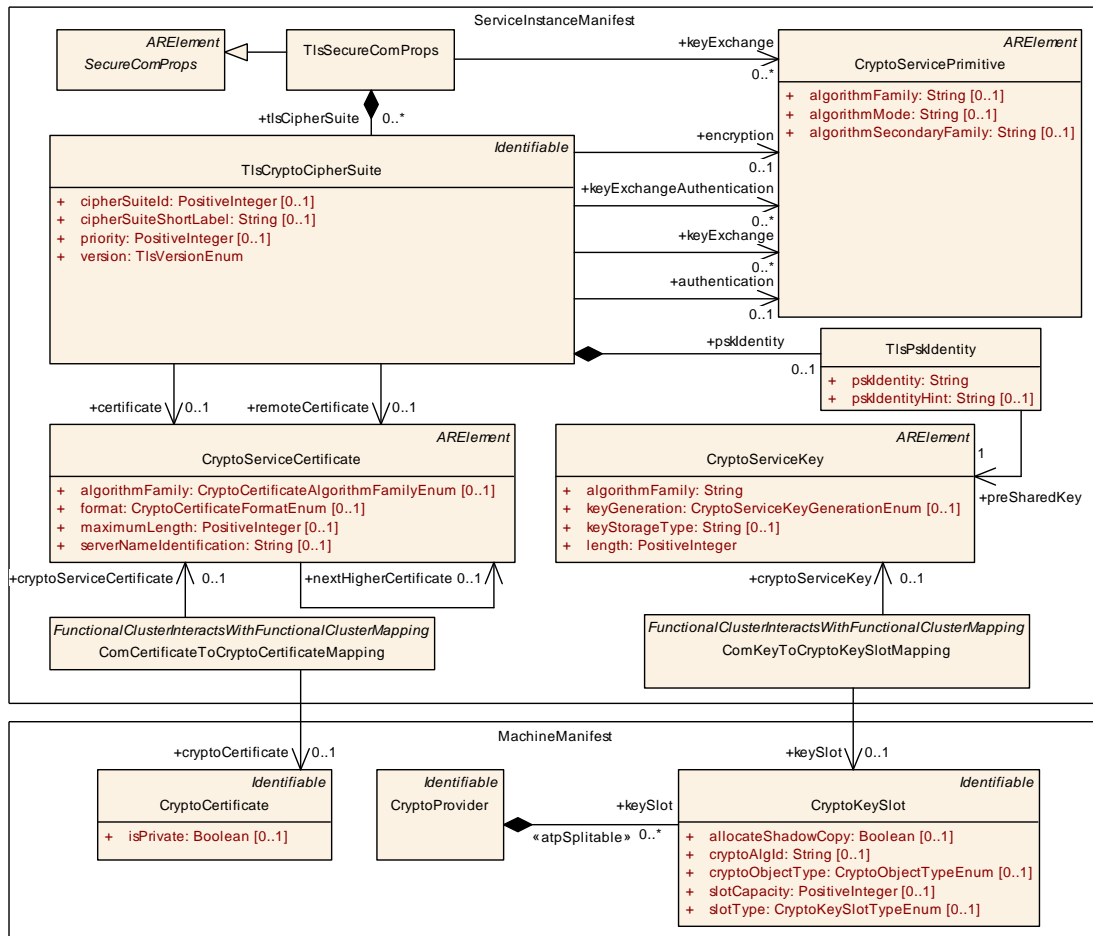


Figure 14.3: Mapping of TLS config elements to crypto objects in the crypto stack

14.2 Com Key To Crypto Key Slot Mapping

[TPS_MANI_03270]{DRAFT} Semantics of [ComKeyToCryptoKeySlotMapping](#)

[The meta-class [ComKeyToCryptoKeySlotMapping](#) provides an anchor for the specification of interaction between the COM FunctionalCluster and the Crypto FunctionalCluster and is used to map a [CryptoServiceKey](#) defined in COM to a [CryptoKeySlot](#) defined in the Crypto Stack.] ([RS_MANI_00023](#))

Figure 14.4 shows the [ComKeyToCryptoKeySlotMapping](#) used to assign a [CryptoServiceKey](#) defined in the IPsec configuration to [CryptoKeySlot](#) in the Crypto Stack.

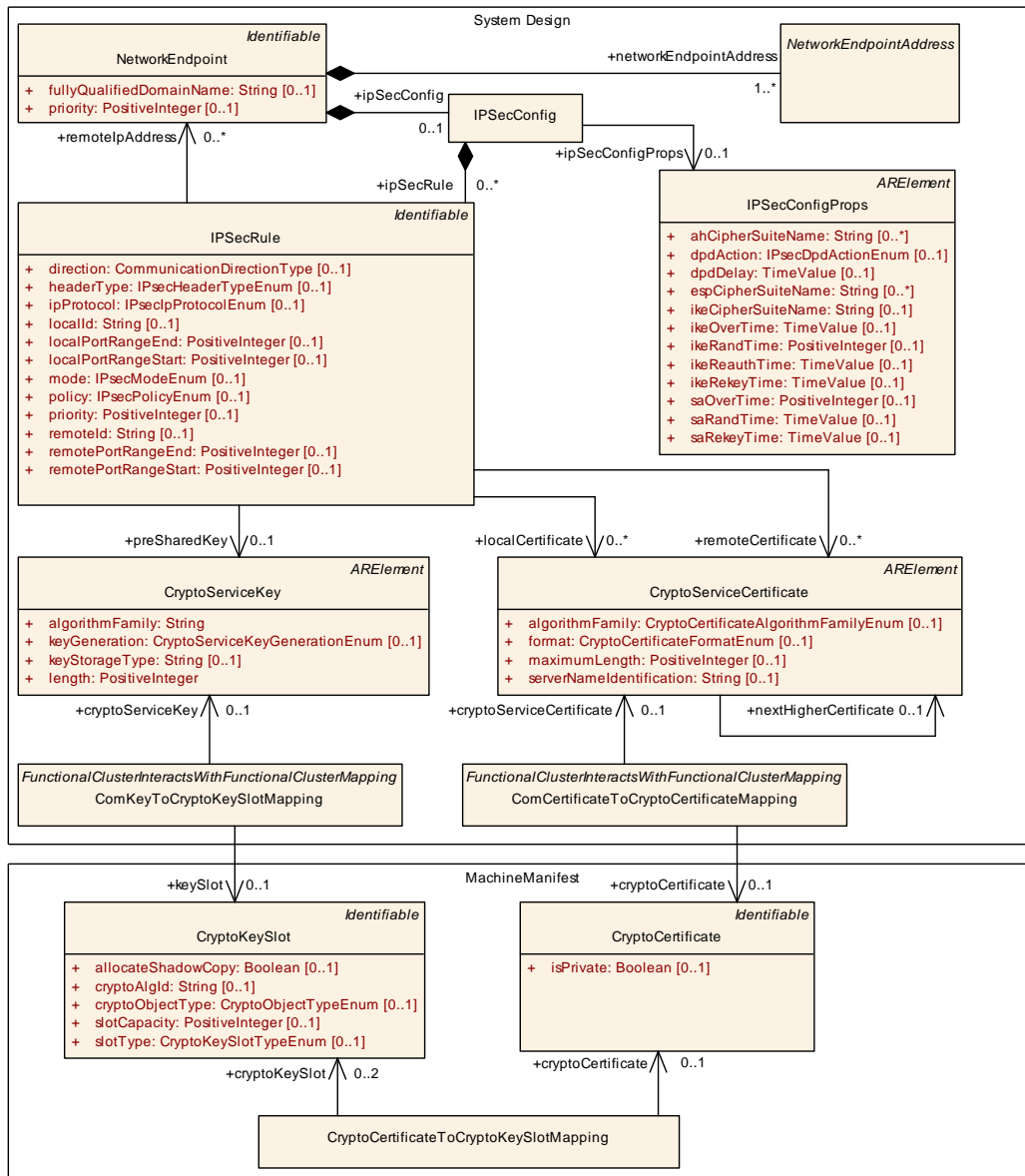


Figure 14.4: Mapping of IPsec config elements to crypto objects in the crypto stack

Class	ComKeyToCryptoKeySlotMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class maps the CryptoServiceKey defined in the COM deployment to the CryptoKeySlot defined in the Crypto Stack. Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
cryptoServiceKey	CryptoServiceKey	0..1	ref	Reference to the cryptoServiceKey in the Com deployment
keySlot	CryptoKeySlot	0..1	ref	Reference to the CryptoKeySlot in the Crypto Stack.

Table 14.3: ComKeyToCryptoKeySlotMapping

14.3 Com SecOc To Crypto Key Slot Mapping

[TPS_MANI_03271]{DRAFT} Semantics of [ComSecOcToCryptoKeySlotMapping](#)
 [The meta-class [ComSecOcToCryptoKeySlotMapping](#) provides an anchor for the specification of interaction between the COM FunctionalCluster and the Crypto FunctionalCluster and is used to map a [ServiceInterfaceElementSecureComConfig](#) defined in COM to a [CryptoKeySlot](#) defined in the Crypto Stack.] ([RS_MANI_00023](#))

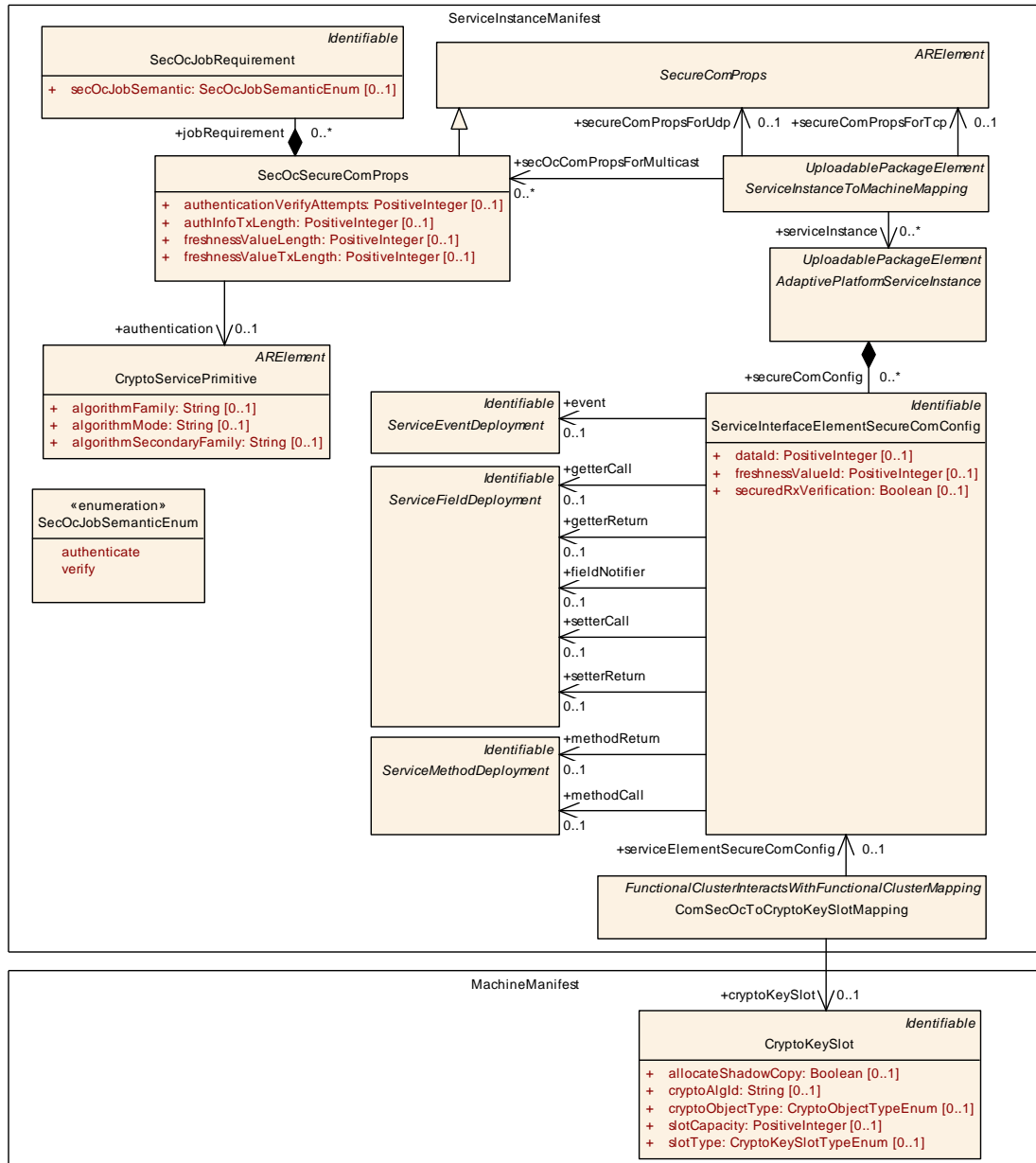


Figure 14.5: Mapping of SecOC config elements to crypto objects in the crypto stack

Class	ComSecOcToCryptoKeySlotMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class maps the ServiceElementSecureComConfig defined in the COM deployment to the CryptoKeySlot defined in the Crypto Stack. Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
cryptoKeySlot	CryptoKeySlot	0..1	ref	Reference to the CryptoKeySlot in the Crypto Stack.
serviceElementSecureComConfig	ServiceInterfaceElementSecureComConfig	0..1	ref	Reference to the ServiceInterfaceElementSecureComConfig element in the COM config.

Table 14.4: ComSecOcToCryptoKeySlotMapping

Figure 14.5 shows the [ComSecOcToCryptoKeySlotMapping](#) used to assign a [ServiceInterfaceElementSecureComConfig](#) defined in the SecOC configuration to [CryptoKeySlot](#) in the Crypto Stack.

14.4 Persistency Deployment To Crypto Key Slot Mapping

[TPS_MANI_03272]{DRAFT} **Semantics of [PersistencyDeploymentToCryptoKeySlotMapping](#)** [The meta-class [PersistencyDeploymentToCryptoKeySlotMapping](#) provides an anchor for the specification of interaction between the Persistency FunctionalCluster and the Crypto FunctionalCluster and is used to map a [PersistencyDeployment](#) defined in Persistency to a [CryptoKeySlot](#) defined in the Crypto Stack.] ([RS_MANI_00023](#))

Class	PersistencyDeploymentToCryptoKeySlotMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class represents the ability to define a mapping between the PersistencyDeployment and a CryptoKeySlot. Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
cryptoAlgorithmString	String	0..1	attr	This attribute defines the cryptographic algorithm used for hashing, encryption, decryption, signature/MAC verification, or MAC generation.
cryptoKeySlot	CryptoKeySlot	0..1	ref	This reference represents the mapped CryptoKeySlot.
keySlotUsage	CryptoKeySlotUsageEnum	0..1	attr	This attribute defines the role of the keySlot assignment.
persistencyDeployment	PersistencyDeployment	0..1	ref	This reference represents the mapped Persistency Deployment.
verificationHash	String	0..1	attr	This attribute defines the hash of the storage used in case of verification.

Table 14.5: PersistencyDeploymentToCryptoKeySlotMapping

[constr_10232]{DRAFT} Multiplicity of reference in the role **PersistencyDeploymentToCryptoKeySlotMapping.persistencyDeployment** [For each **PersistencyDeploymentToCryptoKeySlotMapping**, the reference in the role **persistencyDeployment** shall exist at the time when the creation of the manifest is finished.]()

Enumeration	CryptoKeySlotUsageEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment
Note	This enum defines the possible roles of the keySlotUsage.
Aggregated by	PersistencyDeploymentElementToCryptoKeySlotMapping.keySlotUsage , PersistencyDeploymentToCryptoKeySlotMapping.keySlotUsage
Literal	Description
encryption	Key slot usage for encryption Tags: atp.EnumerationLiteralIndex=1
verification	Key slot usage for verification Tags: atp.EnumerationLiteralIndex=0

Table 14.6: CryptoKeySlotUsageEnum

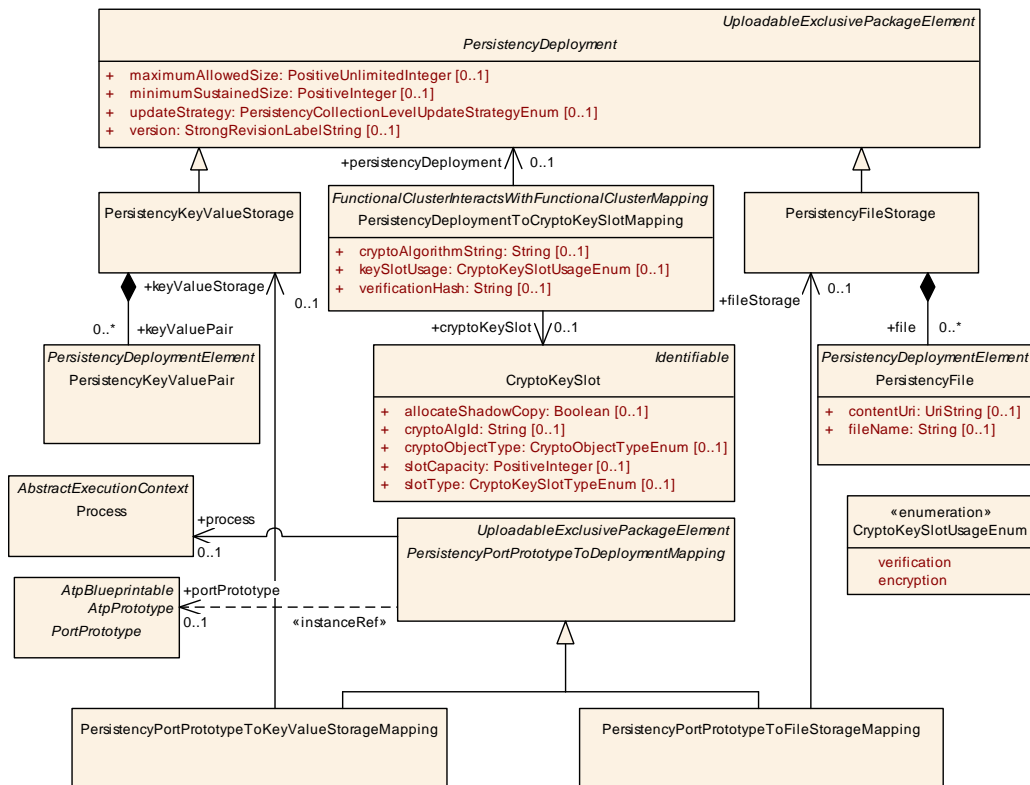


Figure 14.6: Mapping of PersistencyDeployment to crypto objects in the crypto stack

14.5 Persistency Deployment Element To Crypto Key Slot Mapping

[TPS_MANI_03273]{DRAFT} **Semantics of [PersistencyDeploymentElementToCryptoKeySlotMapping](#)** [The meta-class [PersistencyDeploymentElementToCryptoKeySlotMapping](#) provides an anchor for the specification of interaction between the Persistency FunctionalCluster and the Crypto FunctionalCluster and is used to map a [PersistencyDeploymentElement](#) defined in Persistency to a [CryptoKeySlot](#) defined in the Crypto Stack.] ([RS_MANI_00023](#))

Class	PersistencyDeploymentElementToCryptoKeySlotMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::CryptoDeployment			
Note	This meta-class represents the ability to define a mapping between the PersistencyDeploymentElement and a CryptoKeySlot. Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
cryptoAlgorithmString	String	0..1	attr	This attribute defines the cryptographic algorithm used for hashing, encryption, decryption, signature/MAC verification, or MAC generation.
cryptoKeySlot	CryptoKeySlot	0..1	ref	This reference represents the mapped CryptoKeySlot.
keySlotUsage	CryptoKeySlotUsageEnum	0..1	attr	This attribute defines the role of the keySlot assignment.
persistencyDeploymentElement	PersistencyDeploymentElement	0..1	ref	This reference represents the mapped Persistency Deployment.
verificationHash	String	0..1	attr	This attribute defines the hash of the storage used in case of verification.

Table 14.7: PersistencyDeploymentElementToCryptoKeySlotMapping

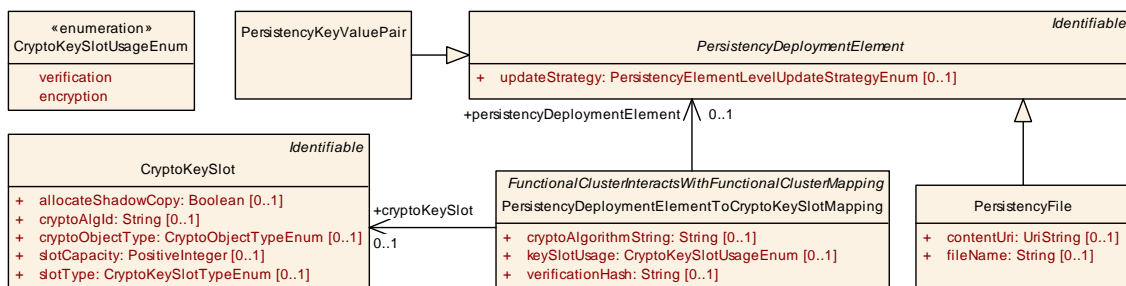


Figure 14.7: Mapping of PersistencyDeploymentElement to crypto objects in the crypto stack

14.6 Persistency Deployment To Dlt Log Sink Mapping

[TPS_MANI_03276]{DRAFT} **Semantics of [PersistencyDeploymentToDltLogSinkMapping](#)** [The meta-class [PersistencyDeploymentToDltLogSinkMapping](#) provides an anchor for the specification of interaction between the Persistency FunctionalCluster and Log & Trace and is used to map a [PersistencyDeployment](#) defined in Persistency to a [DltLogSink](#) defined in the [LogAndTraceInstantiation](#).] ([RS_MANI_00023](#))

Class	PersistencyDeploymentToDltLogSinkMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace			
Note	This meta-class represents the ability to define a mapping between the PersistencyDeployment and a Dlt LogSink. Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dltContext	DltContext	0..1	ref	Reference to the DltContext to which this mapping belongs.
logSink	DltLogSink	0..1	ref	Reference to the DltLogSink to which the Persistency Deployment is mapped
persistency Deployment	PersistencyDeployment	0..1	ref	This reference represents the mapped Persistency Deployment.

Table 14.8: PersistencyDeploymentToDltLogSinkMapping

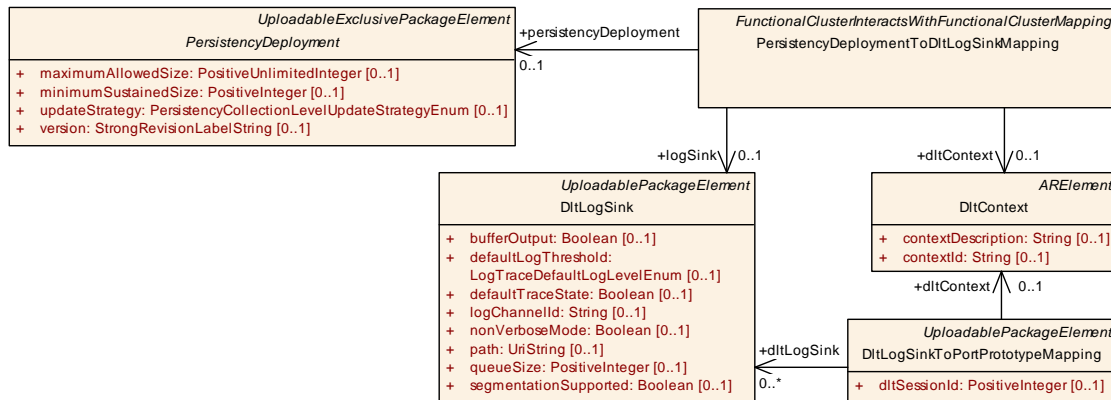


Figure 14.8: Mapping of PersistencyDeployment to DltLogSink

14.7 Ucm To Time Base Resource Mapping

[TPS_MANI_01374]{DRAFT} **Semantics of [UcmToTimeBaseResourceMapping](#)** [The meta-class [UcmToTimeBaseResourceMapping](#) provides an anchor for the specification of interaction between the Ucm Functional Cluster and Time Sync Functional Cluster and is used to identify the source of timestamp-information in the UCM.] ([RS_MANI_00023](#))

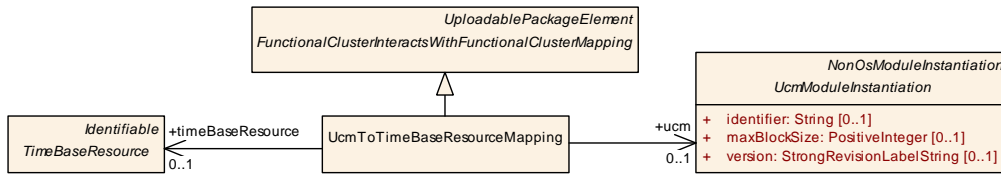


Figure 14.9: Mapping of the Ucm Functional Cluster to the Time Sync Functional Cluster

Class	UcmToTimeBaseResourceMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Ucm			
Note	This meta-class maps the UCM Module Instantiation to the TimeSync Module Instantiation. Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
timeBase Resource	TimeBaseResource	0..1	ref	This reference identifies the relevant TimeBaseResource.
ucm	UcmModuleInstantiation	0..1	ref	This reference identifies the relevant UcmModule Instantiation.

Table 14.9: UcmToTimeBaseResourceMapping

14.8 Functional Cluster Interacts With Persistency Deployment Mapping

[TPS_MANI_01379]{DRAFT} **Semantics of [FunctionalClusterInteractsWithPersistencyDeploymentMapping](#)** [Meta-class [FunctionalClusterInteractsWithPersistencyDeploymentMapping](#) provides the ability to specify that (and how) a functional cluster that is implemented as a **library component** wants to access persistently stored data (formalized by meta-class [PersistencyDeployment](#)) on the target platform.] ([RS_MANI_00023](#))

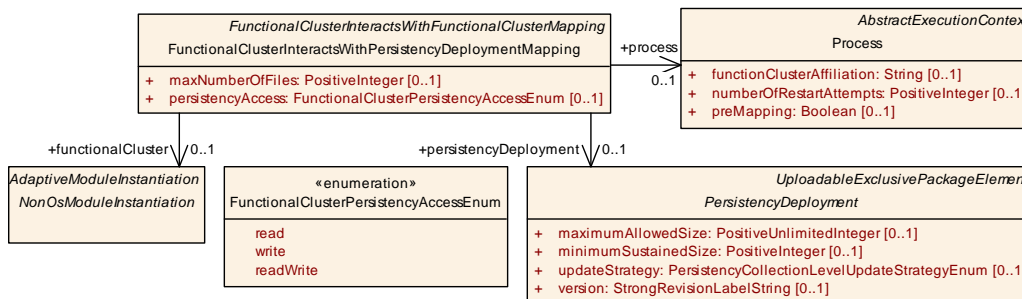


Figure 14.10: Mapping of any non-OS Functional Cluster to the Persistency Functional Cluster

Please note that the functional clusters are typically not dealing with modeled data types and therefore a formalized relation of `FunctionalClusterInteractsWithPersistencyDeploymentMapping` to a subclass of `CppImplementationDataType` is not foreseen.

Class	FunctionalClusterInteractsWithPersistencyDeploymentMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency			
Note	This meta-class represents the ability to define a mapping between any functional cluster modeled as a subclass of <code>NonOsModuleInstantiation</code> and a <code>PersistencyDeployment</code> . Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
functional Cluster	NonOsModuleInstantiation	0..1	ref	This reference identifies the client functional cluster that wants to use persistency.
maxNumberOf Files	PositiveInteger	0..1	attr	This attribute represents the definition of an upper bound for the handling of files at run-time in the context of the enclosing <code>FunctionalClusterInteractsWithPersistencyDeploymentMapping</code> .
persistency Access	FunctionalClusterPersistencyAccessEnum	0..1	attr	This attribute represents the definition of the persistency access of all kinds of persisted data at run-time in the context of the enclosing <code>FunctionalClusterInteractsWithPersistencyDeploymentMapping</code> .
persistency Deployment	PersistencyDeployment	0..1	ref	This reference identifies the applicable <code>PersistencyDeployment</code> .
process	Process	0..1	ref	"This reference identifies the applicable process.

Table 14.10: FunctionalClusterInteractsWithPersistencyDeploymentMapping

Enumeration	FunctionalClusterPersistencyAccessEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::Persistency
Note	This meta-class provides possible values about how functional clusters may use persistency with respect to the direction of access.
Aggregated by	FunctionalClusterInteractsWithPersistencyDeploymentMapping.persistencyAccess
Literal	Description
read	Functional Cluster wants to access persistency with a read semantics. Tags: atp.EnumerationLiteralIndex=0
readWrite	Functional Cluster wants to access persistency with a read and write semantics. Tags: atp.EnumerationLiteralIndex=2
write	Functional Cluster wants to access persistency with a write semantics. Tags: atp.EnumerationLiteralIndex=1

Table 14.11: FunctionalClusterPersistencyAccessEnum

14.9 Deterministic Synchronization Mapping

[TPS_MANI_01409]{DRAFT} **Semantics of meta-class [DeterministicSyncMasterToTimeBaseConsumerMapping](#)** [The meta-class [DeterministicSyncMasterToTimeBaseConsumerMapping](#) provides an anchor for the specification of interaction between a [deterministicSyncMaster](#) and a [timeBaseConsumer](#) for the purpose of using the time base for the creation of time stamps used in the synchronization process.] ([RS_MANI_00023](#))

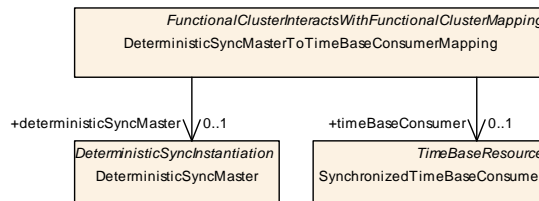


Figure 14.11: Mapping of a [DeterministicSyncMaster](#) to a [SynchronizedTimeBaseConsumer](#)

Class	DeterministicSyncMasterToTimeBaseConsumerMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::DeterministicSync			
Note	This meta-class has the ability to create an association between a deterministic sync master and the time-base consumer that is used to provide the sync master with a time base for creating time stamps for certain use cases. Tags: atp.Status=draft atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
deterministic SyncMaster	DeterministicSyncMaster	0..1	ref	This reference identifies the deterministic sync master in the scope of the mapping. Tags: atp.Status=draft
timeBase Consumer	SynchronizedTimeBaseConsumer	0..1	ref	This reference identifies the time base consumer in the scope of the mapping. Tags: atp.Status=draft

Table 14.12: DeterministicSyncMasterToTimeBaseConsumerMapping

[constr_10408]{DRAFT} **Existence of [DeterministicSyncMasterToTimeBaseConsumerMapping.deterministicSyncMaster](#)** [For each [DeterministicSyncMasterToTimeBaseConsumerMapping](#), the reference in the role [deterministicSyncMaster](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10409]{DRAFT} **Existence of [DeterministicSyncMasterToTimeBaseConsumerMapping.timeBaseConsumer](#)** [For each [DeterministicSyncMasterToTimeBaseConsumerMapping](#), the reference in the role [timeBaseConsumer](#) shall exist **at the time when the creation of the manifest is finished.**]()

15 Software Distribution

15.1 Overview

One of the key features of the *AUTOSAR adaptive platform* is the ability to extend the software on a given ECU without having to re-flash the entire ECU. Instead, software packages are uploaded to the ECU where the content is taken care of by responsible platform modules.

The reason why this topic is relevant for the modeling is the fact that an uploadable software package consists not only of software itself but also of manifest content required to support the integration of the uploaded software with the existing platform instance.

As far as the meta-model is concerned, the discussion about manifests and which manifest content needs to go with which other model elements doesn't care about the file granularity. In other words, it would not make sense to formalize the uploadable software package on the basis of references to files that carry model elements.

Instead, the view on the manifest topic from the modeling point of view focuses on model elements that make up manifest content.

Therefore, the modeling of an uploadable software package allows for putting references to all the required model elements that, in their entirety, make up the manifest of the corresponding application software that is also going to end up in the uploadable software package.

From the formal point of view, such an uploadable software package is modeled as a so-called `SoftwareCluster`. This meta-class is the root element that in turn describes all the necessary content of an uploadable software package.

However, the software package obviously isn't created out of thin air. It is the result of a workflow that starts from the formulation of requirements on the content of a `SoftwareCluster`.

These requirements are formalized by means of meta-class `SoftwareClusterDesigns`.

The relation between `SoftwareClusterDesign` and `SoftwareCluster` is depicted in Figure 15.1.

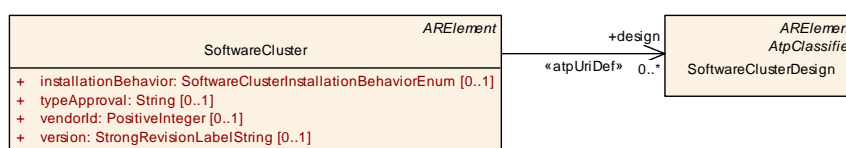


Figure 15.1: Relation of `SoftwareClusterDesign` to `SoftwareCluster`

[TPS_MANI_01109]{DRAFT} **Semantics of UploadablePackageElement** [In order to keep the complexity of the modeling of SoftwareCluster as low as possible abstract meta-class UploadablePackageElement has been created.

This allows for the referencing of model elements derived from UploadablePackageElement that need to be considered in an uploadable software package from within a SoftwareCluster with just the reference containedPackageElement.

The same applies for SoftwareClusterDesign and the respective reference requiredPackageElement.] (RS_MANI_00035)

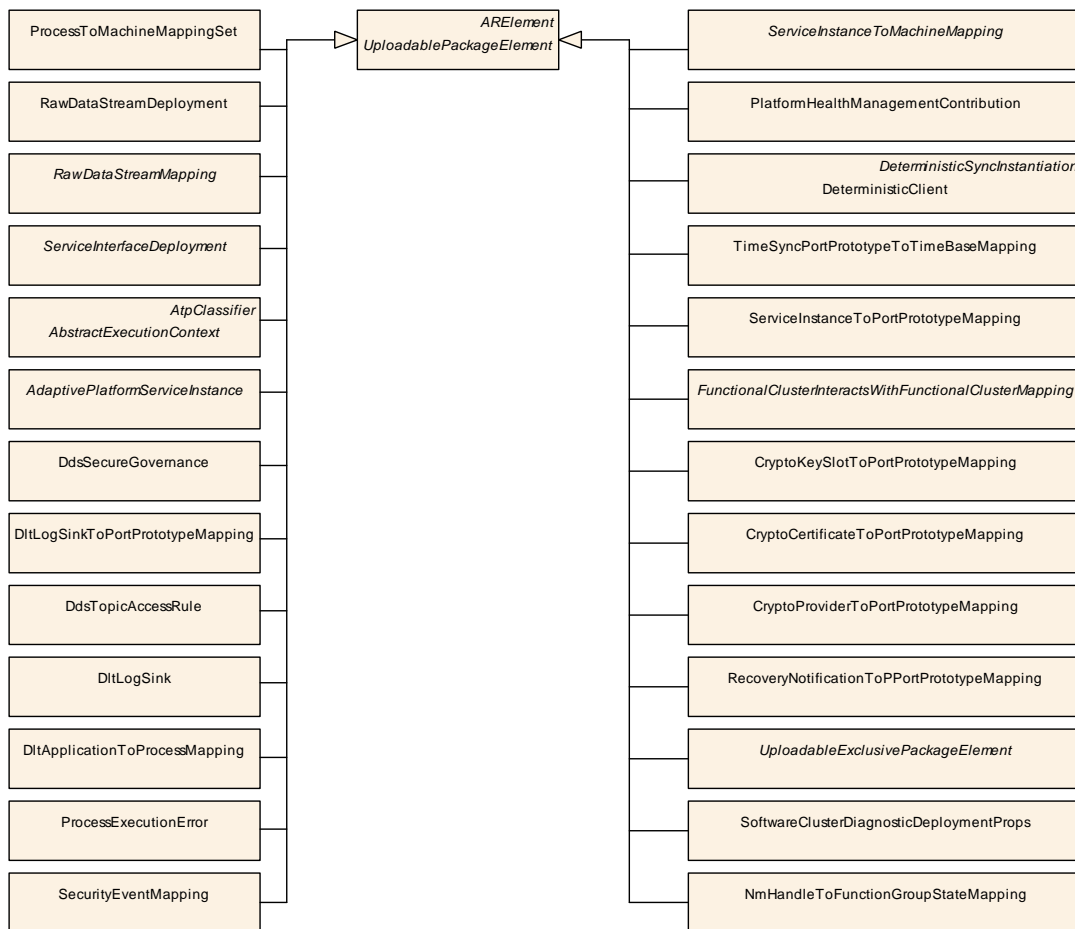


Figure 15.2: Overview of UploadablePackageElement

Class	<i>UploadablePackageElement</i> (abstract)
Package	M2::AUTOSARTemplates::AdaptivePlatform::General
Note	This meta-class acts as an abstract base class for all meta-classes that need to be added to an uploadable software package in order to complete the manifest content.
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>





Class	UploadablePackageElement (abstract)			
Subclasses	<i>AbstractExecutionContext</i> , <i>AdaptiveFirewallToPortPrototypeMapping</i> , <i>AdaptivePlatformServiceInstance</i> , <i>CryptoCertificateToPortPrototypeMapping</i> , <i>CryptoKeySlotToPortPrototypeMapping</i> , <i>CryptoProviderToPortPrototypeMapping</i> , <i>DdsSecureGovernance</i> , <i>DdsTopicAccessRule</i> , <i>DeterministicClient</i> , <i>DltApplicationToProcessMapping</i> , <i>DltLogSink</i> , <i>DltLogSinkToPortPrototypeMapping</i> , <i>FunctionalClusterInteractsWithFunctionalClusterMapping</i> , <i>NmHandleToFunctionGroupStateMapping</i> , <i>PlatformHealthManagementContribution</i> , <i>ProcessExecutionError</i> , <i>ProcessToMachineMappingSet</i> , <i>RawDataStreamDeployment</i> , <i>RawDataStreamMapping</i> , <i>RecoveryNotification</i> , <i>RecoveryNotificationToPortPrototypeMapping</i> , <i>SecurityEventMapping</i> , <i>ServiceInstanceToMachineMapping</i> , <i>ServiceInstanceToPortPrototypeMapping</i> , <i>ServiceInterfaceDeployment</i> , <i>SoftwareClusterDiagnosticDeploymentProps</i> , <i>TimeSyncPortPrototypeToTimeBaseMapping</i> , <i>UploadableExclusivePackageElement</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 15.1: UploadablePackageElement

Please note that this approach to collecting elements is very similar in semantics to [System.fibexElement](#) or [DiagnosticContributionSet.element](#).

15.2 Software Cluster

15.2.1 Software Cluster General Modeling

[TPS_MANI_01110]{DRAFT} **Semantics of [SoftwareCluster](#)** [The existence of a [SoftwareCluster](#) represents an uploadable software package.] ([RS_MANI_00035](#))

[TPS_MANI_01213]{DRAFT} **Semantics of meta-class [StrongRevisionLabelString](#)** [Meta-class [StrongRevisionLabelString](#) supports the specification of a version number for a [SoftwareCluster](#) that consists of four components ([constr_1747](#)] applies):

- Major version
- Minor version
- Patch version
- Additional labels for pre-release version and build metadata

] ([RS_MANI_00035](#))

[TPS_MANI_01410]{DRAFT} **Semantics of attribute [SoftwareCluster.installationBehavior](#)** [Attribute [SoftwareCluster.installationBehavior](#) determines the behavior of a [SoftwareCluster](#) in terms of whether it will be allowed to remove the [SoftwareCluster](#) from the target machine.

The decision to declare a [SoftwareCluster](#) non-removable is most likely limited to [SoftwareClusters](#) with a significant share of platform-level software.] ([RS_MANI_00035](#))

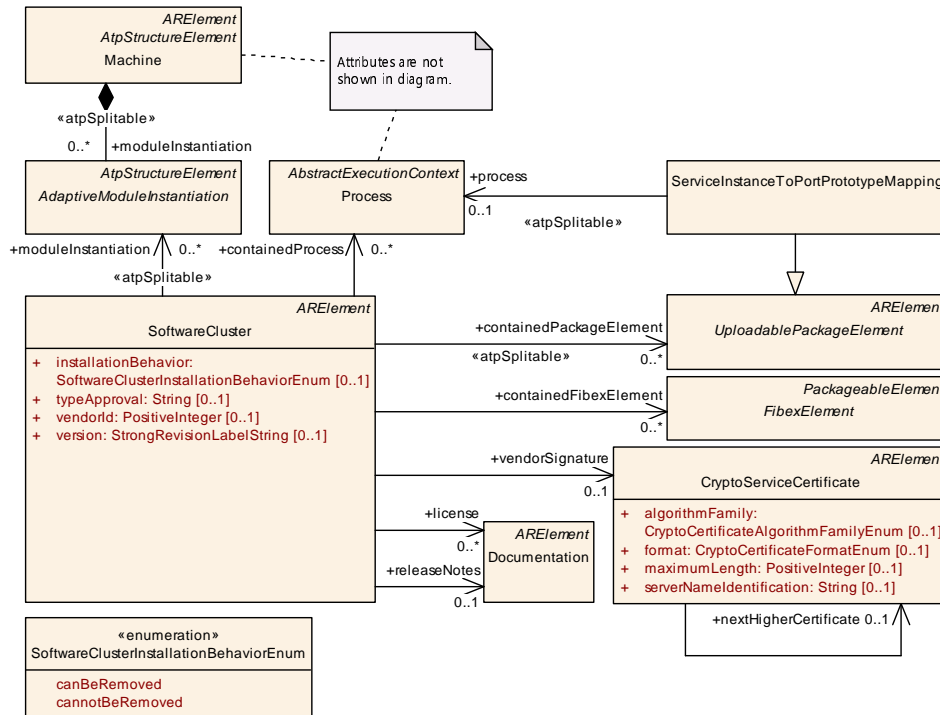


Figure 15.3: Modeling of SoftwareCluster

Class	SoftwareCluster			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define an uploadable software-package, i.e. the SoftwareCluster shall contain all software and configuration for a given purpose. Tags: atp.recommendedPackage=SoftwareClusters			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
artifact Checksum	ArtifactChecksum	*	aggr	This aggregation carries the checksums for artifacts contained in the enclosing SoftwareCluster. Stereotypes: atpSplitable Tags: atp.Splitkey=artifactChecksum.shortName, artifactChecksum.uri
artifactLocator	ArtifactLocator	*	aggr	This aggregation represents the artifact locations that are relevant in the context of the enclosing SoftwareCluster
claimed FunctionGroup	ModeDeclarationGroup Prototype	*	ref	Each SoftwareCluster can reserve the usage of a given functionGroup such that no other SoftwareCluster is allowed to use it
conflictsTo	SoftwareCluster DependencyFormula	0..1	aggr	This aggregation handles conflicts. If it yields true then the SoftwareCluster shall not be installed. Stereotypes: atpSplitable Tags: atp.Splitkey=conflictsTo





Class	SoftwareCluster			
contained ARElement	ARElement	*	ref	This reference represents the collection of model elements that cannot derive from UploadablePackageElement and that contribute to the completeness of the definition of the SoftwareCluster. Stereotypes: atpSplitable Tags: atp.Splitkey=containedARElement
containedFibex Element	FibexElement	*	ref	This allows for referencing FibexElements that need to be considered in the context of a SoftwareCluster.
contained Package Element	UploadablePackageElement	*	ref	This reference identifies model elements that are required to complete the manifest content. Stereotypes: atpSplitable Tags: atp.Splitkey=containedPackageElement
contained Process	Process	*	ref	This reference represent the processes contained in the enclosing SoftwareCluster.
dependsOn	SoftwareCluster DependencyFormula	0..1	aggr	This aggregation can be taken to identify a dependency for the enclosing SoftwareCluster. Stereotypes: atpSplitable Tags: atp.Splitkey=dependsOn
design	SoftwareClusterDesign	*	ref	This reference represents the identification of all SoftwareClusterDesigns applicable for the enclosing SoftwareCluster. Stereotypes: atpUriDef
diagnostic Deployment Props	SoftwareCluster DiagnosticDeployment Props	0..1	ref	This reference identifies the applicable SoftwareClusterDiagnosticProps for the enclosing SoftwareCluster. Note that all SoftwareClusters that share the same DiagnosticContributionSet via the reference diagnosticExtract shall also share the same SoftwareClusterDiagnosticProps.
installation Behavior	SoftwareCluster InstallationBehavior Enum	0..1	attr	This attribute controls the behavior of the SoftwareCluster in terms of installation.
license	Documentation	*	ref	This attribute allows for the inclusion of the full text of a license of the enclosing SoftwareCluster. In many cases open source licenses require the inclusion of the full license text to any software that is released under the respective license.
module Instantiation	AdaptiveModule Instantiation	*	ref	This reference identifies AdaptiveModuleInstantiations that need to be included with the SoftwareCluster in order to establish infrastructure required for the installation of the SoftwareCluster. Stereotypes: atpSplitable Tags: atp.Splitkey=moduleInstantiation
releaseNotes	Documentation	0..1	ref	This attribute allows for the explanations of changes since the previous version. The list of changes might require the creation of multiple paragraphs of text.
typeApproval	String	0..1	attr	This attribute carries the homologation information that may be specific for a given country.
vendorId	PositiveInteger	0..1	attr	Vendor ID of this Implementation according to the AUTOSAR vendor list.
vendor Signature	CryptoService Certificate	0..1	ref	This reference identifies the certificate that represents the vendor's signature.
version	StrongRevisionLabel String	0..1	attr	This attribute can be used to describe a version information for the enclosing SoftwareCluster.

Table 15.2: SoftwareCluster

Enumeration	SoftwareClusterInstallationBehaviorEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution
Note	This enumeration defines possible approaches for the installation behavior of a SoftwareCluster.
Aggregated by	SoftwareCluster.installationBehavior
Literal	Description
canBeRemoved	The enclosing SoftwareCluster can be removed from the target Machine or updated with a newer version. Tags: atp.EnumerationLiteralIndex=0
cannotBeRemoved	The enclosing SoftwareCluster cannot be removed from the target Machine. It can only be updated with a newer version. Tags: atp.EnumerationLiteralIndex=1

Table 15.3: SoftwareClusterInstallationBehaviorEnum

[constr_10410] Value of [SoftwareCluster.installationBehavior](#) for a [SoftwareCluster](#) of category **PLATFORM_CORE** [In a [SoftwareCluster](#) of category **PLATFORM_CORE**, the attribute [installationBehavior](#) shall exist and its value shall be set to **cannotBeRemoved at any time in the workflow.**]()

[constr_10233]{DRAFT} Multiplicity of the reference in the role [SoftwareCluster.vendorSignature](#) [For each [SoftwareCluster](#), the reference in the role [vendorSignature](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10234]{DRAFT} Multiplicity of attribute [SoftwareCluster.version](#) [For each [SoftwareCluster](#), the attribute [version](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10235]{DRAFT} Multiplicity of attribute [SoftwareCluster.vendorId](#) [For each [SoftwareCluster](#), the attribute [vendorId](#) shall exist **at the time when the creation of the manifest is finished.**]()

The modeling of the relation [SoftwareCluster.claimedFunctionGroup](#) is modeled in Figure 15.4.

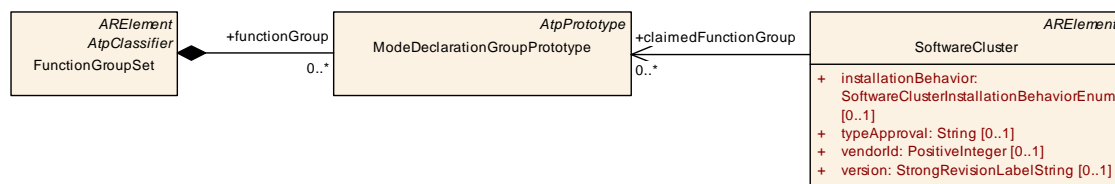


Figure 15.4: Modeling of the relation between [SoftwareCluster](#) and [Function Groups](#)

[constr_1747]{DRAFT} Completeness of the [SoftwareCluster.version](#) [The [SoftwareCluster.version](#) shall contain all the following parts:

- Major version
- Minor version
- Patch version
- Additional labels for pre-release version and build metadata

]()

Primitive	StrongRevisionLabelString
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::PrimitiveTypes
Note	<p>This primitive represents a revision label which identifies an object under version control. It represents a pattern which requires three integer numbers separated by a dot, representing from left to right Major Version, MinorVersion, PatchVersion and additional labels for pre-release version and build metadata.</p> <p>Legal patterns are for example: 1.0.0-alpha+001 1.0.0+20130313144700 1.0.0-beta+exp.sha.5114f85</p> <p>Tags: xml.xsd.customType=STRONG-REVISION-LABEL-STRING xml.xsd.pattern=(0 [1-9]\d*)\.(0 [1-9]\d*)\.(0 [1-9]\d*)(-((0 [1-9]\d* d*[a-zA-Z-][0-9a-zA-Z-]*)(\.(0 [1-9]\d* d*[a-zA-Z-][0-9a-zA-Z-]*))*))?(+([0-9a-zA-Z-]+\.(0 [1-9]\d* d*[a-zA-Z-][0-9a-zA-Z-]*))*)? xml.xsd.type=string</p>

Table 15.4: StrongRevisionLabelString

Please note that the build number does not necessarily have to be consecutively incremented between two builds. In some cases the build number is created by creating a hash over the build.

In such a case it would not make sense to include the build number in a greater/less comparison while a comparison for equality/inequality may positively make sense. This aspect shall be taken into account when processing the value of an attribute types by a [StrongRevisionLabelString](#).

[TPS_MANI_01331]{DRAFT} Standardized values of attribute [SoftwareCluster.category](#) [AUTOSAR standardizes the following values of attribute [SoftwareCluster.category](#)

- **PLATFORM_CORE:** a [SoftwareCluster](#) of this [category](#) typically represents any kind of platform software, e.g. bootloader, hypervisor, OS, adaptive platform module. Such a [SoftwareCluster](#) cannot be removed by a UCM, but updates are possible. Please note that it is not forbidden that such a Software Cluster contains application level software.
- **PLATFORM:** a [SoftwareCluster](#) of this [category](#) represents the parts of the platform software (e.g. configuration of functional clusters) that could be installed, removed, and updated.
- **APPLICATION_LAYER:** a [SoftwareCluster](#) of this [category](#) represents a driving-relevant function on application level, e.g. a lane keeping assistant, window lift controller, seat positioning. Such a [SoftwareCluster](#) can be installed, removed, and updated.

] ([RS_MANI_00035](#))

Please note that [[constr_1789](#)] makes the definition of the PLATFORM_CORE [SoftwareCluster](#) mandatory. Even if the AUTOSAR UCM is not used as the Update Management System on the Machine the PLATFORM_CORE [SoftwareCluster](#) shall be defined for Methodology reasons in the Manifest file. But in such a case it is allowed to define a single PLATFORM_CORE [SoftwareCluster](#) on the Machine that

would contain all software that is deployed on this machine (platform software and application software).

Please also note that it is possible to (in addition to the standardized values) define custom values for attribute `SoftwareCluster.category`.

In this case, however, it is important to use custom values that don't clash with future extensions of the standardized values. A good way to avoid a clash is, for example, to use specific pre- or postfixes that identify a company or project name.

[constr_1788]{DRAFT} Restriction to `SoftwareCluster` of category `PLATFORM_CORE` [On each `Machine`, only a single `SoftwareCluster` of category `PLATFORM_CORE` shall be deployed.] ()

[TPS_MANI_01115]{DRAFT} Specification of executable software within `SoftwareCluster` [One of the most prominent contents of an uploadable software package is the reference to the executable software.

Within the definition of a `SoftwareCluster`, this reference is implicitly given by means of the reference `SoftwareCluster.containedProcess`.

The target of `SoftwareCluster.containedProcess` is a `Process` that represents an instance of the corresponding executable program (the software image), formalized as `Executable`] (*RS_MANI_00035*)

The prominence of the dedicated reference to `Process` is amplified by the fact that it would have been technically possible to let `Process` inherit from `UploadablePackageElement` and thus include the referenced `Process(es)` in the bulk of references to other required model elements.

These references are formalized in two different forms. For technical reasons it is not possible to let all model elements that need to be immediately referenced by a `SoftwareCluster` inherit from `UploadablePackageElement`.

The main reason is that further model elements need to be referenced by a `SoftwareCluster` that are also used on the *AUTOSAR classic platform*.

In other words, it would be very questionable to introduce the “useless” concept of an `UploadablePackageElement` into the scope of the *AUTOSAR classic platform* as a mere (and unwanted) side effect of providing a definition of the `SoftwareCluster` on the *AUTOSAR classic platform*.

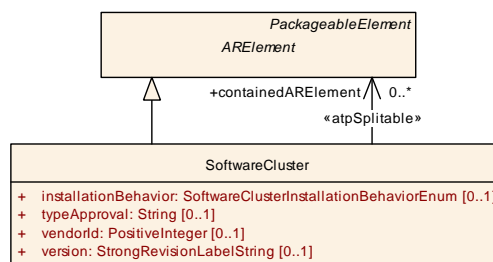


Figure 15.5: `SoftwareCluster` can reference `ARElement`

The scope of a single `SoftwareCluster` in terms of a relation to a `Machine` is that all software contained in one `SoftwareCluster` is supposed to be uploaded to one and only one `Machine`.

The definition of `SoftwareCluster` shall never include multiple `Machines`. This is expressed in [`constr_1536`].

[`constr_1536`]{DRAFT} Definition of `SoftwareCluster` applies for a single `Machine` [Within the scope of a `SoftwareCluster`, each `Process` referenced in the role `containedProcess` shall be mapped (e.g. by means of the existence of a `ProcessToMachineMapping`) to the same `Machine`.]()

[`TPS_MANI_01116`]{DRAFT} Reference to model elements included in an uploadable software package [Beside the ability to explicitly reference a `Process` in the role `containedProcess` it is possible to define the following references to required model elements:

- references to meta-classes derived from `UploadablePackageElement` are formalized by way of `SoftwareCluster.containedPackageElement`.
- references to meta-classes derived from `ARElement` are formalized by way of `SoftwareCluster.containedARElement`.
- references to meta-classes derived from `FibexElement` are formalized by way of `SoftwareCluster.containedFibexElement`.

Technically, an `UploadablePackageElement` is also an `ARElement`, but it is still mandated to use the dedicated reference specifically for `UploadablePackageElement`.] (`RS_MANI_00035`)

To exemplify the reference to `UploadablePackageElement`, Figure 15.3 contains a subclass of `UploadablePackageElement`: `ServiceInstanceToPortPrototypeMapping`.

It is obvious that the uploaded software needs to integrate with the communication stack and `ServiceInstanceToPortPrototypeMapping` is a prominent model element for this purpose.

[`TPS_MANI_01202`]{DRAFT} Semantics of reference `SoftwareCluster.moduleInstantiation` [By means of the reference `SoftwareCluster.moduleInstantiation` it is possible to express the need for updates of the platform infrastructure along with other resources referenced by the enclosing `SoftwareCluster`.] (`RS_MANI_00035`)

[`TPS_MANI_01218`]{DRAFT} Cryptographic signature of `SoftwareCluster` [A `SoftwareCluster` also needs to be signed cryptographically. For this purpose, meta-class `CryptoServiceCertificate` is referenced in the role `vendorSignature`.] (`RS_MANI_00035`)

[`TPS_MANI_01219`]{DRAFT} License of software in included `SoftwareCluster` [It is possible to refer to licenses for software included in a `SoftwareCluster` by

means of a reference to meta-class [Documentation](#) in the role [license](#).] ([RS_MANI_00035](#))

Class	Documentation			
Package	M2::AUTOSARTemplates::GenericStructure::DocumentationOnM1			
Note	This meta-class represents the ability to handle a so called standalone documentation. Standalone means, that such a documentation is not embedded in another ARElement or identifiable object. The standalone documentation is an entity of its own which denotes its context by reference to other objects and instances. Tags: atp.recommendedPackage=Documentations			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
context	DocumentationContext	*	aggr	This is the context of the particular documentation.
documentation Content	PredefinedChapter	0..1	aggr	This is the content of the documentation related to the specified contexts. Tags: xml.sequenceOffset=200

Table 15.5: Documentation

Please note that [Documentation](#) is an [ARElement](#) that cannot be owned by a [SoftwareCluster](#). The latter can only refer to it.

This aspect also means that once a given [license](#) is formalized by means of a [Documentation](#) it is in general possible to refer to this formalization from within different [SoftwareClusters](#).

[TPS_MANI_01220]{DRAFT} **Release notes of software in included [SoftwareCluster](#)** [It is possible to refer to release notes for software included in a [SoftwareCluster](#) by means of a reference to meta-class [Documentation](#) in the role [releaseNotes](#).] ([RS_MANI_00035](#))

[constr_1566]{DRAFT} **Usage of [SoftwareCluster.containedARElement](#)** [The reference [SoftwareCluster.containedARElement](#) shall not be used to refer to a [SoftwareCluster](#) or a [SoftwareClusterDesign](#).] ()

15.2.2 Relevance of Software Cluster for Diagnostics

15.2.2.1 Diagnostic Props

[TPS_MANI_01349]{DRAFT} **Configuration of diagnostic-related properties of a [SoftwareCluster](#)** [The diagnostics-related properties of a [SoftwareCluster](#) are configured in the context of meta-class [SoftwareClusterDiagnosticDeploymentProps](#), referenced in the role [SoftwareCluster.diagnosticDeploymentProps](#).] ([RS_MANI_00035](#))

[constr_10069]{DRAFT} Existence of SoftwareClusterDiagnosticDeploymentProps.powerDownTime [The attribute `SoftwareClusterDiagnosticDeploymentProps.powerDownTime` shall exist **at the time when the creation of the manifest is finished** and have a value between 0 and 254 if the referenced `diagnosticExtract` that in turn references in the role `element` a `DiagnosticEcuReset` where attribute `category` is set to the value `ENABLE_RAPID_POWER_SHUT_DOWN`.] ()

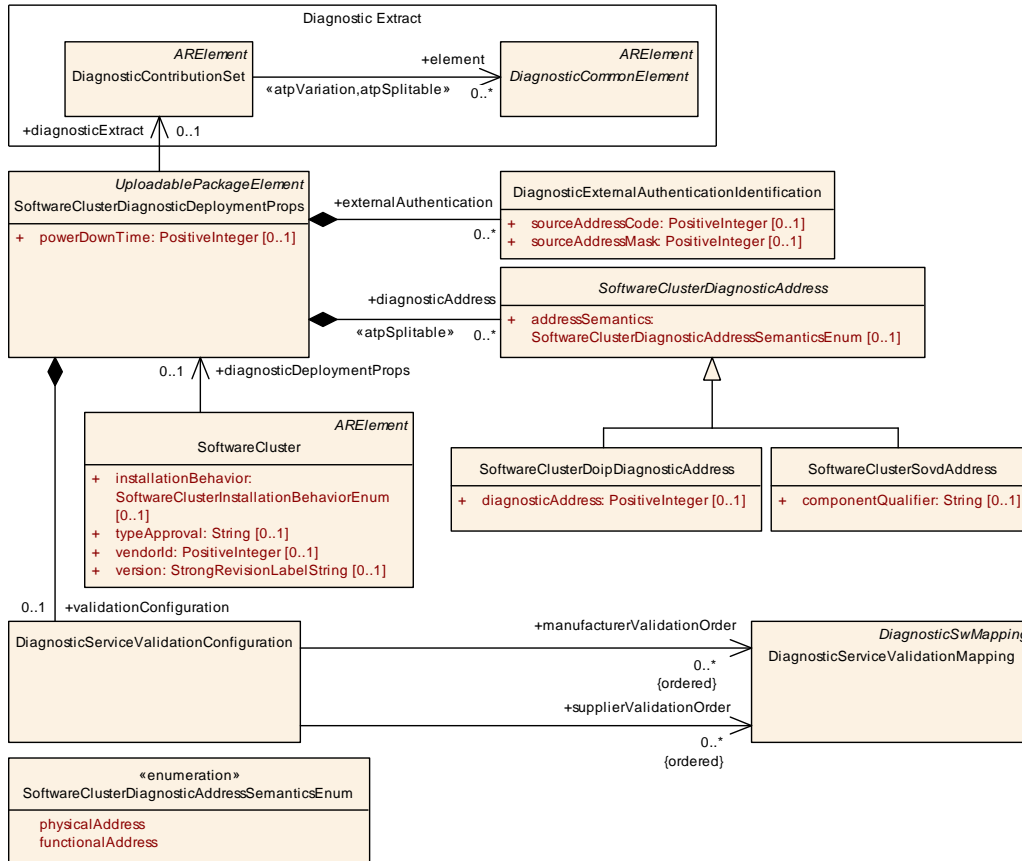


Figure 15.6: Modeling of diagnostic properties of a SoftwareCluster

Class	DiagnosticExternalAuthenticationIdentification			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to support the authentication of diagnostic clients.			
Base	ARObject			
Aggregated by	SoftwareClusterDiagnosticDeploymentProps.externalAuthentication			
Attribute	Type	Mult.	Kind	Note
sourceAddress Code	PositiveInteger	0..1	attr	This attribute represents the value to exactly match after applying the mask to the source address of a client's request.
sourceAddress Mask	PositiveInteger	0..1	attr	This attribute represents the mask to apply to the source address of a client's request.

Table 15.6: DiagnosticExternalAuthenticationIdentification

15.2.2.2 Diagnostic Address

[TPS_MANI_01111]{DRAFT} Diagnostic Address of a `SoftwareCluster` [An uploadable software package formalized as a `SoftwareCluster` will typically be equipped with a diagnostics management component.

Therefore, the definition of the `SoftwareCluster` needs to provide information about the diagnostic address(es) to which the contained diagnostic management component shall respond.

This information is formalized by means of the attribute `SoftwareCluster.diagnosticDeploymentProps.diagnosticAddress`.

A `SoftwareCluster` may be required to respond to multiple (i.e. several functional plus one physical) diagnostic addresses, thus the multiplicity of `diagnosticAddress` is set to 0..*.] (*RS_MANI_00035*)

Please note that the modeling of the `SoftwareClusterDiagnosticAddress` has been created with the primary goal to support the usage of DoIP for diagnostics.

The secondary goal has been to make the modeling of the diagnostic address extensible such that the idiomatic ways in which other transport layers (CAN, LIN, FlexRay, etc.) define diagnostic addresses can also be supported by adding respective sub-classes of `SoftwareClusterDiagnosticAddress`.

[constr_1543]{DRAFT} Only one physical address per `SoftwareCluster.diagnosticDeploymentProps` [Each `SoftwareClusterDiagnosticDeploymentProps` shall only aggregate one `SoftwareClusterDiagnosticAddress` where the value of attribute `addressSemantics` is set to `SoftwareClusterDiagnosticAddressSemanticsEnum.physicalAddress`.] ()

[TPS_MANI_01405]{DRAFT} Semantics of sub-classes of `SoftwareClusterDiagnosticAddress` [The definition of the actual diagnostic address is done by means of the applicable sub-class of the abstract base-class `SoftwareClusterDiagnosticAddress`:

- If the diagnostic session is executed on the basis of **UDS**, then the diagnostic address shall be specified by means of `SoftwareClusterDoipDiagnosticAddress.diagnosticAddress`.
- If the diagnostic session is executed on the basis of **SOVD**, then the diagnostic address shall be specified by means of `SoftwareClusterSovdAddress.componentQualifier`.

] (*RS_MANI_00005, RS_MANI_00070*)

Class	SoftwareClusterSovdAddress			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define a diagnostic address specifically for the SOVD case. Tags: atp.Status=candidate			
Base	<i>ARObject</i> , SoftwareClusterDiagnosticAddress			
Aggregated by	SoftwareClusterDiagnosticDeploymentProps.diagnosticAddress			
Attribute	Type	Mult.	Kind	Note
component Qualifier	String	0..1	attr	This attribute is used to specify the component qualifier for the usage in an SOVD query. Tags: atp.Status=candidate

Table 15.7: SoftwareClusterSovdAddress

[constr_10404]{DRAFT} Existence of [SoftwareClusterSovdAddress.componentQualifier](#) [For each [SoftwareClusterSovdAddress](#), attribute [componentQualifier](#) shall exist **at the time when the creation of the manifest is finished.**]

Class	SoftwareClusterDiagnosticAddress (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define a diagnostic address in an abstract form. Sub-classes are supposed to clarify how the diagnostic address shall be defined according to the applicable addressing scheme (DoIP vs. CAN TP vs. ...).			
Base	<i>ARObject</i>			
Subclasses	SoftwareClusterDoipDiagnosticAddress , SoftwareClusterSovdAddress			
Aggregated by	SoftwareClusterDiagnosticDeploymentProps.diagnosticAddress			
Attribute	Type	Mult.	Kind	Note
address Semantics	SoftwareClusterDiagnosticAddressSemanticsEnum	0..1	attr	This attribute clarifies whether the address value shall be interpreted as a physical or a functional address.

Table 15.8: SoftwareClusterDiagnosticAddress

[constr_10236]{DRAFT} Multiplicity of attribute [SoftwareClusterDiagnosticAddress.addressSemantics](#) [For each [SoftwareClusterDiagnosticAddress](#), the attribute [addressSemantics](#) shall exist **at the time when the creation of the manifest is finished.**]

Enumeration	SoftwareClusterDiagnosticAddressSemanticsEnum			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class defines a list of semantics for the interpretation of diagnostic addresses in the context of a SoftwareCluster.			
Aggregated by	SoftwareClusterDiagnosticAddress.addressSemantics			
Literal	Description			
functionalAddress	This address represents a functional address. Tags: atp.EnumerationLiteralIndex=1			
physicalAddress	This address represents a physical address. Tags: atp.EnumerationLiteralIndex=0			

Table 15.9: SoftwareClusterDiagnosticAddressSemanticsEnum

Class	SoftwareClusterDoipDiagnosticAddress			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define a diagnostic address specifically for the DoIP case.			
Base	<i>ARObject</i> , SoftwareClusterDiagnosticAddress			
Aggregated by	SoftwareClusterDiagnosticDeploymentProps.diagnosticAddress			
Attribute	Type	Mult.	Kind	Note
diagnostic Address	PositiveInteger	0..1	attr	This attribute represents the collection of diagnostic addresses the SoftwareCluster occupies.

Table 15.10: SoftwareClusterDoipDiagnosticAddress

15.2.2.3 Relation to the Diagnostic Contribution Set

[TPS_MANI_01114]{DRAFT} Relation of [DiagnosticContributionSet](#) to [SoftwareCluster](#) [In AUTOSAR, the formalization of the external behavior of the diagnostic stack is rooted in meta-class [DiagnosticContributionSet](#).

On the *AUTOSAR classic platform* the scope of the “external behavior of the diagnostic stack” is represented by an entire ECU.

This relation changes on the *AUTOSAR adaptive platform* where each uploadable software package is shipped with the definition of the “external behavior of the diagnostic stack” **as far as the software in the scope of respective uploadable software package is concerned.**

To fully support the different approaches of *AUTOSAR classic platform* and *AUTOSAR adaptive platform* it is necessary to provide means for specifying a [DiagnosticContributionSet](#) for a given [SoftwareCluster](#).

In particular, this relation is created by means of the reference [SoftwareCluster.diagnosticDeploymentProps.diagnosticExtract.](#) ([RS_MANI_00035](#))

Please note that the placement of the reference to the [DiagnosticContributionSet](#) at the [SoftwareClusterDiagnosticDeploymentProps](#) follows the pattern on the *AUTOSAR adaptive platform* that deployment-related elements shall reference their corresponding design-level elements.

In addition, it is much easier to keep the definition of diagnostic deployment and diagnostic design in sync if the former has a direct reference to the latter.

Please note further that this approach works for all levels of granularity in the definition of diagnostics on the *AUTOSAR adaptive Platform*:

- One [SoftwareCluster](#) represents a separately diagnosable entity with its own diagnostic address.
- All [SoftwareClusters](#) deployed to one Machine share the same [SoftwareClusterDiagnosticDeploymentProps](#) and therefore also the same [DiagnosticContributionSet](#).

Class	SoftwareClusterDiagnosticDeploymentProps			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class acts as the owner of all deployment-related diagnostic properties of a SoftwareCluster. Tags: atp.recommendedPackage=SoftwareClusterDiagnosticProps			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
diagnostic Address	SoftwareClusterDiagnosticAddress	*	aggr	This aggregation represents the collection of diagnostic addresses that apply for the SoftwareCluster. Stereotypes: atpSplittable Tags: atp.Splitkey=diagnosticAddress
diagnostic Extract	DiagnosticContributionSet	0..1	ref	This reference identifies the applicable SoftwareCluster DiagnosticProps for the enclosing SoftwareCluster. Note that all SoftwareClusters that share the same DiagnosticContributionSet via the reference diagnosticExtract shall also share the same SoftwareClusterDiagnosticDeploymentProps.
external Authentication	DiagnosticExternalAuthenticationIdentification	*	aggr	This reference supports the configuration of the authentication of diagnostic clients.
powerDown Time	PositiveInteger	0..1	attr	This attribute indicates the minimum time of the stand-by sequence the server will remain in the power-down sequence. The unit is seconds.
validation Configuration	DiagnosticServiceValidationConfiguration	0..1	aggr	This aggregation represents the ability to define the order of manufacturer and supplier validations in diagnostic management.

Table 15.11: SoftwareClusterDiagnosticDeploymentProps

15.2.2.4 Diagnostic Service Validation

The configuration of the diagnostic management is mostly done on design level by means of the diagnostic extract (see sections 3.11 and 4).

Some aspects, like the validation of service request by manufacturer-specific or supplier-specific checks, can only be decided on deployment level and in the context of the enclosing [SoftwareCluster](#), see Figure 15.6.

[TPS_MANI_01350]{DRAFT} Semantics of [DiagnosticServiceValidationConfiguration](#) [For the specific purpose of the validation prior to the execution of diagnostic services, meta-class [DiagnosticServiceValidationConfiguration](#) is defined.

The main purpose of [DiagnosticServiceValidationConfiguration](#) is to define the order in which manufacturer-specific (by means of the reference in the role [manufacturerValidationOrder](#)) and (separately, via the reference in the role [supplierValidationOrder](#)) supplier-specific checks are executed.] ([RS_MANI_00005](#))

Class	DiagnosticServiceValidationConfiguration			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class has the ability to configure the order of manufacturer/supplier-checks. Tags: atp.recommendedPackage=DiagnosticValueConfigurations			
Base	ARObject			
Aggregated by	SoftwareClusterDiagnosticDeploymentProps.validationConfiguration			
Attribute	Type	Mult.	Kind	Note
manufacturer ValidationOrder (ordered)	DiagnosticServiceValidationMapping	*	ref	This reference defines the order in which validations created by manufacturer are executed.
supplier ValidationOrder (ordered)	DiagnosticServiceValidationMapping	*	ref	This reference defines the order in which validations created by supplier are executed.

Table 15.12: DiagnosticServiceValidationConfiguration

[constr_10065]{DRAFT} Validity of [DiagnosticServiceValidationConfiguration.manufacturerValidationOrder](#) [Any [DiagnosticServiceValidationConfiguration.manufacturerValidationOrder](#) shall only refer to a [DiagnosticServiceValidationMapping](#) where attribute `category` has been set to `MANUFACTURER_VALIDATION`.]()

[constr_10066]{DRAFT} Validity of [DiagnosticServiceValidationConfiguration.supplierValidationOrder](#) [Any [DiagnosticServiceValidationConfiguration.supplierValidationOrder](#) shall only refer to a [DiagnosticServiceValidationMapping](#) where attribute `category` has been set to `SUPPLIER_VALIDATION`.]()

15.2.3 Software Cluster Dependency

[TPS_MANI_01215]{DRAFT} Semantics of meta-class [SoftwareClusterDependencyFormula](#) [Meta-class [SoftwareClusterDependencyFormula](#) allows for the definition of a formal condition that can be taken to decide about the dependency to or the conflict with a [SoftwareCluster](#).

The modeling of [SoftwareClusterDependencyFormula](#) allows for the definition of nested conditions. The attribute `operator` is applied on the results of the evaluation of the `parts`.]([RS_MANI_00035](#))

Class	SoftwareClusterDependencyFormula			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define a dependency among SoftwareClusters.			
Base	ARObject, SoftwareClusterDependencyFormulaPart			
Aggregated by	SoftwareCluster.conflictsTo , SoftwareCluster.dependsOn , SoftwareClusterDependencyFormula.part			
Attribute	Type	Mult.	Kind	Note
category	CategoryString	0..1	attr	This attribute specializes the semantics of the enclosing SoftwareClusterDependencyFormula .





Class	SoftwareClusterDependencyFormula			
operator	SoftwareClusterDependencyLogicalOperatorEnum	0..1	attr	This logical operator can be used to relate the results of different SoftwareClusterDependencyParts.
part (ordered)	SoftwareClusterDependencyFormulaPart	*	aggr	This aggregation represents the ordered collection of the parts of the SoftwareClusterDependencyFormula.

Table 15.13: SoftwareClusterDependencyFormula

Enumeration	SoftwareClusterDependencyLogicalOperatorEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution
Note	This enumeration provides a set of operators to be used in a SoftwareClusterDependencyFormula.
Aggregated by	SoftwareClusterDependencyFormula.operator
Literal	Description
logicalAnd	logical and Tags: atp.EnumerationLiteralIndex=0
logicalOr	logical or Tags: atp.EnumerationLiteralIndex=1

Table 15.14: SoftwareClusterDependencyLogicalOperatorEnum

[TPS_MANI_01216]{DRAFT} **Semantics of meta-class [SoftwareClusterDependencyFormulaPart](#)** [Meta-class [SoftwareClusterDependencyFormulaPart](#) represents a part of a [SoftwareClusterDependencyFormula](#). The order of the parts of a [SoftwareClusterDependencyFormula](#) is significant.] ([RS_MANI_00035](#))

Class	SoftwareClusterDependencyFormulaPart (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents an abstract base class for the definition of different formula parts of a SoftwareClusterDependencyFormula.			
Base	ARObject			
Subclasses	SoftwareClusterDependencyCompareCondition , SoftwareClusterDependencyFormula			
Aggregated by	SoftwareClusterDependencyFormula.part			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 15.15: SoftwareClusterDependencyFormulaPart

At the same time, [SoftwareClusterDependencyFormulaPart](#) is the base class of [SoftwareClusterDependencyFormula](#).

This means that the [SoftwareClusterDependencyFormula](#) can aggregate all sub-classes of [SoftwareClusterDependencyFormulaPart](#), i.e. [SoftwareClusterDependencyFormula](#) and [SoftwareClusterDependencyCompareCondition](#).

[TPS_MANI_01164]{DRAFT} **Semantics of [SoftwareCluster.dependsOn](#)** [A [SoftwareCluster](#) has the ability to express a dependency to other [SoftwareClusters](#) in the role [dependsOn](#).

Attribute `SoftwareCluster.dependsOn` allows for the definition of a **formal** (potentially nested) dependency condition. The dependency shall be applicable only if the condition defined by `dependsOn` yields `True`.|(RS_MANI_00035)

[TPS_MANI_01217]{DRAFT} **Semantics of meta-class `SoftwareClusterDependencyCompareCondition`** [Meta-class `SoftwareClusterDependencyCompareCondition` allows for the definition of a formal condition to compare against the version of the referenced `softwareCluster` using a given `compareType`.

The ability to specifically decide about whether to consider the build number in the comparison is implemented by means of attribute `considerBuildNumber`.|(RS_MANI_00035)

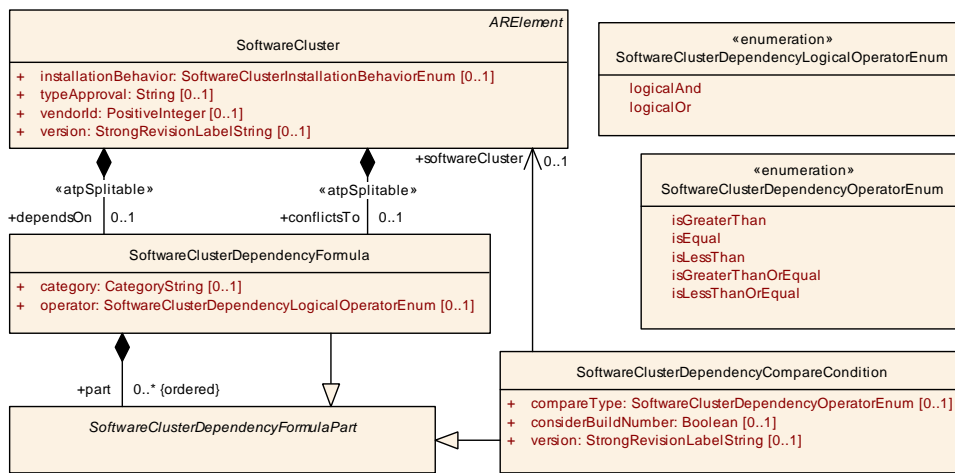


Figure 15.7: Modeling of dependencies in the context of a `SoftwareCluster` and `SoftwareClusterDesign`

Class	SoftwareClusterDependencyCompareCondition				
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution				
Note	This meta-class represents the ability to specify a concrete dependency condition in the context of a SoftwareClusterDependencyFormula.				
Base	ARObject, SoftwareClusterDependencyFormulaPart				
Aggregated by	SoftwareClusterDependencyFormula.part				
Attribute	Type	Mult.	Kind	Note	
compareType	SoftwareClusterDependencyOperatorEnum	0..1	attr	This attribute identifies the semantics of the compare operator.	
considerBuildNumber	Boolean	0..1	attr	If this attribute is set to true then the build number shall be taken into account for the comparison. Build numbers don't have to be consecutive but could be created by some kind of hashing algorithm. In such a case it might make sense to include the build number in a test for equality but it is probably not reasonable to apply e.g. a less-than comparison.	
softwareCluster	SoftwareCluster	0..1	ref	This reference identifies the SoftwareCluster to which the dependency/conflict applies.	
version	StrongRevisionLabelString	0..1	attr	This attribute represents the value of a version against which the comparison shall be executed.	

Table 15.16: SoftwareClusterDependencyCompareCondition

[constr_10237]{DRAFT} **Multiplicity of attribute `SoftwareClusterDependencyCompareCondition.compareType`** [For each `SoftwareClusterDependencyCompareCondition`, the attribute `compareType` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10253]{DRAFT} **Multiplicity of attribute `SoftwareClusterDependencyCompareCondition.considerBuildNumber`** [For each `SoftwareClusterDependencyCompareCondition`, the attribute `considerBuildNumber` shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10254]{DRAFT} **Multiplicity of attribute `SoftwareClusterDependencyCompareCondition.version`** [For each `SoftwareClusterDependencyCompareCondition`, the attribute `version` shall exist **at the time when the creation of the manifest is finished.**]()

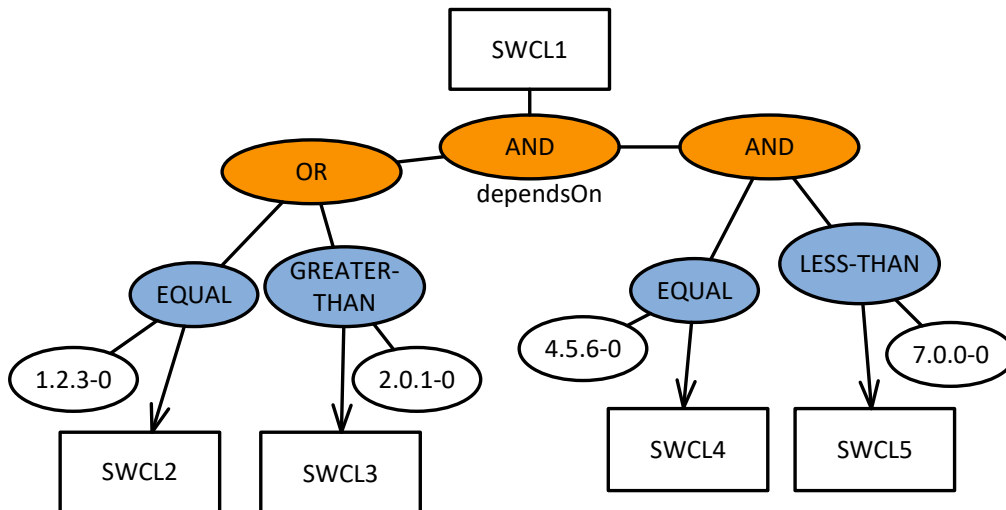


Figure 15.8: Example how dependencies among `SoftwareClusters` can be defined.

Enumeration	<code>SoftwareClusterDependencyOperatorEnum</code>
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution
Note	This enumeration provides a choice of operators for comparison within a <code>SoftwareClusterDependencyCompareCondition</code> .
Aggregated by	<code>SoftwareClusterDependencyCompareCondition.compareType</code>
Literal	Description
isEqual	equal Tags: atp.EnumerationLiteralIndex=1
isGreaterThan	greater than Tags: atp.EnumerationLiteralIndex=0
isGreaterThanOrEqual	greater than or equal Tags: atp.EnumerationLiteralIndex=3





Enumeration	SoftwareClusterDependencyOperatorEnum
isLessThan	less than Tags:atp.EnumerationLiteralIndex=2
isLessThanOrEqual	less than or equal Tags:atp.EnumerationLiteralIndex=4

Table 15.17: SoftwareClusterDependencyOperatorEnum

This relation is exemplified by the following sketch (where the orange ellipsis represent `SoftwareClusterDependencyFormula` and the blue ellipsis represent `SoftwareClusterDependencyCompareCondition`) and a corresponding ARXML formalization:

```

<SOFTWARE-CLUSTER>
  <SHORT-NAME>SWCL1</SHORT-NAME>
  <DEPENDS-ON>
    <OPERATOR>LOGICAL-AND</OPERATOR>
    <PARTS>
      <SOFTWARE-CLUSTER-DEPENDENCY-FORMULA>
        <PARTS>
          <SOFTWARE-CLUSTER-DEPENDENCY-COMPARE-CONDITION>
            <COMPARE-TYPE>IS-EQUAL</COMPARE-TYPE>
            <SOFTWARE-CLUSTER-REF DEST="SOFTWARE-CLUSTER"/>/SoftwareClusters
              /SWCL2</SOFTWARE-CLUSTER-REF>
            <VERSION>1.2.3-0</VERSION>
          </SOFTWARE-CLUSTER-DEPENDENCY-COMPARE-CONDITION>
          <SOFTWARE-CLUSTER-DEPENDENCY-COMPARE-CONDITION>
            <COMPARE-TYPE>IS-GREATER-THAN</COMPARE-TYPE>
            <SOFTWARE-CLUSTER-REF DEST="SOFTWARE-CLUSTER"/>/SoftwareClusters
              /SWCL3</SOFTWARE-CLUSTER-REF>
            <VERSION>2.0.1-0</VERSION>
          </SOFTWARE-CLUSTER-DEPENDENCY-COMPARE-CONDITION>
        </PARTS>
      </SOFTWARE-CLUSTER-DEPENDENCY-FORMULA>
      <SOFTWARE-CLUSTER-DEPENDENCY-FORMULA>
        <OPERATOR>LOGICAL-AND</OPERATOR>
        <PARTS>
          <SOFTWARE-CLUSTER-DEPENDENCY-COMPARE-CONDITION>
            <COMPARE-TYPE>IS-EQUAL</COMPARE-TYPE>
            <SOFTWARE-CLUSTER-REF DEST="SOFTWARE-CLUSTER"/>/SoftwareClusters
              /SWCL4</SOFTWARE-CLUSTER-REF>
            <VERSION>4.5.6-0</VERSION>
          </SOFTWARE-CLUSTER-DEPENDENCY-COMPARE-CONDITION>
          <SOFTWARE-CLUSTER-DEPENDENCY-COMPARE-CONDITION>
            <COMPARE-TYPE>IS-LESS-THAN</COMPARE-TYPE>
            <SOFTWARE-CLUSTER-REF DEST="SOFTWARE-CLUSTER"/>/SoftwareClusters
              /SWCL5</SOFTWARE-CLUSTER-REF>
            <VERSION>7.0.0-0</VERSION>
          </SOFTWARE-CLUSTER-DEPENDENCY-COMPARE-CONDITION>
        </PARTS>
      </SOFTWARE-CLUSTER-DEPENDENCY-FORMULA>
    </PARTS>
  </DEPENDS-ON>

```

</SOFTWARE-CLUSTER>

Listing 15.1: Example for the definition of a dependency between `SoftwareClusters`

[TPS_MANI_01214]{DRAFT} **Semantics of `SoftwareCluster.conflictsTo`** [A `SoftwareCluster` has the ability to express a conflict to other `SoftwareClusters` in the role `conflictsTo`. The semantics is to express that the functionality of the referenced `SoftwareCluster` **inhibits** the installation of the referencing `SoftwareCluster`.

Attribute `SoftwareCluster.conflictsTo` allows for the definition of a **formal** (potentially nested) dependency condition. The dependency shall be applicable only if the condition defined by `conflictsTo` yields `False`.] (*RS_MANI_00035*)

15.2.4 References between Software Clusters

There are several strong use cases for the need of referencing into different `SoftwareClusters`, for example:

- Reference to a `ProvidedApServiceInstance` of `RequiredApServiceInstance` defined in the context of a "host" `SoftwareCluster`.
- Reference to `CommunicationConnectors` defined on `Machine` level from within application `SoftwareClusters`.
- Reference from a `Process` in one `SoftwareCluster` to an `Executable` in another `SoftwareCluster` with the semantics that the referencing `Process` is just another instance of the `Executable`.

To support such use cases, AUTOSAR provides the definition of dependencies among `SoftwareClusters` such that a `SoftwareCluster` that contains a reference can define a dependency to another `SoftwareCluster` that contains the referenced object.

[TPS_MANI_01329]{DRAFT} **Reference to model elements in different `SoftwareClusters`** [If a model element inside a given `SoftwareCluster` defines a reference to another model element and the referenced model element is contained in a different `SoftwareCluster`, then the `SoftwareCluster` that contains the referencing model element shall establish a dependency to the other `SoftwareCluster` by means of an aggregation of `SoftwareClusterDependencyFormula` in the role `dependsOn`.] (*RS_MANI_00035*)

[constr_1784]{DRAFT} **Restriction for the reference to `UploadableExclusivePackageElement`** [A reference to an `UploadableExclusivePackageElement` shall not cross the boundary of the enclosing `SoftwareCluster`, i.e. the target `UploadableExclusivePackageElement` of such a reference shall not be located in a different `SoftwareCluster` than the owner of the reference.] ()

Class	<i>UploadableExclusivePackageElement</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General			
Note	This meta-class represents an abstract base class for an uploadable package element that is not supposed to be referenced from a different software cluster.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Subclasses	PersistencyDeployment , PersistencyPortPrototypeToDeploymentMapping			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table 15.18: UploadableExclusivePackageElement

Note that [\[constr_1784\]](#) forbids a reference across [SoftwareClusters](#) to an [UploadableExclusivePackageElement](#), regardless of whether there is a dependency relation defined or not.

Referencing from one [SoftwareCluster](#) into another [SoftwareCluster](#) is only allowed if the referenced [SoftwareCluster](#) is in the list of dependent [SoftwareClusters](#) for the referencing [SoftwareCluster](#).

This restriction is formalized in [\[constr_1785\]](#).

[constr_1785]{DRAFT} Restriction regarding the reference into another [SoftwareCluster](#) [A reference from an element in one [SoftwareCluster](#) to an element located in another [SoftwareCluster](#) shall only exist if the [SoftwareCluster](#) that owns the referenced element is referenced by a [SoftwareClusterDependencyCompareCondition](#) in the context of the mentioned [SoftwareClusterDependencyFormula](#) in the role `part.softwareCluster`. [\[constr_1784\]](#) applies.]()

15.2.5 Software Cluster Artifact Checksum

[TPS_MANI_01345]{DRAFT} Ability to attach checksums to [SoftwareCluster](#) [Meta-class [SoftwareCluster](#) supports the collection of checksums for artifacts like binary executable files, libraries, or persistency files by means of the aggregation of meta-class [ArtifactChecksum](#) in the role `artifactChecksum`.] ([RS_MANI_00035](#))

Class	ArtifactChecksum			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class provides the ability to associate a checksum with a given artifact identified by its URI.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	SoftwareCluster.artifactChecksum			
Attribute	Type	Mult.	Kind	Note
checksumValue	String	0..1	attr	This attributes carries the serialized checksum of the corresponding artifact.





Class	ArtifactChecksum			
uri	UriString	0..1	attr	This attribute represents the URI of the artifact on which the checksum shall be computed. Stereotypes: atpIdentityContributor

Table 15.19: ArtifactChecksum

[TPS_MANI_01346]{DRAFT} **No formal definition of checksum algorithm** [The checksum algorithm used for computing the `ArtifactChecksum.checksumValue` is not formally defined.

A description of the algorithm shall be contained in the `CryptoProvider.cryptoProviderDocumentation` of the `CryptoProvider` that is associated with a specific `ArtifactChecksum` via the existence of `ArtifactChecksumToCryptoProviderMapping`. (*RS_MANI_00035*)

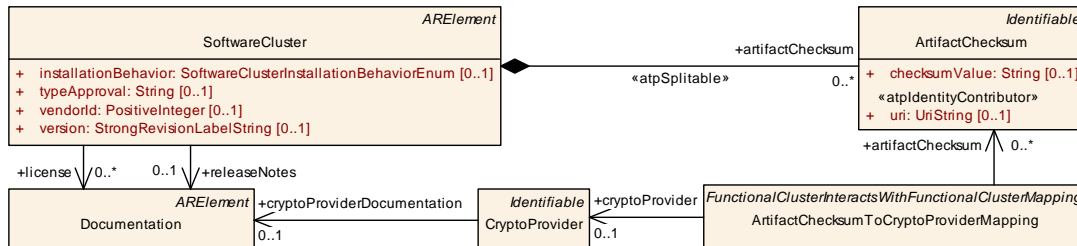


Figure 15.9: Modeling of the artifact checksum of a `SoftwareCluster`

Class	ArtifactChecksumToCryptoProviderMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class provides the ability to associate a <code>CryptoProvider</code> with a collection of the checksums computed for artifacts. Tags: atp.recommendedPackage=FCInteractions			
Base	ARElement , ARObject , CollectableElement , FunctionalClusterInteractsWithFunctionalClusterMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , UploadablePackageElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
artifactChecksum	ArtifactChecksum	*	ref	This reference identifies the collection of Artifact Checksums associated with the corresponding Crypto Provider.
cryptoProvider	CryptoProvider	0..1	ref	This reference identifies the applicable CryptoProvider.

Table 15.20: ArtifactChecksumToCryptoProviderMapping

15.2.6 Software Cluster Artifact Locator

[TPS_MANI_01381]{DRAFT} **Semantics of meta-class `ArtifactLocator`** [Meta-class `ArtifactLocator` represents a generic approach to configure a location of a referable model element in the role `representedModelElement` by means of attribute `uri`.]()

The modeling of meta-class `ArtifactLocator` as a generic concept is depicted in Figure 15.10.

The association between an artifact and its location is a 1:1 relation. It is not allowed to associate a second (or more) location to a model element that is already the target of a reference in the role `ArtifactLocator.representedModelElement`.

[constr_10380]{DRAFT} Target of `ArtifactLocator.representedModelElement` [The target of a reference in the role `ArtifactLocator.representedModelElement` shall not be the target of another reference in the role `ArtifactLocator.representedModelElement`.

This rule shall be imposed **at the time when the creation of the manifest is finished.**]()

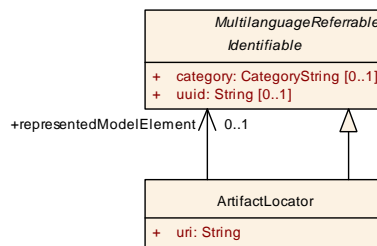


Figure 15.10: Modeling of the artifact location of a model element that belongs to a `SoftwareCluster`

Class	ArtifactLocator			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General			
Note	This meta-class has the ability to define the location of an artifact that is represented by a model element, e.g. Executable.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	<code>SoftwareCluster.artifactLocator</code>			
Attribute	Type	Mult.	Kind	Note
representedModelElement	Identifiable	0..1	ref	This reference identifies the model element that is represented by the artifact.
uri	String	1	attr	This attribute describes the location of the artifact.

Table 15.21: ArtifactLocator

[constr_10381]{DRAFT} Existence of attribute `ArtifactLocator.uri` [For each `ArtifactLocator`, the attribute `uri` shall exist **at the time when the creation of the manifest is finished**]()

[constr_10382]{DRAFT} Existence of attribute `ArtifactLocator.representedModelElement` [For each `ArtifactLocator`, the attribute `representedModelElement` shall exist **at the time when the creation of the manifest is finished**]()

Meta-class `ArtifactLocator` is used in the context of the modeling of a `SoftwareCluster` to facilitate the configuration of model elements that belong to the

`SoftwareCluster` and for which a representation in the software exists that can have a “location” (e.g. a file that contains executable code).

Therefore, one example for the application of `ArtifactLocator` in the context of the modeling of a `SoftwareCluster` is the configuration of the location of binary executable code that corresponds to an `Executable`, which is claimed by a `SoftwareCluster` via the indirection of `SoftwareCluster.containedProcess` that in turn references the `Executable` in the role `executable`.

It is obviously assumed that the entire code represented by an `Executable` is locatable in one place described by the attribute `uri`.

This relation is depicted in Figure 15.11. The ability to refer to an `Executable` in the role `representedModelElement` is inherited to `Executable` by its superclass `Identifiable`.

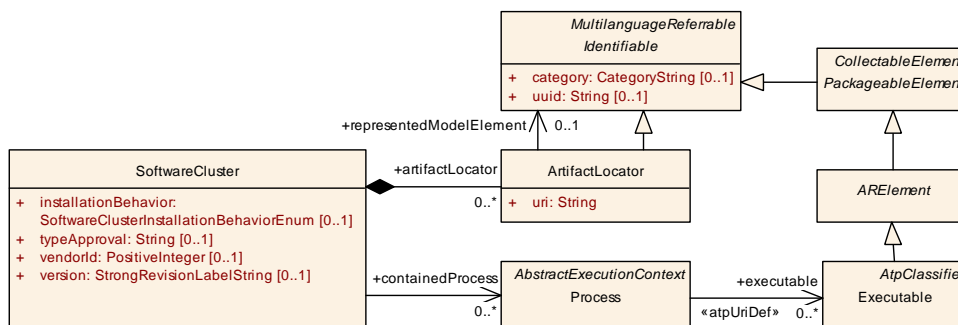


Figure 15.11: Modeling of the location of an `Executable` that (via a `containedProcess`) belongs to a `SoftwareCluster`

[TPS_MANI_01382]{DRAFT} **Location of artifact that contains executable code represented by `Executable`** [The location of the executable code that is represented by `Executable` can be identified by means of the aggregation `SoftwareCluster.artifactLocator` where attribute `ArtifactLocator.representedModelElement.dest` is set to the value `EXECUTABLE`.]()

15.3 Software Package

The existence of the `SoftwareCluster` by itself is not sufficient for installation. Actually, the `SoftwareCluster` gets wrapped into a so-called `SoftwarePackage` that comes with an own manifest format that is at least partly standardized.

The difference between the semantics of a `SoftwareCluster` and the semantics of `SoftwarePackage` is that a `SoftwareCluster` focuses on the structure of the software itself while the `SoftwarePackage` is created to handle the logistics aspect of the software installation.

[TPS_MANI_01221]{DRAFT} **Semantics of meta-class SoftwarePackage** [The purpose of meta-class `SoftwarePackage` is to cover the "logistics" aspect of the software installation procedure.] (*RS_MANI_00035*)

[constr_1690]{DRAFT} **SoftwareCluster shall only be referenced by a single SoftwarePackage.** [Each `SoftwareCluster` shall only be referenced by a single `SoftwarePackage`.] ()

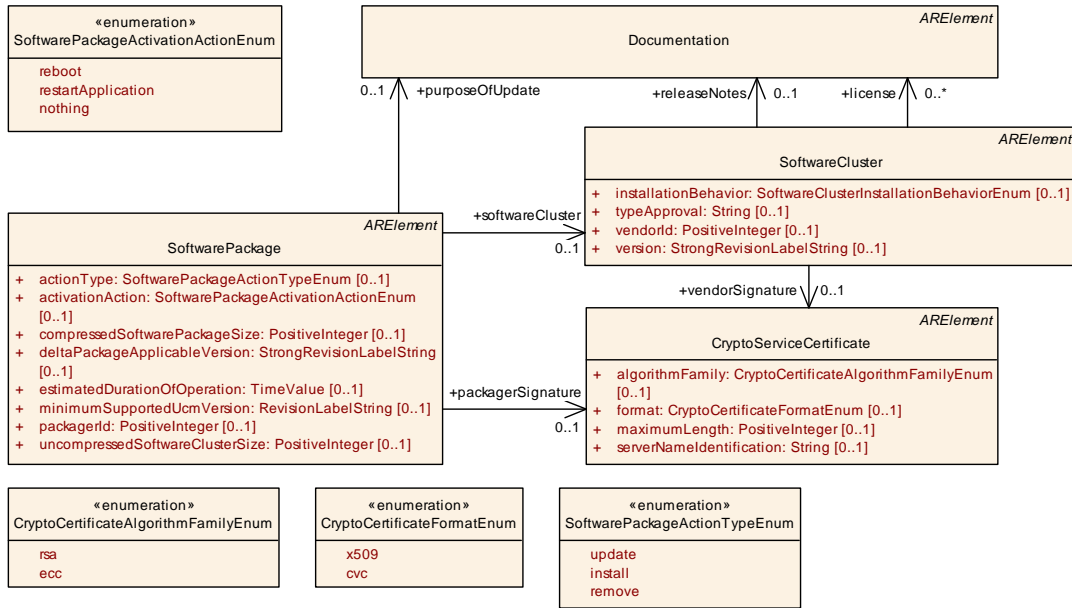


Figure 15.12: Modeling of `SoftwarePackage`

Class	SoftwarePackage			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to formalize the content of a software package. Tags: atp.recommendedPackage=SoftwarePackages			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
actionType	SoftwarePackageActionTypeEnum	0..1	attr	This attribute defines the action to be taken in the step of processing the enclosing SoftwarePackage.
activationAction	SoftwarePackageActivationActionEnum	0..1	attr	This attribute governs the action to be taken after the installation of the SoftwareCluster completed.
compressedSoftwarePackageSize	PositiveInteger	0..1	attr	This size represents the size of the compressed Software Package.
deltaPackageApplicableVersion	StrongRevisionLabelString	0..1	attr	This attribute identifies the version of the included SoftwareCluster for which the enclosing SoftwarePackage can be used as a delta update
estimatedDurationOfOperation	TimeValue	0..1	attr	This attribute provides an estimation about how long the operation of the SoftwarePackage is going to take.





Class	SoftwarePackage			
minimumSupportedUcmVersion	RevisionLabelString	0..1	attr	This attribute identifies the minimum supported version of the UCM for this SoftwarePackage.
packagerId	PositiveInteger	0..1	attr	This attribute identifies Id of the organization that provides the packager generating the SoftwarePackage.
packagerSignature	CryptoServiceCertificate	0..1	ref	This reference identifies the certificate that represents the packager's signature.
purposeOfUpdate	Documentation	0..1	ref	The referenced Documentation is supposed to provide a description of the purpose of the update.
softwareCluster	SoftwareCluster	0..1	ref	This reference identifies the SoftwareCluster that belongs to the SoftwarePackage. The nature of this relation is actually more like an aggregation than a reference. But the relation is still modelled as a reference because two ARElements cannot aggregate each other.
uncompressedSoftwareClusterSize	PositiveInteger	0..1	attr	This attribute gives an indication about the storage that has to be available on the target.

Table 15.22: SoftwarePackage

[constr_10240]{DRAFT} Multiplicity of attribute [SoftwarePackage.actionType](#)
 [For each [SoftwarePackage](#), the attribute [actionType](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10241]{DRAFT} Multiplicity of attribute [SoftwarePackage.compressedSoftwarePackageSize](#)
 [For each [SoftwarePackage](#), the attribute [compressedSoftwarePackageSize](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10242]{DRAFT} Multiplicity of attribute [SoftwarePackage.minimumSupportedUcmVersion](#)
 [For each [SoftwarePackage](#), the attribute [minimumSupportedUcmVersion](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10243]{DRAFT} Multiplicity of attribute [SoftwarePackage.packagerId](#)
 [For each [SoftwarePackage](#), the attribute [packagerId](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10244]{DRAFT} Multiplicity of reference in the role [SoftwarePackage.packagerSignature](#)
 [For each [SoftwarePackage](#), the reference in the role [packagerSignature](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10245]{DRAFT} Multiplicity of reference in the role [SoftwarePackage.softwareCluster](#)
 [For each [SoftwarePackage](#), the reference in the role [softwareCluster](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10246]{DRAFT} Multiplicity of attribute `SoftwarePackage.uncompressedSoftwareClusterSize` [For each `SoftwarePackage`, the attribute `uncompressedSoftwareClusterSize` shall exist **at the time when the creation of the manifest is finished.**]([\(\)](#))

Primitive	RevisionLabelString
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::PrimitiveTypes
Note	<p>This primitive represents an internal AUTOSAR revision label which identifies an engineering object. It represents a pattern which</p> <ul style="list-style-type: none"> • supports three integers representing from left to right MajorVersion, MinorVersion, PatchVersion. • may add an application specific suffix separated by one of ".", "_", ";". <p>Legal patterns are for example:</p> <ul style="list-style-type: none"> • 4.0.0 • 4.0.0.1234565 • 4.0.0_vendor specific;13 • 4.0.0;12 <p>Tags: xml.xsd.customType=REVISION-LABEL-STRING xml.xsd.pattern=[0-9]+\.[0-9]+\.[0-9]+([\._;]*)? xml.xsd.type=string</p>

Table 15.23: RevisionLabelString

In other words, AUTOSAR factually assumes a 1:1 relation between `SoftwarePackage` and `SoftwareCluster`. Such a relation would otherwise typically be modeled by means of an aggregation with the multiplicity 1.

However, a `SoftwareCluster` is derived from base class `PackageableElement` which is only aggregated by `ARPackage`. Subclasses of `PackageableElement` – by convention – shall not be aggregated by any other meta-class.

[TPS_MANI_01222]{DRAFT} Cryptographic signature of `SoftwarePackage` [A `SoftwarePackage` also needs to be signed cryptographically. For this purpose, meta-class `CryptoServiceCertificate` is referenced in the role `packagerSignature`.]([RS_MANI_00035](#))

[TPS_MANI_01223]{DRAFT} Semantics of attribute `SoftwarePackage.packagerId` [Attribute `SoftwarePackage.packagerId` contains the value of the AUTOSAR vendor Id of the organization that created software tool that created the `SoftwarePackage`.]([RS_MANI_00035](#))

For clarification, a UCM can only accept packages that are generated by a packaging tool developed by the same organization that also developed the UCM itself. The vendor of the `SoftwareCluster` contained in the `SoftwarePackage` can obviously be different.

[TPS_MANI_01225]{DRAFT} Actions taken during installation of a `SoftwarePackage` [It is necessary to define the concrete activity that shall be taken to handle the `SoftwarePackage` on the target machine. Possible actions are:

- Do a clean installation of a `SoftwareCluster`.

- Update a previously installed `SoftwareCluster`.
- Remove a `SoftwareCluster`

These options are formalized by means of meta-class `SoftwarePackageActionTypeEnum` and attribute `SoftwarePackage.actionType`.] ([RS_MANI_00035](#))

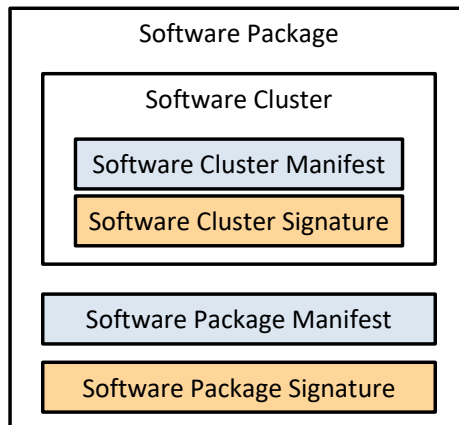


Figure 15.13: Conceptual relation of `SoftwarePackage` and `SoftwareCluster`

Enumeration	<code>SoftwarePackageActionTypeEnum</code>
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution
Note	This enumeration provides a choice of possible actions for the handling of a software package.
Aggregated by	<code>SoftwarePackage.actionType</code>
Literal	Description
install	Do a clean installation of a <code>SoftwareCluster</code> . Tags: atp.EnumerationLiteralIndex=1
remove	Remove a <code>SoftwareCluster</code> . Tags: atp.EnumerationLiteralIndex=2
update	Update a previously installed <code>SoftwareCluster</code> . Tags: atp.EnumerationLiteralIndex=0

Table 15.24: `SoftwarePackageActionTypeEnum`

[[TPS_MANI_01344](#)]{DRAFT} **Actions taken after installation of a `SoftwarePackage`** [After a `SoftwarePackage` has been installed on the target machine it is possible to execute one of the following actions:

- Reboot the target platform.
- Restart the installed `SoftwareCluster`.
- Do nothing.

These options are formalized by means of meta-class `SoftwarePackageActivationActionEnum` and attribute `SoftwarePackage.activationAction`.] ([RS_MANI_00035](#))

<i>Enumeration</i>	SoftwarePackageActivationActionEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution
Note	This enumeration provides a choice of possible actions to be executed on installing a Software Package to a target Machine.
Aggregated by	SoftwarePackage.activationAction
Literal	Description
nothing	The installation has no immediate consequences in terms of other software on the target. Tags: atp.EnumerationLiteralIndex=2
reboot	Reboot the whole Machine. Tags: atp.EnumerationLiteralIndex=0
restartApplication	Restart the application software on the target Machine. Tags: atp.EnumerationLiteralIndex=1

Table 15.25: SoftwarePackageActivationActionEnum

15.4 Vehicle Package

15.4.1 Overview

The ability to handle [SoftwarePackages](#) is the prerequisite for an important further step: the execution of an **update campaign that applies for the whole vehicle**. The basis for the update campaign is the definition of meta-class [VehiclePackage](#).

[TPS_MANI_01290]{DRAFT} [VehiclePackage](#) names affected UCMs [Meta-class [VehiclePackage](#) has the ability to describe the set of UCMs that are affected by the update campaign by means of aggregating meta-class [UcmDescription](#) in the role `ucm`.] ([RS_MANI_00035](#))

[TPS_MANI_01291]{DRAFT} Identification of an actual UCM in the context of an update campaign [It is necessary to unambiguously identify the individual UCMs that are affected in the update campaign. For this purpose, meta-class [UcmDescription](#) defines attribute `identifier`.

By means of the reference to [UcmModuleInstantiation](#) in the role `ucmModuleInstantiation` it is in addition possible to identify the actual UCMs (represented by a [UcmModuleInstantiation](#)) that are relevant for the update campaign.

In order to be able to resolve the reference it is necessary to have access to the manifest model of the target [Machine](#).] ([RS_MANI_00035](#))

[constr_1731]{DRAFT} Value of [UcmDescription.identifier](#) in the scope of a [VehiclePackage](#) [Within the scope of any given [VehiclePackage](#), no two [UcmDescriptions](#) shall define the same value of attribute `identifier`.] ()

[TPS_MANI_01292]{DRAFT} Definition of fallback-order for UCM master [The update campaign is executed under the management of one UCM that acts as a “master UCM”.

If this UCM goes down for some reason, [VehiclePackage](#) has the ability to define an **ordered** list of other candidates for becoming the “master UCM” by means of the reference to meta-class [UcmDescription](#) in the role `ucmMasterFallback`.] ([RS_MANI_00035](#))

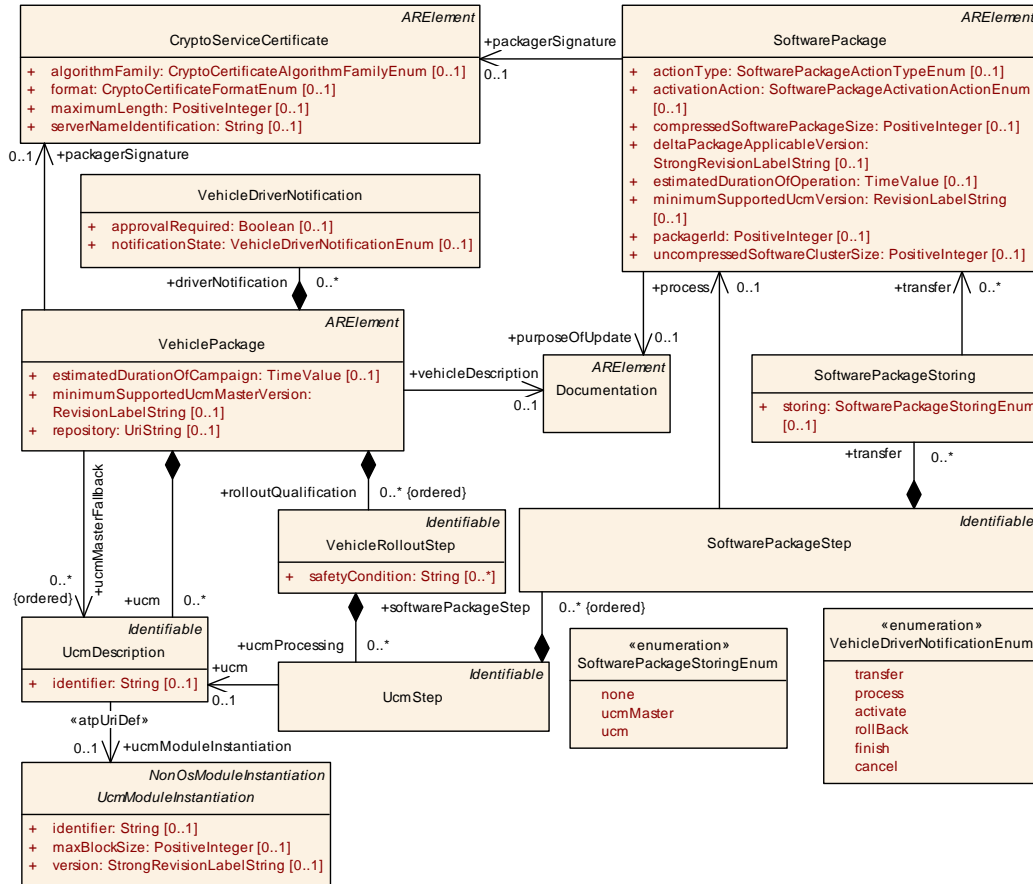


Figure 15.14: Modeling of `VehiclePackage`

Class	<code>VehiclePackage</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define a vehicle package for executing an update campaign. Tags: atp.recommendedPackage=VehiclePackages			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
driver Notification	VehicleDriverNotification	*	aggr	This aggregation provides the ability to configure the necessary driver notifications.
estimated DurationOf Campaign	TimeValue	0..1	attr	This attribute provides an estimation about how long the campaign based on the <code>VehiclePackage</code> is going to take.
minimum SupportedUcm MasterVersion	RevisionLabelString	0..1	attr	This attribute identifies the minimum supported version of the UCM Master for this <code>VehiclePackage</code> .





Class	VehiclePackage			
packager Signature	CryptoService Certificate	0..1	ref	This reference identifies the certificate that represents the packager's signature.
repository	UriString	0..1	attr	This attribute identifies the repository where the Vehicle Package is stored.
rollout Qualification (ordered)	VehicleRolloutStep	*	aggr	This represents the rollout qualification.
ucm	UcmDescription	*	aggr	This aggregation represents the UcmDescriptions to be considered in the context of the VehiclePackage.
ucmMaster Fallback (ordered)	UcmDescription	*	ref	This reference lists the fallback order of Ucms that can take over the master role if the master goes down.
vehicle Description	Documentation	0..1	ref	This reference identifies the vehicle description.

Table 15.26: VehiclePackage

[constr_10247]{DRAFT} Multiplicity of reference in the role [VehiclePackage.packagerSignature](#) [For each [VehiclePackage](#), the reference in the role [packagerSignature](#) shall exist **at the time when the creation of the manifest is finished.**]()

Class	UcmDescription			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define an identifier for a given UCM.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	VehiclePackage.ucm			
Attribute	Type	Mult.	Kind	Note
identifier	String	0..1	attr	This attribute represents the unique identification of the UcmIdentifier.
ucmModule Instantiation	UcmModuleInstantiation	0..1	ref	This reference identifies the applicable UcmModule Instantiation. Stereotypes: atpUriDef

Table 15.27: UcmDescription

[constr_10248]{DRAFT} Multiplicity of reference in the role [UcmDescription.identifier](#) [For each [UcmDescription](#), the reference in the role [identifier](#) shall exist **at the time when the creation of the manifest is finished.**]()

[TPS_MANI_01294]{DRAFT} Update campaign depends on driver's acceptance [For obvious reasons, it is not possible to arbitrarily trigger the execution of an update campaign at any time. It is the prerogative of the vehicle driver to decide about the amount and consequence of the UCM activities with respect to an update campaign.

For this purpose [VehiclePackage](#) aggregates meta-class [VehicleDriverNotification](#) in the role [driverNotification](#).] ([RS_MANI_00035](#))

Class	VehicleDriverNotification			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class provides the ability to configure a notification of the vehicle driver with respect to the update of vehicle software.			
Base	ARObject			
Aggregated by	VehiclePackage.driverNotification			
Attribute	Type	Mult.	Kind	Note
approvalRequired	Boolean	0..1	attr	This attribute controls whether approval is required for the driver notification.
notificationState	VehicleDriverNotificationEnum	0..1	attr	This attribute is used to configure the notification state.

Table 15.28: VehicleDriverNotification

[constr_10249]{DRAFT} Multiplicity of reference in the role [VehicleDriverNotification.approvalRequired](#) [For each [VehicleDriverNotification](#), the reference in the role [approvalRequired](#) shall exist **at the time when the creation of the manifest is finished.**]()

[constr_10250]{DRAFT} Multiplicity of reference in the role [VehicleDriverNotification.notificationState](#) [For each [VehicleDriverNotification](#), the reference in the role [notificationState](#) shall exist **at the time when the creation of the manifest is finished.**]()

Enumeration	VehicleDriverNotificationEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution
Note	This meta-class provides available options for vehicle driver notification.
Aggregated by	VehicleDriverNotification.notificationState
Literal	Description
activate	Software package shall be activated. Tags: atp.EnumerationLiteralIndex=2
cancel	Cancellation of the campaign. Tags: atp.EnumerationLiteralIndex=5
finish	Finish notification Tags: atp.EnumerationLiteralIndex=4
process	Processing of software package shall be executed Tags: atp.EnumerationLiteralIndex=1
rollBack	Software package shall be rolled back. Tags: atp.EnumerationLiteralIndex=3
transfer	Software shall be transferred to the vehicle. Tags: atp.EnumerationLiteralIndex=0

Table 15.29: VehicleDriverNotificationEnum

15.4.2 VehicleRolloutStep

[TPS_MANI_01295]{DRAFT} Semantics of [VehicleRolloutStep](#) [The purpose of an update campaign is to roll out the installation or update of [SoftwarePackages](#) in

the context of given UCMs. Each `VehicleRolloutStep` may apply to several UCMs at the same time.

The activation of the `SoftwarePackages` processed in the context of the enclosing `VehiclePackage` is triggered as the last element of the `rolloutQualification` is processed. (RS_MANI_00035)

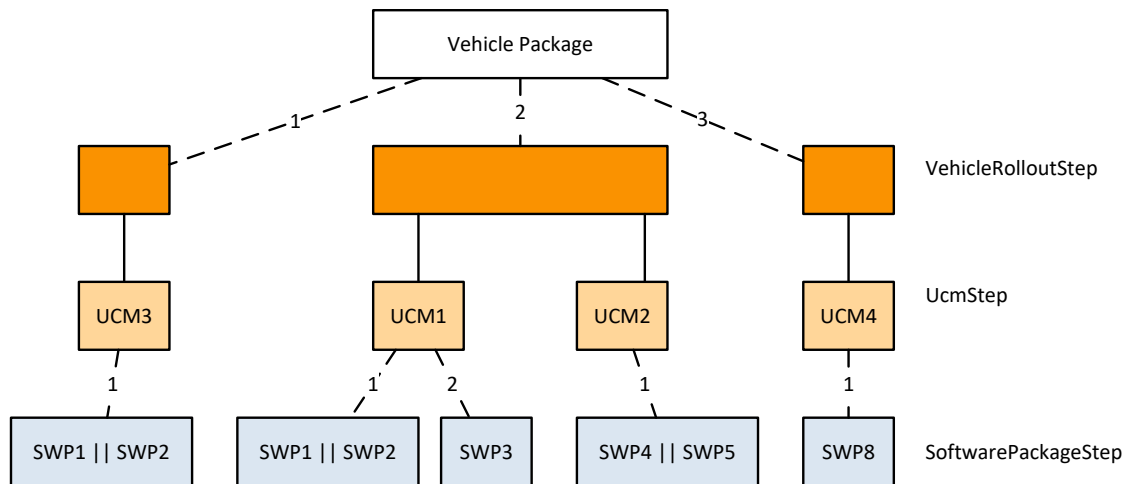


Figure 15.15: Conceptual view on an update campaign

Figure 15.15 takes a conceptual view on the structure of an update campaign and associates the relevant aspects of this view to meta-classes explained in this chapter. Associations that are labeled by a number indicate that an ordering is implied with the respective step.

For example, the execution of the update campaign happens in dedicated steps formalized as `VehicleRolloutStep`, as explained in [TPS_MANI_01295]. Each of the three steps sketched in the picture would be modeled as an individual `VehicleRolloutStep`.

The rollout action is formalized by `UcmStep.softwarePackageStep`. In other words, it is possible to specify a different `softwarePackageStep` for each individual UCM.

The individual `VehicleRolloutSteps` are executed in the order in which they are aggregated at the enclosing `VehiclePackage`. This aspect is in more detail explained by [TPS_MANI_01296].

Class	<code>VehicleRolloutStep</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define a rollout-condition for a vehicle update campaign.			
Base	<code>ARObject</code> , <code>Identifiable</code> , <code>MultilanguageReferrable</code> , <code>Referrable</code>			
Aggregated by	<code>VehiclePackage.rolloutQualification</code>			
Attribute	Type	Mult.	Kind	Note





Class	VehicleRolloutStep			
safetyCondition	String	*	attr	This attribute represents a list of textual safety conditions (e.g.: close the driver window) that need to be fulfilled before the rollout step can proceed.
ucmProcessing	UcmStep	*	aggr	This aggregation collects the UcmProcessingSteps that make up the rollout step.

Table 15.30: VehicleRolloutStep

[TPS_MANI_01296]{DRAFT} **Ordered execution of rollout steps in an update campaign** [The individual [VehicleRolloutSteps](#) defined in the context of a given [VehiclePackage](#) are executed in the defined order and therefore the aggregation of [VehicleRolloutStep](#) at [VehiclePackage](#) is ordered.] ([RS_MANI_00035](#))

15.4.3 UcmStep

[TPS_MANI_01297]{DRAFT} **Semantics of meta-class [UcmStep](#)** [Each [VehicleRolloutStep](#) consists of a number of [UcmSteps](#) (aggregated by [VehicleRolloutStep](#) in the role `ucmProcessing`). Each [UcmStep](#) refers to a specific UCM (represented by [UcmDescription](#)) in the role `ucm`.] ([RS_MANI_00035](#))

[TPS_MANI_01298]{DRAFT} **No ordering of [VehicleRolloutStep.ucmProcessing](#)** [Each [UcmStep](#) defined in the context of an enclosing [VehicleRolloutStep](#) can be handled without the consideration of a dedicated order. Therefore, the aggregation [VehicleRolloutStep.ucmProcessing](#) is not labeled as `ordered`.] ([RS_MANI_00035](#))

Class	UcmStep			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the ability to define a rollout-condition for a vehicle update campaign.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	VehicleRolloutStep.ucmProcessing			
Attribute	Type	Mult.	Kind	Note
softwarePackageStep (ordered)	SoftwarePackageStep	*	aggr	This aggregation represents the sequence of activities to be carried out in the context of the respective UCM.
ucm	UcmDescription	0..1	ref	This reference identifies the UCM for which the rollout step applies.

Table 15.31: UcmStep

15.4.4 SoftwarePackageStep

[TPS_MANI_01299]{DRAFT} **Aggregation of [SoftwarePackageSteps](#) at [UcmStep](#)** [Each [UcmStep](#) consists of an `ordered` collection of [SoftwarePackageSteps](#). This

means that the order in which `SoftwarePackages` are handled in the scope of one `UcmStep` is significant.] ([RS_MANI_00035](#))

Class	SoftwarePackageStep			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class represents the configuration of an activation step in the context of software package activation.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	<code>UcmStep.softwarePackageStep</code>			
Attribute	Type	Mult.	Kind	Note
process	<code>SoftwarePackage</code>	0..1	ref	This reference identifies the <code>SoftwarePackage</code> to be processed in the enclosing <code>SoftwarePackageStep</code> .
transfer	<code>SoftwarePackageStoring</code>	*	aggr	This aggregation clarifies the storing of the <code>SoftwarePackage</code> .

Table 15.32: SoftwarePackageStep

[TPS_MANI_01300]{DRAFT} **Semantics of reference `SoftwarePackageStep.transfer.transfer`** [The reference `SoftwarePackageStep.transfer.transfer` identifies the `SoftwarePackages` that are supposed to be transferred in the context of the enclosing `SoftwarePackageStep`.

It is positively supported that `SoftwarePackages` are transferred in parallel and therefore the multiplicity of the reference in the role `transfer` has been set to 0..*.] ([RS_MANI_00035](#))

[TPS_MANI_01301]{DRAFT} **Semantics of aggregation `SoftwarePackageStep.transfer`** [By means of the aggregation of `SoftwarePackageStoring` it is possible to specify for each individual `SoftwarePackage` to specify whether and where the `SoftwarePackage` is stored in the vehicle.

This information is specifically provided by attribute `SoftwarePackageStoring.storing` of type `SoftwarePackageStoringEnum`.] ([RS_MANI_00035](#))

Class	SoftwarePackageStoring			
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution			
Note	This meta-class provides the ability to specify whether and where the referenced <code>SoftwarePackage</code> is stored.			
Base	<i>ARObject</i>			
Aggregated by	<code>SoftwarePackageStep.transfer</code>			
Attribute	Type	Mult.	Kind	Note
storing	<code>SoftwarePackageStoringEnum</code>	0..1	attr	This attribute clarifies whether and where the referenced <code>SoftwarePackage</code> is stored.
transfer	<code>SoftwarePackage</code>	*	ref	This reference identifies the <code>SoftwarePackage(s)</code> to be transferred in the enclosing <code>SoftwarePackageStep</code> .

Table 15.33: SoftwarePackageStoring

[constr_10256]{DRAFT} **Multiplicity of reference in the role `SoftwarePackageStoring.storing`** [For each `SoftwarePackageStoring`, the reference in the

role `storing` shall exist **at the time when the creation of the manifest is finished.**]()

Enumeration	SoftwarePackageStoringEnum
Package	M2::AUTOSARTemplates::AdaptivePlatform::SoftwareDistribution
Note	This enumeration controls where software packages are stored.
Aggregated by	SoftwarePackageStoring.storing
Literal	Description
none	No storing in vehicle. Tags: atp.EnumerationLiteralIndex=0
ucm	Storing in UCM (subordinate). Tags: atp.EnumerationLiteralIndex=2
ucmMaster	Storing in Ucm Master. Tags: atp.EnumerationLiteralIndex=1

Table 15.34: SoftwarePackageStoringEnum

[TPS_MANI_01302]{DRAFT} **Semantics of reference `SoftwarePackageStep.process`** [The reference `SoftwarePackageStep.process` identifies the `SoftwarePackage` that is supposed to be processed in the context of the enclosing `SoftwarePackageStep`.

The processing of `SoftwarePackages` happens strictly one after the other and therefore the reference `process` can only have the multiplicity 0..1. The strict order of processing is guaranteed by the aggregation of the `SoftwarePackageStep` at `UcmStep`.] ([RS_MANI_00035](#))

[TPS_MANI_01306]{DRAFT} **Simultaneous existence of references in the role `SoftwarePackageStep.transfer` and `SoftwarePackageStep.process`** [It is possible that the references `SoftwarePackageStep.transfer` and `SoftwarePackageStep.process` simultaneously exist to the identical `SoftwarePackage` in the context of the same `SoftwarePackageStep`.

The semantics of such a configuration is that the `SoftwarePackage` that is referenced by the two roles owned by the same `SoftwarePackageStep` is "streamed", i.e. transferred and processed in one step represented by the `SoftwarePackageStep`.] ([RS_MANI_00035](#))

15.4.5 Examples for the Usage of SoftwarePackageStep

The semantics of the references

- `transfer`
- `process`

shall be explained along a set of examples.

15.4.5.1 Examples for the Usage of transfer and process

The first example (as depicted in Figure 15.16) assumes a scenario where three *SoftwarePackages* shall be activated and the three *SoftwarePackages* are transferred in parallel in the context of one *SoftwarePackageStep*.

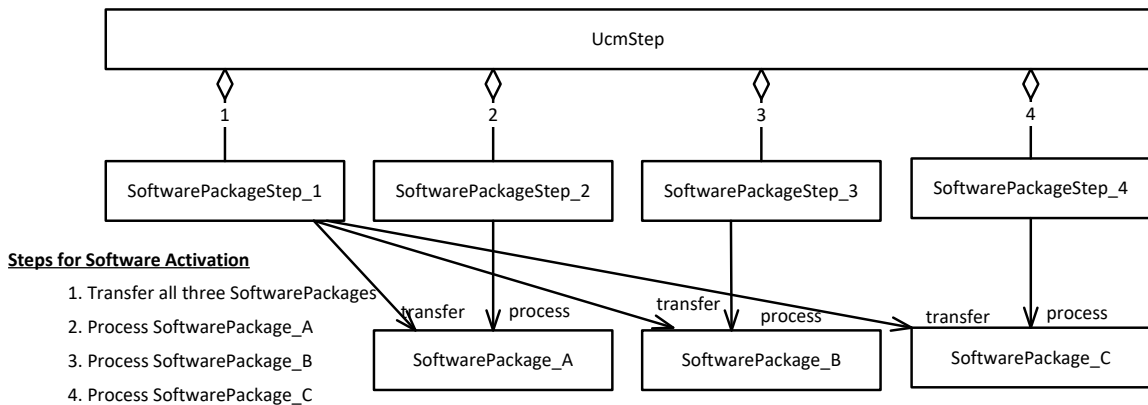
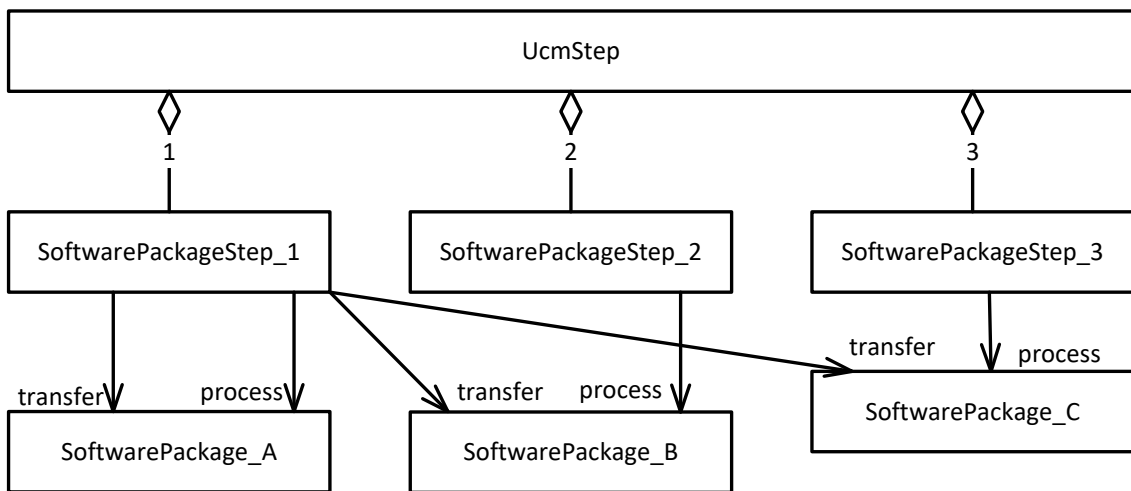


Figure 15.16: Example 1 of the configuration of *SoftwarePackageStep*

After that, the three *SoftwarePackages* are processed one by one in the context of three further *SoftwarePackageSteps*.



Steps for Software Activation

1. Transfer all three *SoftwarePackages* and process *SoftwarePackage_A* (streaming)
2. Process *SoftwarePackage_B*
3. Process *SoftwarePackage_C*

Figure 15.17: Example 2 of the configuration of *SoftwarePackageStep*

The ordering of the `SoftwarePackageSteps` in the context of the enclosing `UcmStep` is depicted explicitly by assigning numerical values to the aggregation as well as naming the respective `SoftwarePackageStep` using the same numerical values.

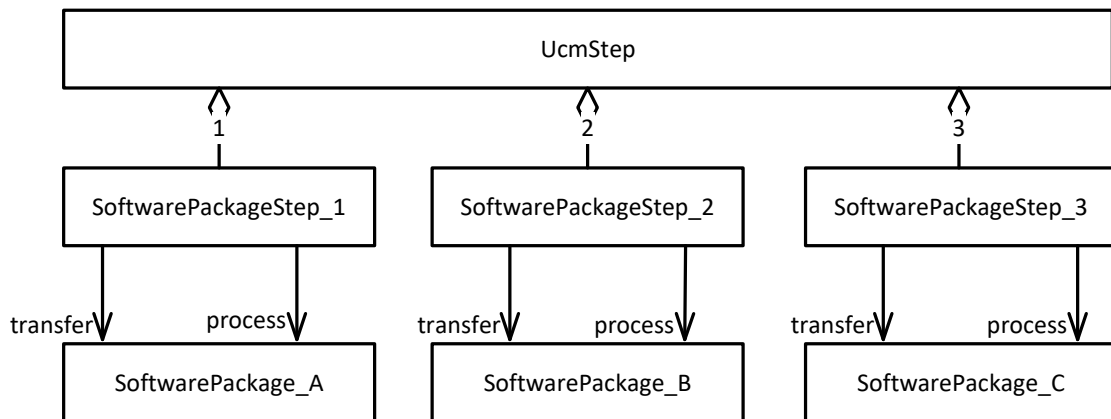
The second example introduces a scenario where the three `SoftwarePackages` are transferred in the first `SoftwarePackageStep`. One of the `SoftwarePackages` is additionally referenced in the role `process` and this indicates that the respective `SoftwarePackage` is streamed.

Because the first `SoftwarePackage` is streamed, only three¹ `SoftwarePackageSteps` are needed to model the example.

The rest of the `SoftwarePackages` are processed in a dedicated `SoftwarePackageStep`. The example is depicted in Figure 15.17.

The third example, depicted in Figure 15.18, sketches a scenario where three `SoftwarePackages` are streamed one after the other.

Consequently, this scenario requires the existence of three `SoftwarePackageSteps` that each reference the same `SoftwarePackage` in the roles `transfer` and `process`.



Steps for Software Activation

1. Transfer and process (i.e. stream) `SoftwarePackage_A`
2. Transfer and process (i.e. stream) `SoftwarePackage_B`
3. Transfer and process (i.e. stream) `SoftwarePackage_C`

Figure 15.18: Example 3 of the configuration of `SoftwarePackageStep`

¹As opposed to four `SoftwarePackageSteps` required to model the first example.

16 Interoperability between Classic Platform and Adaptive Platform

This chapter collects restrictions for interoperability between Classic Platform and Adaptive Platform.

16.1 Usage of majorVersion in the SOME/IP network binding

In case of a SOME/IP communication between Classic Platform and Adaptive Platform the usage of `SomeipServiceInterfaceDeployment.serviceInterfaceVersion.majorVersion` is restricted.

If several `ProvidedSomeipServiceInstances` are defined with the same `SomeipServiceInterfaceDeployment.serviceInterfaceId` and different `SomeipServiceInterfaceDeployment.serviceInterfaceVersion.majorVersions` and these `ProvidedSomeipServiceInstances` are mapped to the same Socket Address (UDP/TCP Port and IP Address) by `SomeipServiceInstanceToMachineMapping` then particular restrictions apply in case that the `ProvidedSomeipServiceInstances` **are consumed on a Classic Platform ECU**.

In such a scenario the same `MessageId` may be used for `ServiceInterface` elements like an `event` in the different `ProvidedSomeipServiceInstances` that have different `majorVersions`. On the Classic Platform in the SoAd module this will result in different `Pdus` that have the same `headerId` in the same `SocketConnection`. In the AUTOSAR Architecture of the Classic Platform one part of the SOME/IP Header is evaluated in the SOME/IP Transformer (`RequestId`, `Protocol Version`, `Interface Version`, `Message Type`, `Return Code`) and the other part in the `Socket Adaptor` (`MessageId`, `Length`). This means that the `Socket Adaptor` is not able to evaluate the `MajorVersion` in the `Pdu` and can not determine the source of the `Pdu`.

The following restrictions apply in case that the `ServiceInterface` contains `methods` and/or `fields` with `hasGetter` or `hasSetter` set to true: If two or more `ProvidedSomeipServiceInstances` are defined using the same `serviceInterfaceId` and different `majorVersions` and these `ProvidedSomeipServiceInstances` are mapped to the same Socket Address (same UDP/TCP Port and IP Address) then the destination IP address, the destination port number, and the Level 4 protocol (`Udp/Tcp`) fields of header of IP packets containing calls that are sent to the `ProvidedSomeipServiceInstances` are identical. In such a scenario, the `ProvidedSomeipServiceInstances` may still use identical `methodIds` if the following condition applies:

- a) At any point in time only one of the `ProvidedSomeipServiceInstances` is active, and only clients of that `ProvidedSomeipServiceInstance` send requests to the `ProvidedSomeipServiceInstance`.

In all other cases, the `methodIds` of the two `ProvidedSomeipServiceInstances` should not overlap.

The following restrictions apply for `ServiceInterface` events and fields with `hasNotifier` set to true: If two or more `ProvidedSomeipServiceInstances` are defined using the same `serviceInterfaceId` and different `majorVersions`, and these `ProvidedSomeipServiceInstances` are mapped to the same Socket Address (same UDP/TCP Port and IP Address) then the source IP address, the source port number, and the Level 4 protocol (Udp) fields of header of IP packets containing event PDUs that are sent to the clients of the `ProvidedSomeipServiceInstances` are identical. In such a scenario, the `ProvidedSomeipServiceInstances` may use identical `eventId`s if at least one of the following conditions holds for any pair of the `ProvidedSomeipServiceInstances`:

- a) At any point in time only one of the `ProvidedSomeipServiceInstances` is active
- b) If two or more `ProvidedSomeipServiceInstances` can send events or Field notifiers at the same time, the `ProvidedSomeipServiceInstances` may still use identical `eventId`s if at least one of the following IP header fields of the IP packet containing the event is different for any pair of `SomeipEventDeployments` identified by the same `eventId`:
 - b1) Destination IP address (== IP address of client)
 - b2) Destination port number (== client port number)

A Examples

This chapter contains a collection of examples that reflect concepts described in different chapters of this document. The content of the chapter provides mere explanation and does not add anything to the model semantics.

A.1 Service Instance Deployment by Service Interface Mapping

The example in Figure A.2 sketches the modeling of a `ProvidedSomeipServiceInstance` in the presence of a `ServiceInterfaceMapping`, that references two `ServiceInterfaces` in the role `sourceServiceInterface`.

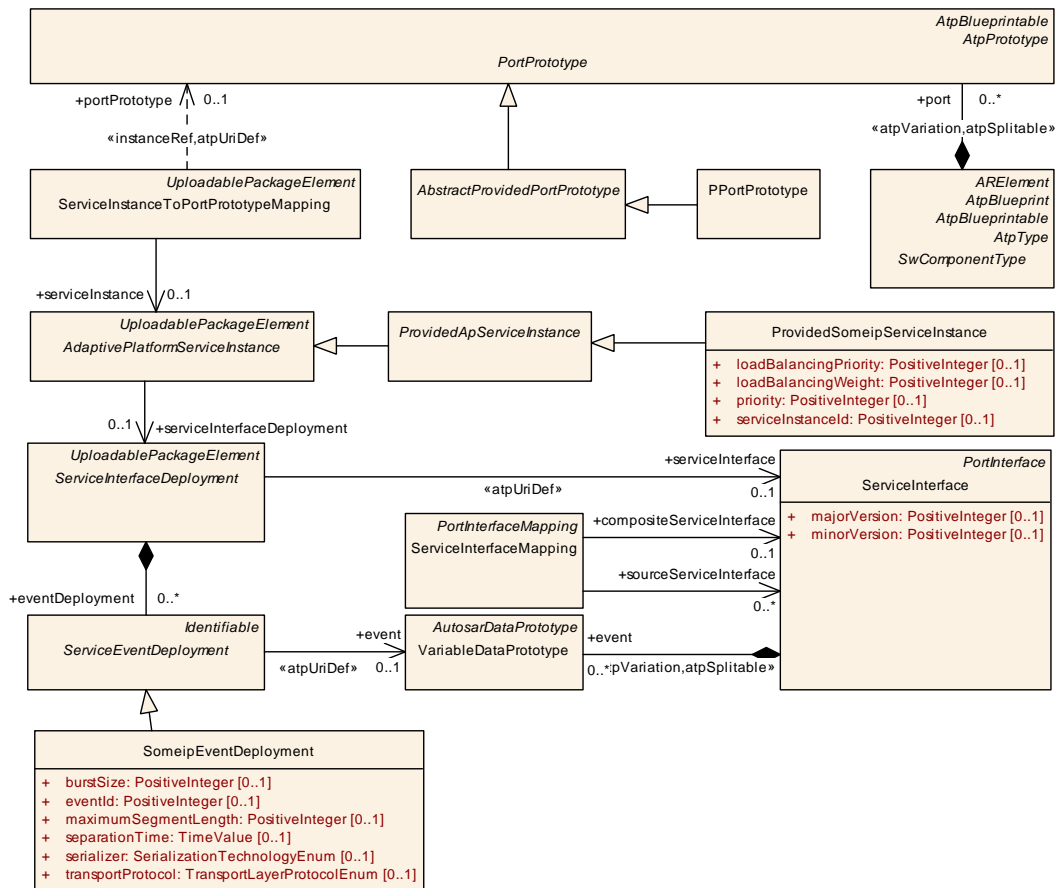


Figure A.1: Meta-model excerpt relevant for the example

For support, Figure A.1 contains an excerpt from the meta-model that contains the relevant meta-classes that have been instantiated to create the example sketched in Figure A.2.

Note further that the example depicted in Figure A.2 is not limited to the explanation of the actual `ServiceInterfaceMapping`.

As the main use case for this is the usage of `ServiceInterfaces` for the definition of an “outside” communication binding the example also contains the modeling of such a binding, in this case to SOME/IP.

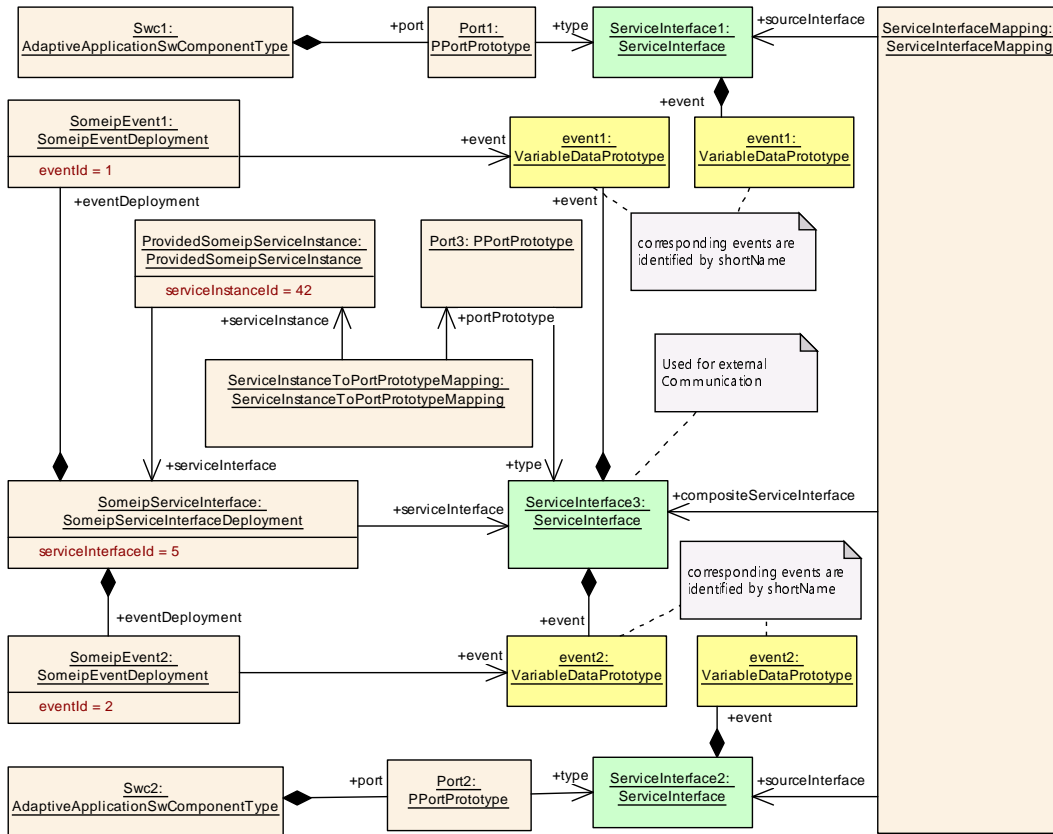


Figure A.2: Example for the deployments of a service in the presence of a `ServiceInterfaceMapping`

Please note that the modeling of the binding requires the existence of a `PortPrototype`, which in turn is aggregated by an `SwComponentType` (not depicted).

This approach still contains some degrees of freedom with respect to the role of the `SwComponentType` that aggregates the mentioned `PortPrototype`. This document does not go further in discussing the nature of such a configuration.

For reasons of keeping the example as simple as possible, each of the `ServiceInterfaces` in the role `sourceServiceInterface` aggregate a single `event`.

The `ServiceInterface` referenced in the role `compositeServiceInterface` aggregates two `event` with `shortNames` that match the mentioned `event` of the source `ServiceInterfaces` (see [TPS_MANI_01022]).

This approach still contains some degrees of freedom with respect to the role of the `SwComponentType` that aggregates the mentioned `PortPrototype`. This document does not go further in discussing the nature of such a configuration.

By mapping individual elements of `ServiceInterfaces`, it is possible to map element with different `shortNames` to each other. In this example, the `event` with the `shortName` `event1` is mapped to another `event` with the `shortName` `eventLeft`.

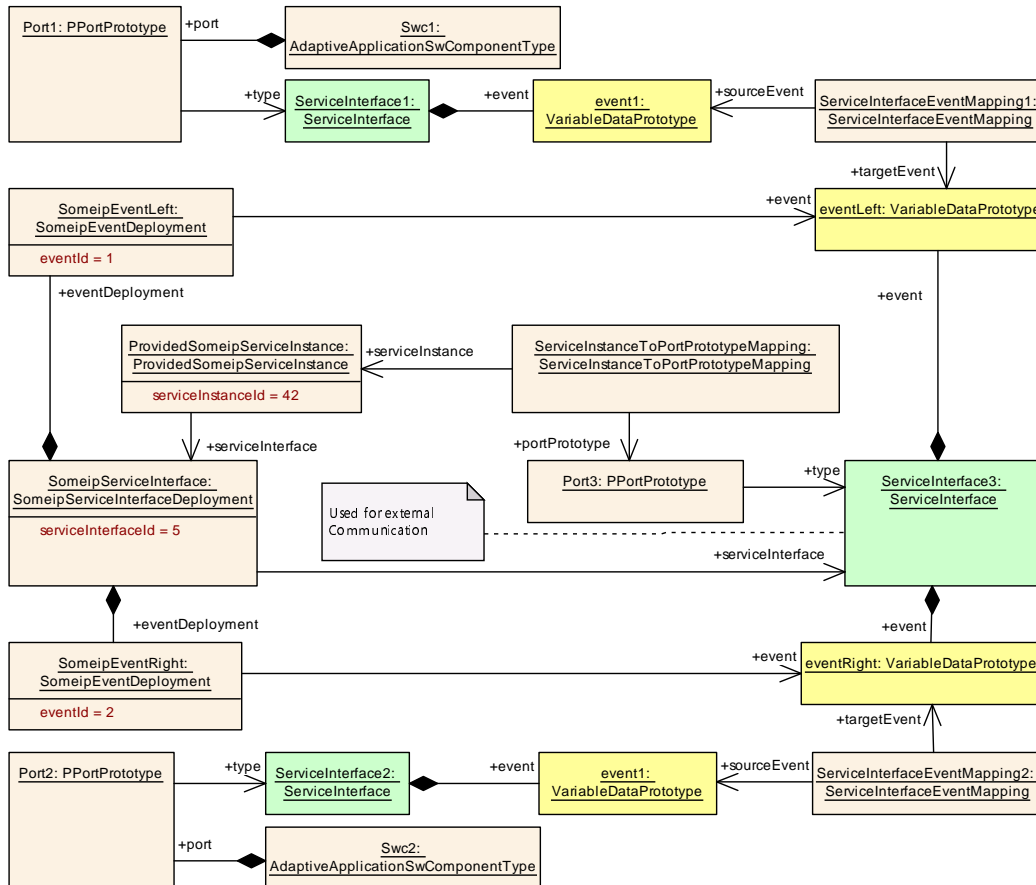


Figure A.4: Example for the deployment of a service in the presence of a `ServiceInterfaceEventMapping`

In Figure A.4, two different `ServiceInterfaces` exist that each aggregate an `event` with the identical `shortName`. This scenario **requires** the existence of `ServiceInterfaceElementMappings`.

As an extension to the scenario depicted in Figure A.4, Figure A.5 describes a model where the **same** `event` of a `ServiceInterface` is used in two different event deployments by means of two `ServiceInterfaceEventMappings` that each refer to said `event` in the role `ServiceInterfaceEventMapping.sourceEvent`.

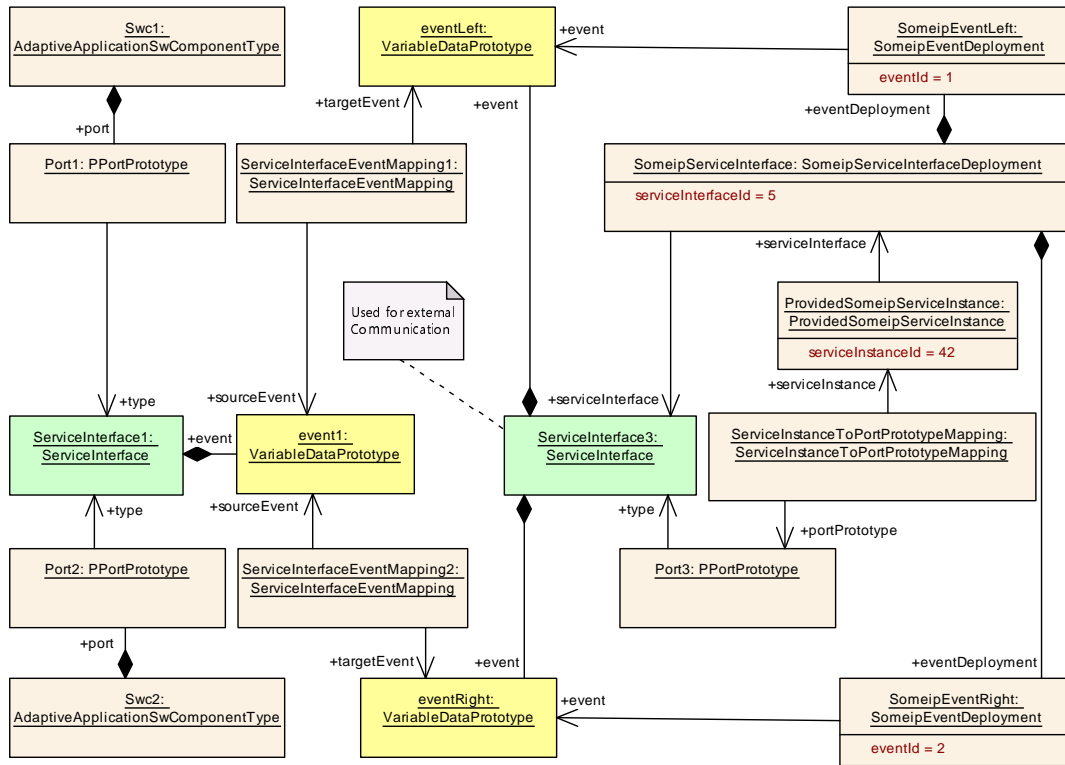


Figure A.5: Example for the deployment of a service in the presence of a **ServiceInterfaceEventMapping** to the same source **ServiceInterface**

Again, this scenario **requires** the existence of appropriately configured **ServiceInterfaceElementMappings**.

A.3 Definition of Startup Configuration

As already mentioned, the mode-dependent startup configuration is directly aggregated by the definition of a **Process**:

```
<PROCESS>
  <SHORT-NAME>AA1</SHORT-NAME>
  <STATE-DEPENDENT-STARTUP-CONFIGS>
    <STATE-DEPENDENT-STARTUP-CONFIG>
      <EXECUTION-DEPENDENCIES>
        <EXECUTION-DEPENDENCY>
          <PROCESS-STATE-IREF>
            <CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF DEST="MODE-DECLARATION-GROUP-PROTOTYPE">/Processes/MWC/ProcessStateMachine</CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF>
            <TARGET-MODE-DECLARATION-REF DEST="MODE-DECLARATION">/ModeDeclarationGroups/ProcessStateMachine/Running</TARGET-MODE-DECLARATION-REF>
          </PROCESS-STATE-IREF>
        </EXECUTION-DEPENDENCY>
      </EXECUTION-DEPENDENCIES>
    </STATE-DEPENDENT-STARTUP-CONFIG>
  </STATE-DEPENDENT-STARTUP-CONFIGS>
</PROCESS>
```



```

<PROCESS-STATE-IREF>
  <CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF DEST="MODE-
    DECLARATION-GROUP-PROTOTYPE">/Processes/MSM/
    ProcessStateMachine</CONTEXT-MODE-DECLARATION-GROUP-
    PROTOTYPE-REF>
  <TARGET-MODE-DECLARATION-REF DEST="MODE-DECLARATION">/
    ModeDeclarationGroups/ProcessStateMachine/Running</TARGET-
    MODE-DECLARATION-REF>
</PROCESS-STATE-IREF>
</EXECUTION-DEPENDENCY>
</EXECUTION-DEPENDENCYS>
<FUNCTION-GROUP-STATE-IREFS>
  <FUNCTION-GROUP-STATE-IREF>
    <CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF DEST="MODE-
      DECLARATION-GROUP-PROTOTYPE">/FunctionGroupSets/ExampleFGS/
      ExampleFG</CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF>
    <TARGET-MODE-DECLARATION-REF DEST="MODE-DECLARATION">/
      ModeDeclarationGroups/ExampleFG/Running</TARGET-MODE-
      DECLARATION-REF>
  </FUNCTION-GROUP-STATE-IREF>
</FUNCTION-GROUP-STATE-IREFS>
<RESOURCE-GROUP-REF DEST="RESOURCE-GROUP">/Machines/ExampleMachine/
  Linux/resourceGroup2</RESOURCE-GROUP-REF>
<STARTUP-CONFIG-REF DEST="STARTUP-CONFIG">/StartupConfigs/AA1_Startup
  </STARTUP-CONFIG-REF>
</STATE-DEPENDENT-STARTUP-CONFIG>
</STATE-DEPENDENT-STARTUP-CONFIGS>
</PROCESS>
    
```

Listing A.1: Example for the definition of the `StateDependentStartupConfig` owned by a `Process`

In this example, launch dependencies exist on two other `Processes`. Both `Processes` MWC and MSM need to be in the `ProcessState` “Running” before AA1 is started.

The reference `StateDependentStartupConfig.functionGroupState` refers to a `ModeDeclaration` with the `shortName` “Running” within the `Function Group` “ExampleFG”.

In other words, the referenced `StartupConfig` that is defined in Listing A.2 is valid if the `Function Group` “ExampleFG” is in state “Running”.

```

<STARTUP-CONFIG>
  <SHORT-NAME>AA1_Startup</SHORT-NAME>
  <PROCESS-ARGUMENTS>
    <PROCESS-ARGUMENT>
      <ARGUMENT>-a</ARGUMENT>
    </PROCESS-ARGUMENT>
    <PROCESS-ARGUMENT>
      <ARGUMENT>-b</ARGUMENT>
    </PROCESS-ARGUMENT>
    <PROCESS-ARGUMENT>
      <ARGUMENT>-d</ARGUMENT>
    </PROCESS-ARGUMENT>
    <PROCESS-ARGUMENT>
      <ARGUMENT>XYZ</ARGUMENT>
    
```

```

        </PROCESS-ARGUMENT>
    </PROCESS-ARGUMENTS>
    <SCHEDULING-POLICY>SCHEDULING-POLICY-FIFO</SCHEDULING-POLICY>
    <SCHEDULING-PRIORITY>20</SCHEDULING-PRIORITY>
</STARTUP-CONFIG>
    
```

Listing A.2: Example for a [StartupConfig](#)

The [StateDependentStartupConfig](#) of the [Process](#) is assigned to the [ResourceGroup](#) named “ResourceGroup2” that is defined in the Machine Manifest.

The corresponding definition of a [Machine](#) contains a [OsModuleInstantiation](#) that in turn owns the two [ResourceGroups](#) named “ResourceGroup1” and “ResourceGroup2”. This aspect can be found in Listing A.3.

```

<MACHINE>
  <SHORT-NAME>ExampleMachine</SHORT-NAME>
  <MODULE-INSTANTIATIONS>
    <OS-MODULE-INSTANTIATION>
      <SHORT-NAME>Linux</SHORT-NAME>
      <RESOURCE-GROUPS>
        <RESOURCE-GROUP>
          <SHORT-NAME>resourceGroup1</SHORT-NAME>
          <CPU-USAGE>60</CPU-USAGE>
          <MEM-USAGE>1000000</MEM-USAGE>
        </RESOURCE-GROUP>
        <RESOURCE-GROUP>
          <SHORT-NAME>resourceGroup2</SHORT-NAME>
          <CPU-USAGE>70</CPU-USAGE>
          <MEM-USAGE>2000000</MEM-USAGE>
        </RESOURCE-GROUP>
      </RESOURCE-GROUPS>
    </OS-MODULE-INSTANTIATION>
  </MODULE-INSTANTIATIONS>
</MACHINE>
    
```

Listing A.3: Example for the definition of a [Machine](#)

The example definition of a [FunctionGroupSet](#) is sketched in Listing A.4.

```

<FUNCTION-GROUP-SET>
  <SHORT-NAME>ExampleFGS</SHORT-NAME>
  <FUNCTION-GROUPS>
    <MODE-DECLARATION-GROUP-PROTOTYPE>
      <SHORT-NAME>ExampleFG</SHORT-NAME>
      <TYPE-TREF DEST="MODE-DECLARATION-GROUP">/ModeDeclarationGroups/
        ExampleFG</TYPE-TREF>
    </MODE-DECLARATION-GROUP-PROTOTYPE>
  </FUNCTION-GROUPS>
</FUNCTION-GROUP-SET>
    
```

Listing A.4: Example for the definition of a [FunctionGroupSet](#)

The definition of the [ModeDeclarationGroup](#) that represents the [Function Group](#) is contained in Listing A.5.

```

<MODE-DECLARATION-GROUP>
    
```

```

<SHORT-NAME>ExampleFG</SHORT-NAME>
<INITIAL-MODE-REF DEST="MODE-DECLARATION">/ModeDeclarationGroups/
  ExampleFG/Off</INITIAL-MODE-REF>
<MODE-DECLARATIONS>
  <MODE-DECLARATION>
    <SHORT-NAME>Off</SHORT-NAME>
  </MODE-DECLARATION>
  <MODE-DECLARATION>
    <SHORT-NAME>Running</SHORT-NAME>
  </MODE-DECLARATION>
  <MODE-DECLARATION>
    <SHORT-NAME>Fallback</SHORT-NAME>
  </MODE-DECLARATION>
  <MODE-DECLARATION>
    <SHORT-NAME>Diag</SHORT-NAME>
  </MODE-DECLARATION>
</MODE-DECLARATIONS>
</MODE-DECLARATION-GROUP>

```

Listing A.5: Example for the definition of [ModeDeclarationGroups](#)

The definition of the [ModeDeclarationGroup](#) that represents the process state machine is contained in Listing [A.6](#).

```

<MODE-DECLARATION-GROUP>
  <SHORT-NAME>ProcessStateMachine</SHORT-NAME>
  <INITIAL-MODE-REF DEST="MODE-DECLARATION">/ModeDeclarationGroups/
    ProcessStateMachine/Terminated</INITIAL-MODE-REF>
  <MODE-DECLARATIONS>
    <MODE-DECLARATION>
      <SHORT-NAME>Running</SHORT-NAME>
    </MODE-DECLARATION>
    <MODE-DECLARATION>
      <SHORT-NAME>Terminated</SHORT-NAME>
    </MODE-DECLARATION>
  </MODE-DECLARATIONS>
</MODE-DECLARATION-GROUP>

```

Listing A.6: Example for the definition of [ModeDeclarationGroups](#)

A.4 Service Instance Mapping

This section contains some examples that explain the modeling of a mapping between a service instance and the application. The examples have been created to show both the “find” and the “offer” side of the service binding.

In the first example, depicted in Figure [A.6](#) shows the binding of [PortPrototypes](#) to a SOME/IP-based transport layer. The left part of the diagram contains the modeling of the “find” aspect and the right part contains the modeling of the “offer” aspect.

Please note that the [shortNames](#) of the two affected [PortPrototypes](#) are different. In other words, the [shortNames](#) of the [PortPrototypes](#) are not used as a way to identify the opposite end of the service binding.

Instead, the existence of a `ServiceInstanceToPortPrototypeMapping` that maps a `PortPrototype` to a `ProvidedSomeipServiceInstance` or `RequiredSomeipServiceInstance` with the **identical value** of attribute `serviceInstanceId` creates the actual binding between the “find” and the “offer” end.

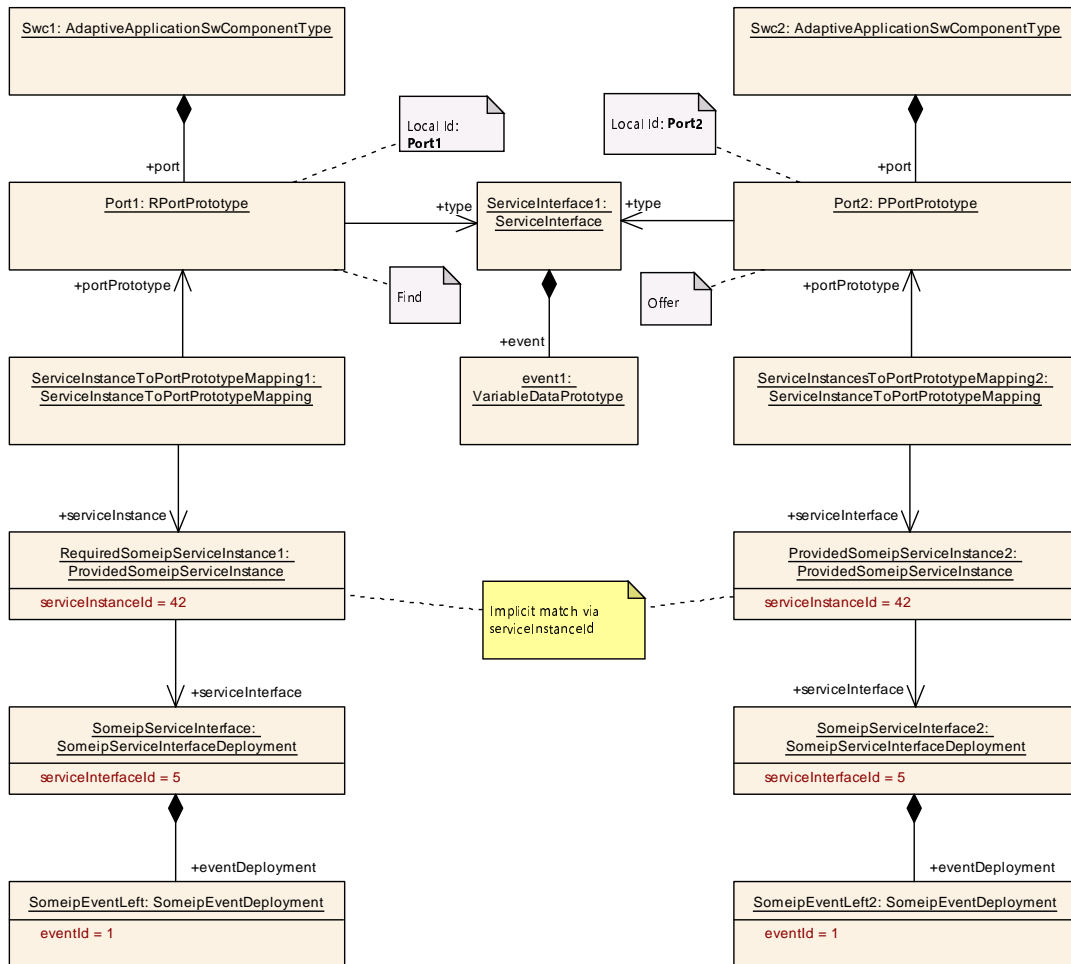


Figure A.6: Port-based binding of a service instance to the application using SOME/IP

The next example (depicted in Figure A.7) shows a binding of `PortPrototypes` to a user-defined transport layer. The left part of the diagram contains the modeling of the “find” aspect and the right part contains the modeling of the “offer” aspect.

Because the binding is user-defined, there are no attributes modeled on the level of the meta-model available to identify an instance according to the user-defined service implementation. There is just no way to define attributes that are “needed anyway” for a user-defined binding.

Therefore, the only option in this case is the usage of `AdminData`, `Sdg`, and `Sd` to define an identification of the user-defined transport layer.

In order to support the comparison to the example depicted in Figure A.6, the example described in Figure A.7 uses a simple identification based on a numerical value. Again, this is an arbitrary scenario created just for the sake of explanation.

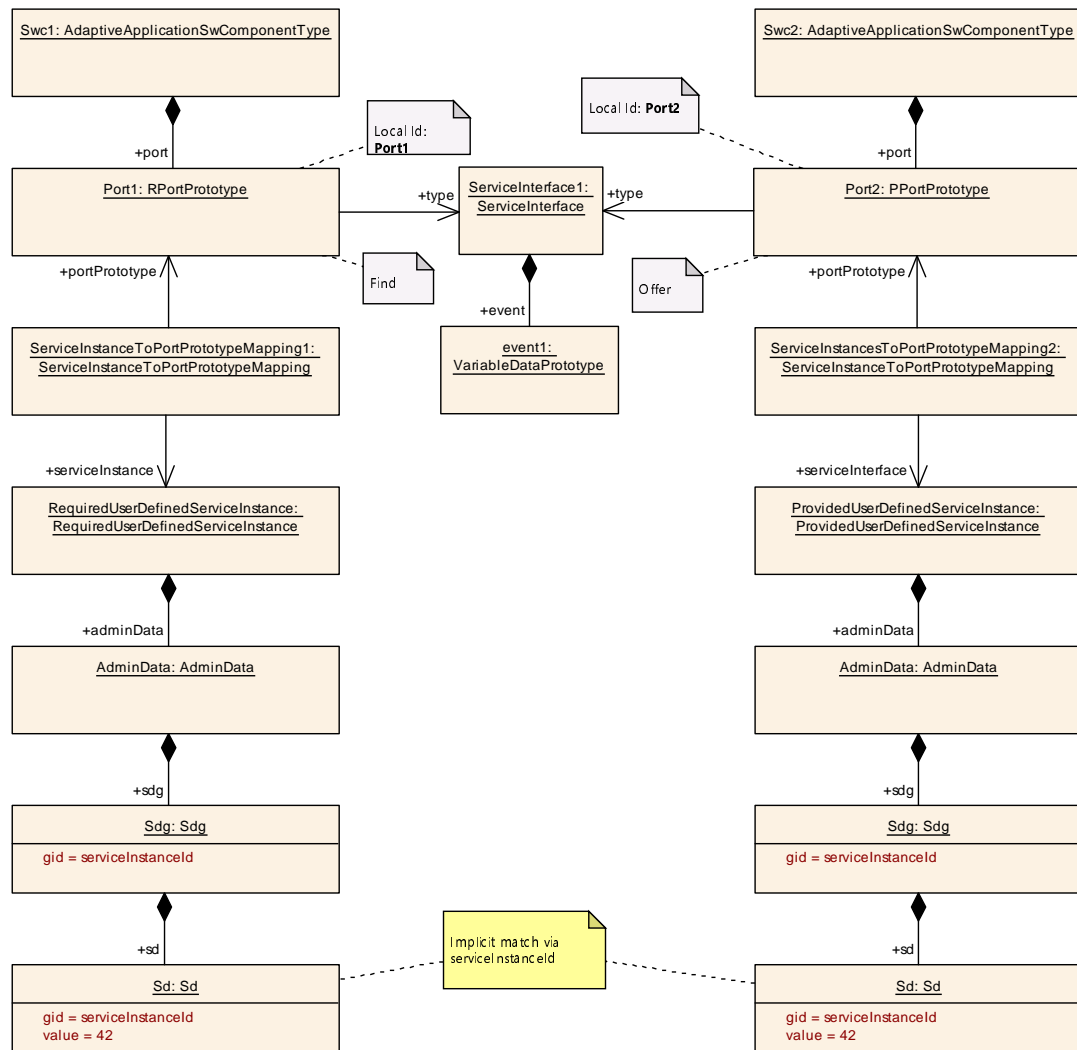


Figure A.7: Port-based binding of a service instance to the application using a user-defined binding

A.5 Radar and Camera ServiceInterface example

The example in figure A.8 shows a *Radar ServiceInterface* with a *BrakeEvent* and two *methods*: *Calibrate* and *Adjust*. The *Camera ServiceInterface* shown in figure A.9 has two events: *LaneEvent* and *SpeedLimitEvent* and one *Calibrate* *method*.

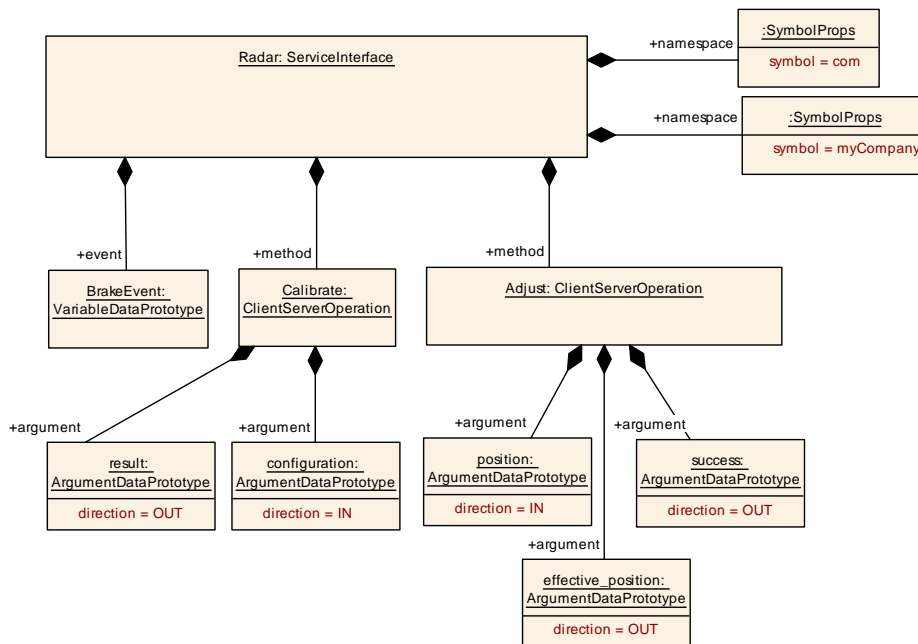


Figure A.8: Radar Service Interface

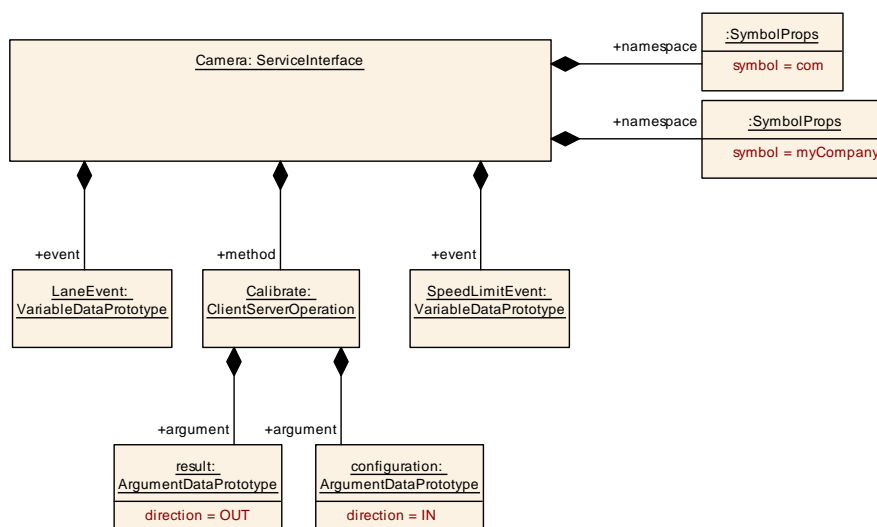


Figure A.9: Camera Service Interface

Both *ServiceInterfaces* *Radar* and *Camera* are mapped to a combined *RadarAndCamera ServiceInterface* with an *Service Interface Element Mapping* since both *ServiceInterfaces* have a *method* with the same name: *Calibrate*.

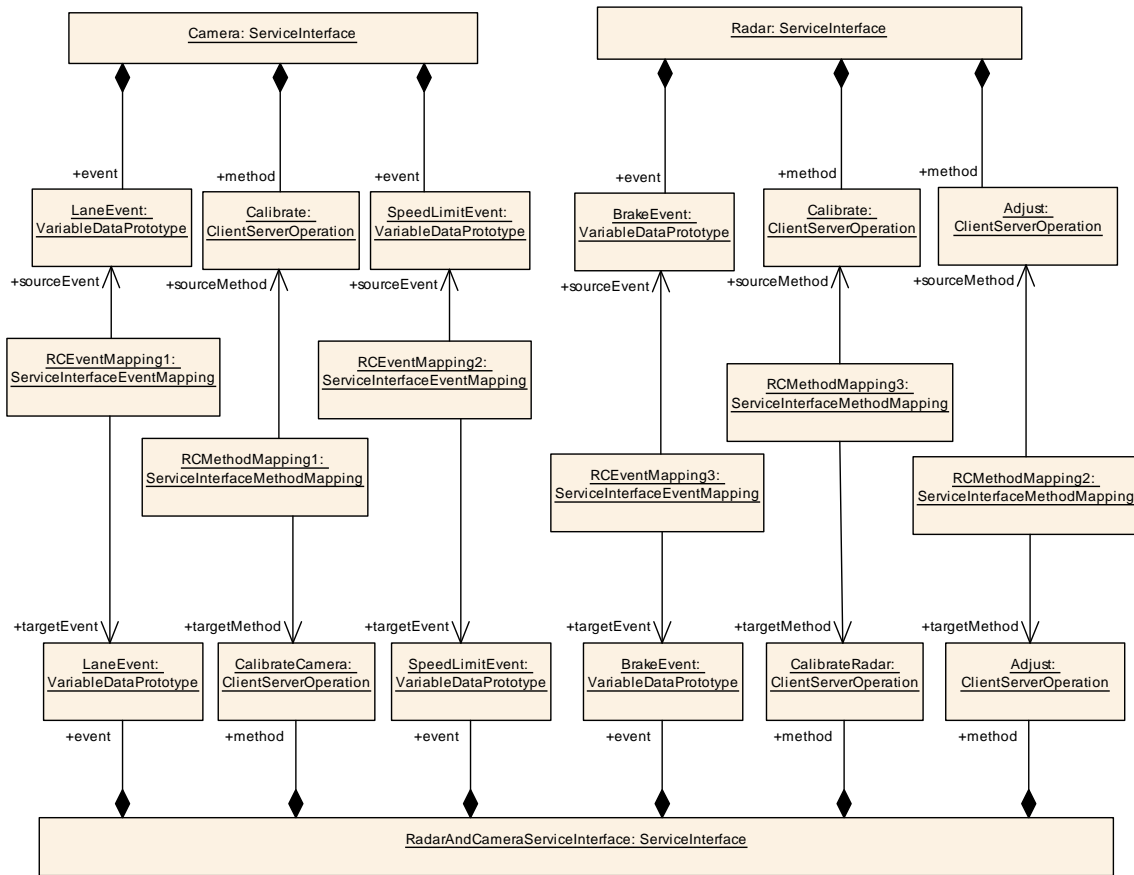


Figure A.10: Service Interface Element Mapping example

The combined `ServiceInterface` is offered over the network as a SOME/IP Service. Figure A.11 shows the assignment of the SOME/IP `serviceInterfaceId` to 31.

In addition SOME/IP `eventIds` are assigned to the `events` and `methodIds` are assigned to the `methods`. Furthermore a single `SomeipEventGroup` is defined to which all `SomeipEventDeployments` of the `RadarAndCamera ServiceInterface` are assigned.

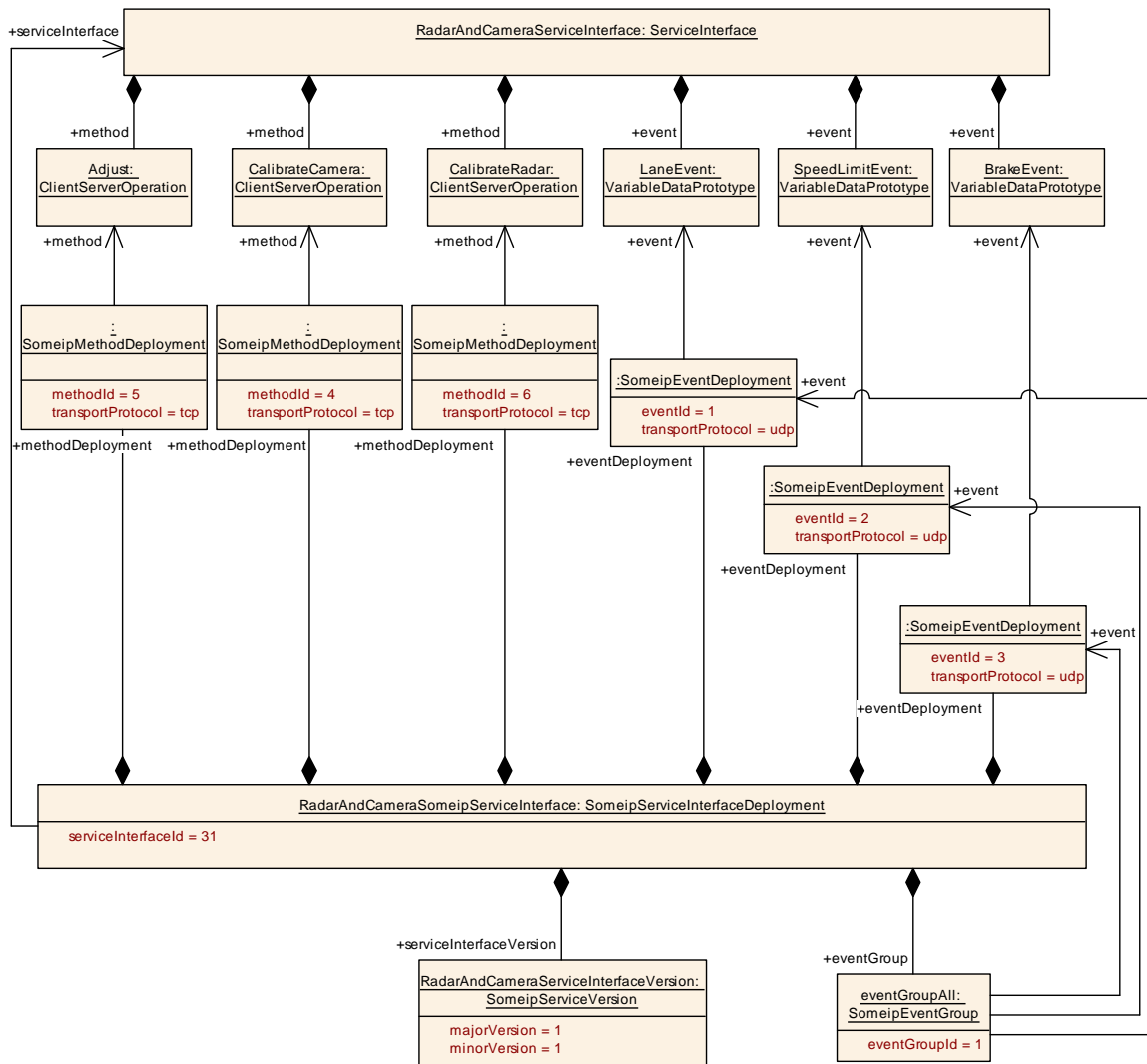


Figure A.11: SOME/IP Deployment

Figure A.12 shows a modeled `ProvidedSomeipServiceInstance` that is mapped to a `Machine`.

The displayed configuration in figure A.12 leads to a SOME/IP OfferService Message with the following content:

- Serviceld => `serviceInterfaceId = 31`
- Instanceld => `serviceInstanceId = 1`
- MajorVersion => 1
- MinorVersion => 1
- TTL => 3
- IPv4 Endpoint Option with IPv4 Address (170.88.199.94), Protocol (TCP), Port-Number (30567)

- IPv4 Endpoint Option with IPv4 Address (170.88.199.94), Protocol (UDP), Port-Number (30501)
- IP Multicast Endpoint Option with IPv4 Address (239.255.0.1), Protocol (UDP), PortNumber (30502)

An example of a [RequiredSomeipServiceInstance](#) is shown in Figure A.13.

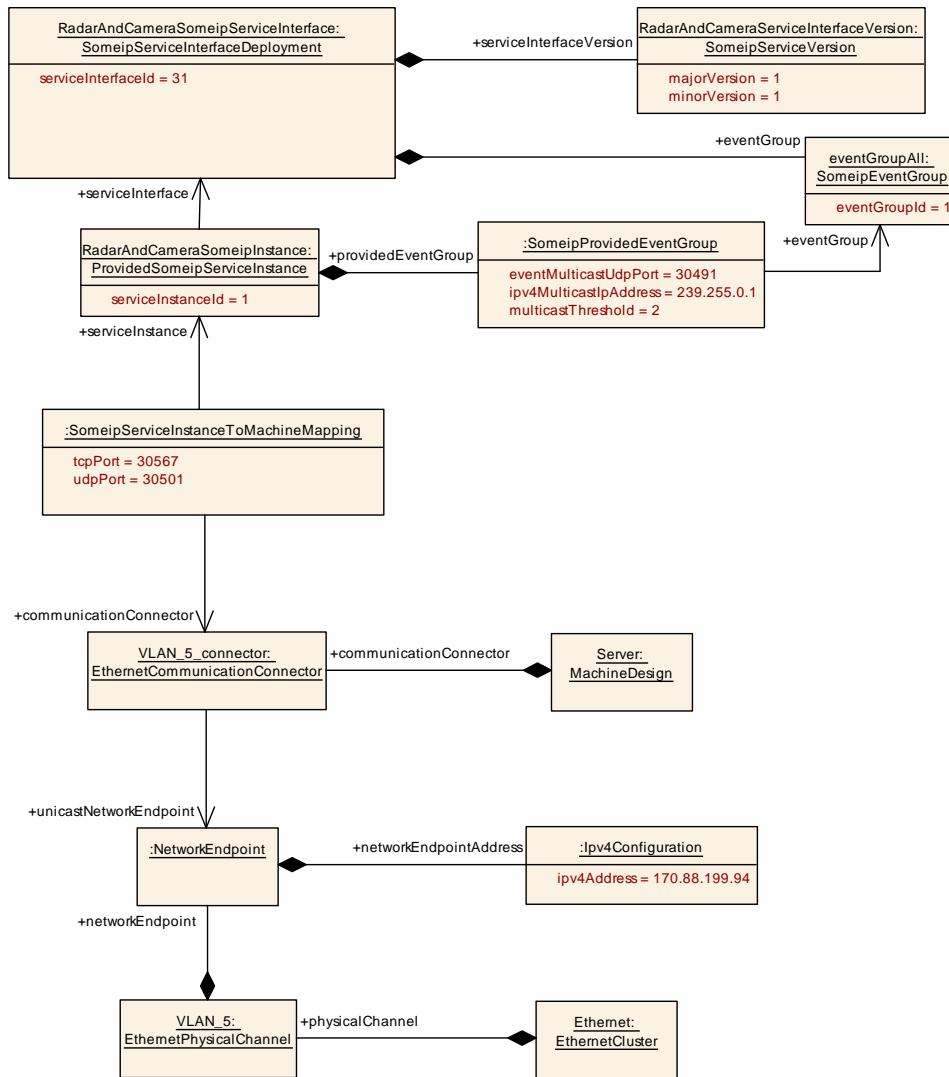


Figure A.12: SOME/IP Provided Service Instance

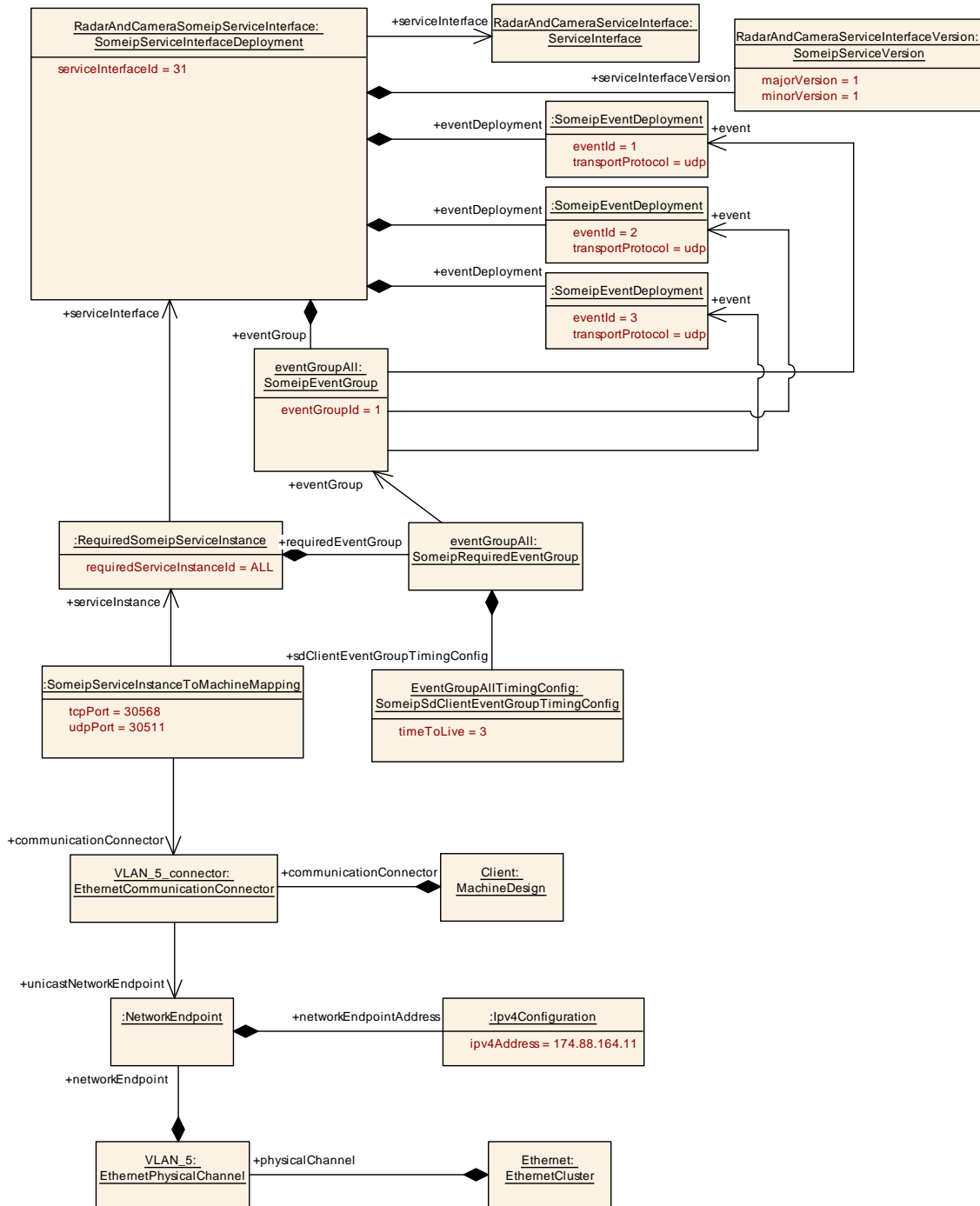


Figure A.13: SOME/IP Required Service Instance

The displayed configuration in figure A.13 leads to a SOME/IP Find Service Message with the following content:

- ServiceId => `serviceInterfaceId = 31`
- InstanceId => `RequiredSomeipServiceInstance.requiredServiceInstanceId = ALL`
- MajorVersion => `majorVersion = 1`

- MinorVersion => `minorVersion = 1`

The displayed configuration in figure A.12 also leads to a SOME/IP SubscribeEvent-Group Message content that is sent from the Service Requester to the Service Provider:

- ServiceId => taken from the OfferMessage
- InstanceId => taken from the OfferMessage
- MajorVersion => taken from the OfferMessage
- MinorVersion => taken from the OfferMessage
- Eventgroup ID => `RequiredSomeipServiceInstance.requiredEventGroup.eventGroup.eventGroupId = 1`
- TTL => `RequiredSomeipServiceInstance.requiredEventGroup.sd-ClientEventGroupTimingConfig.timeToLive = 3`
- IPv4 Endpoint Option with IPv4 Address (170.88.164.11), Protocol (UDP), Port-Number (30511)

A.6 Definition of Persistent Data

This chapter contains examples for the modeling of persistent data and file storage starting from the design aspect down to the definition of the persistent storage and the mapping between design and deployment.

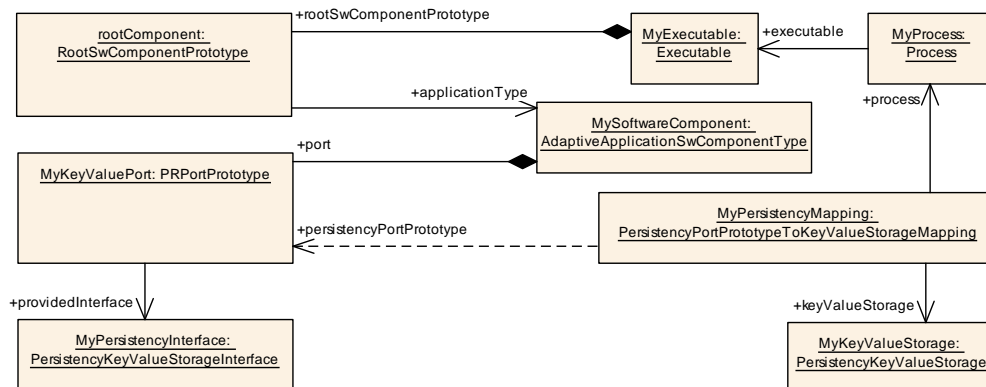


Figure A.14: Simple example modeling of persistent data (design + deployment)

The setup presented in Figure A.14 represents a case with reduced modeling of persistent data.

It is possible to extend the modeling to a deeper level of detail and also formally describe the individual data that is subject to persistency on both design and deployment level, see Figure A.15.

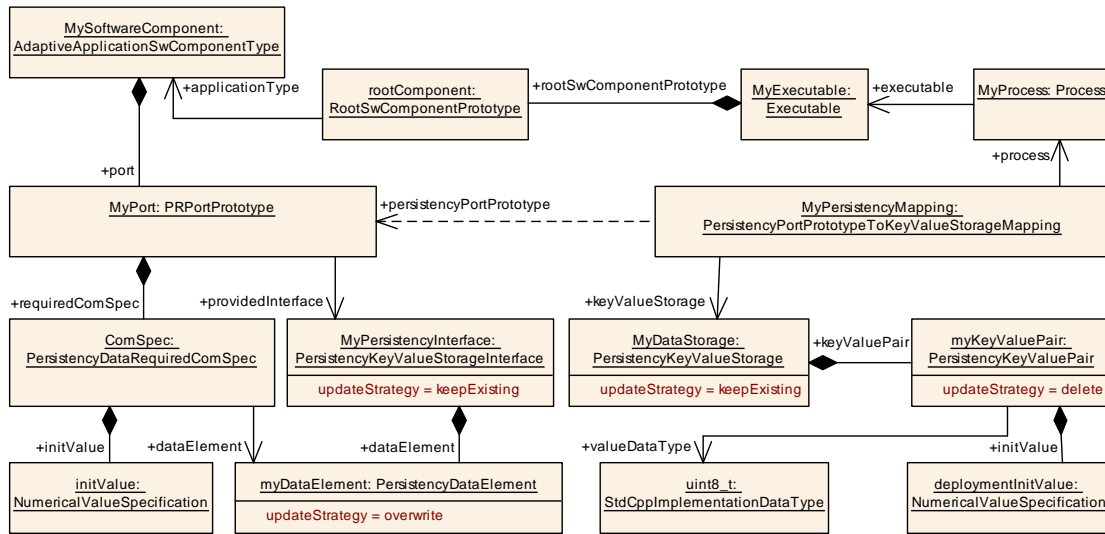


Figure A.15: Advanced example modeling of persistent data (design + deployment)

A.7 Definition of Persistent File

The setup presented in Figure A.16 represents a case with reduced modeling of persistent files.

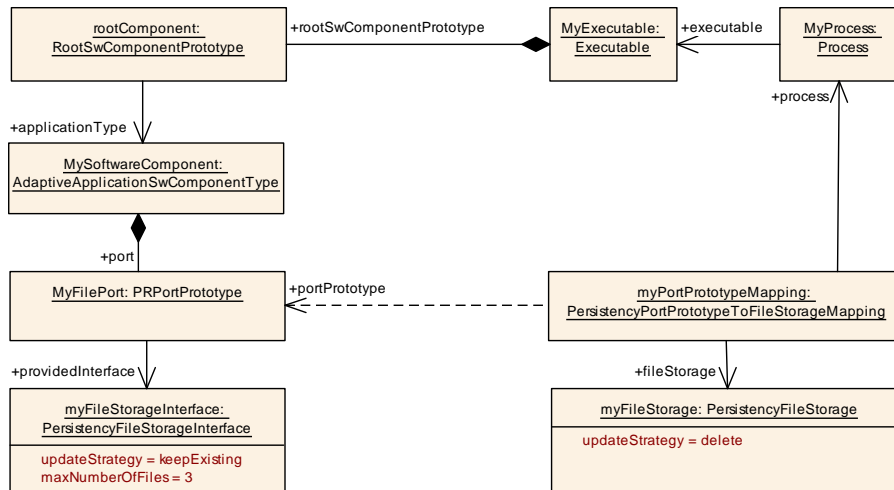


Figure A.16: Simple example modeling of persistent file (design + deployment)

It is possible to extend the modeling to a deeper level of detail and also formally describe the individual file that is subject to persistency on both design and deployment level, see Figure A.17.

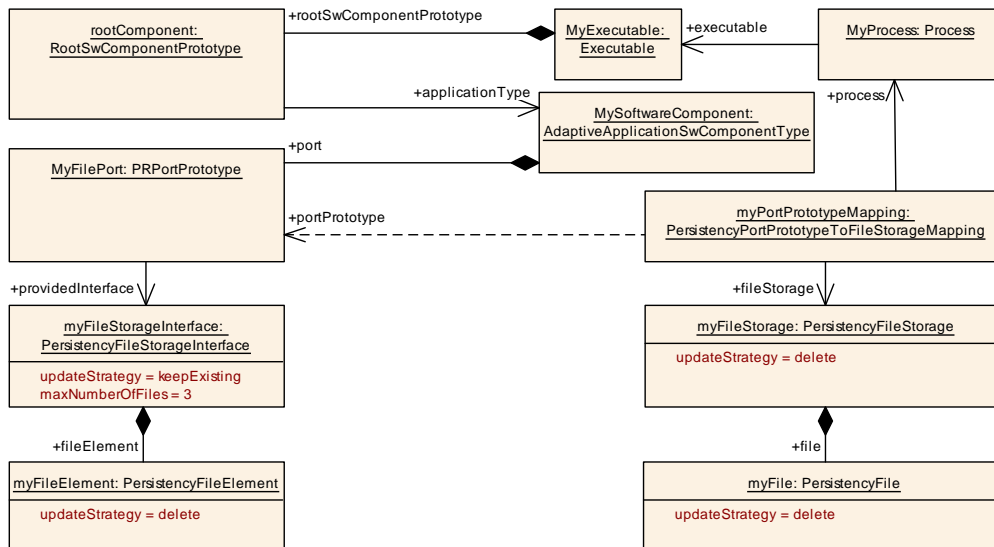


Figure A.17: Advanced example modeling of persistent file (design + deployment)

A.8 Definition of Phm interaction

This chapter contains examples for the modeling of platform health management. The example is structured into Application design and platform health management configuration.

A.8.1 Phm Application Design example

The simple example provided in figure A.18 shows the definition of a `PhmHealthChannelInterface` and a `PhmSupervisedEntityInterface`. This example will also be used in the subsequent section to define the platform health management configuration.

The `PhmHealthChannelInterface` `HealthChannel_A` defines two status attributes:

- *Good*
- *Bad*

The `PhmSupervisedEntityInterface` `SupervisedEntity_B` defines two checkpoints:

- *CP1*
- *CP2*

The `AdaptiveApplicationSwComponentType` `AdaptiveApplication` defines two `RPortPrototypes`

- *Hc_A* typed by `HealthChannel_A`

- *Se_B* typed by *SupervisedEntity_B*

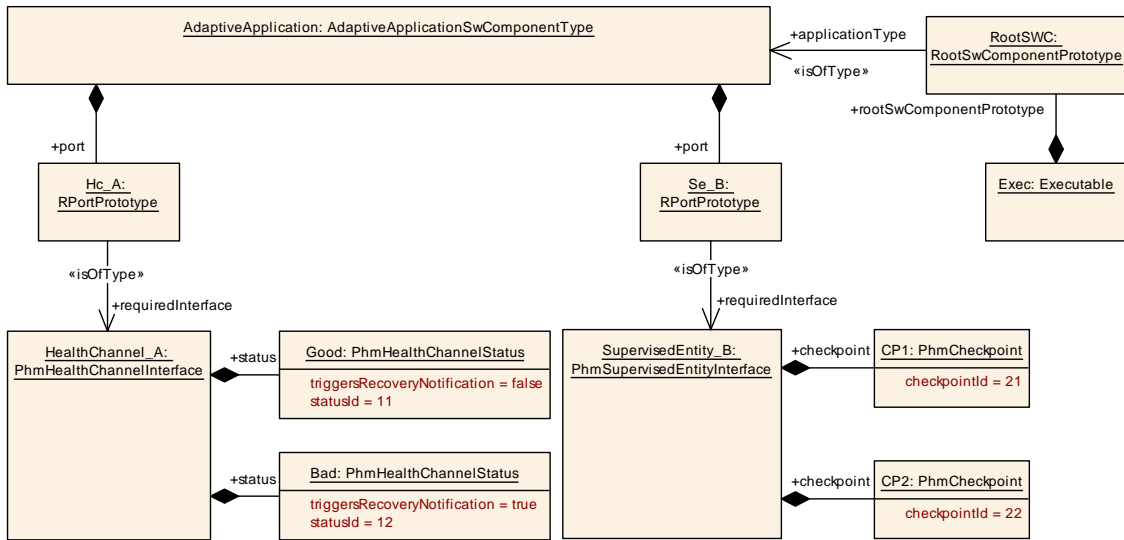


Figure A.18: Example modeling of Health Channel and Supervised Entity

A.8.2 Phm configuration example

When defining the configuration contribution for Phm it is required to first create representatives of the application design model artifacts (health channel status and supervised entity checkpoints) in the Phm configuration context. This is shown in figure A.19.

In this example the *PHM PlatformHealthManagementContribution* defines placeholder elements which refer to the respective application design model artifacts:

Example health channel:

- *Hc_Status_Good* refers to the *Good* status of *HealthChannel_A*
- *Hc_Status_Bad* refers to the *Bad* status of *HealthChannel_A*

Example supervision checkpoint:

- *Se_B_Cp1* refers to the *CP1* checkpoint of *SupervisedEntity_B*
- *Se_B_Cp2* refers to the *CP2* checkpoint of *SupervisedEntity_B*

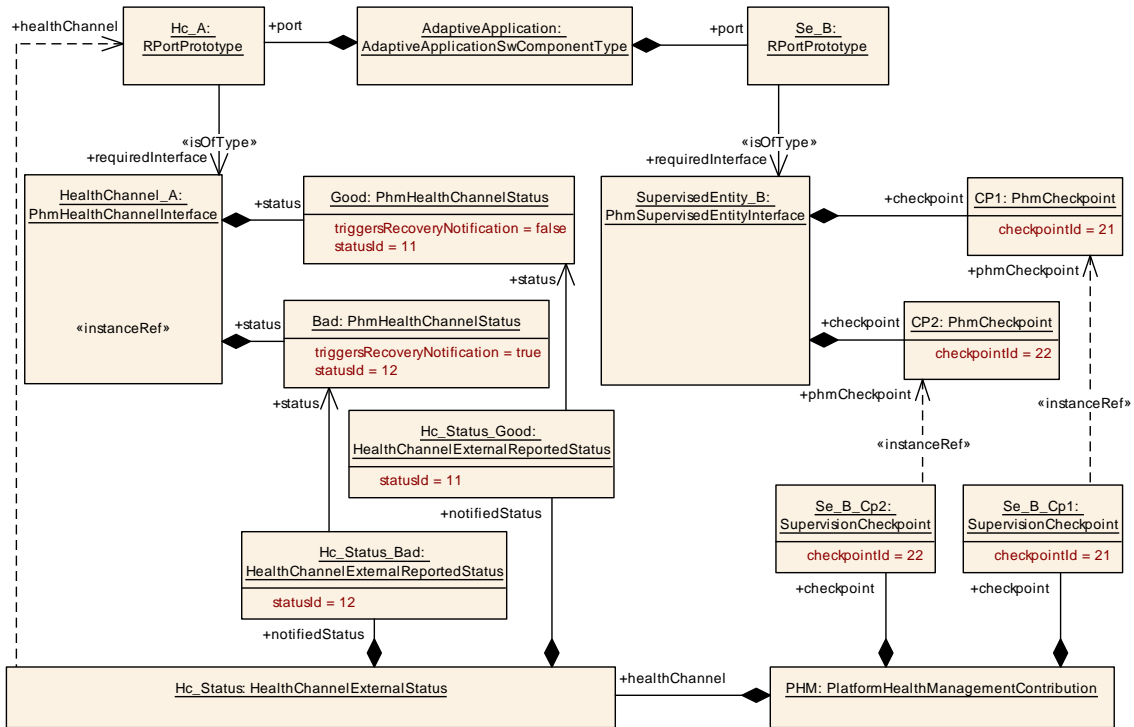


Figure A.19: Example modeling of Phm placeholder definition

Note how the numbers from the `PhmCheckpoint.checkpointId` have been replicated in `SupervisionCheckpoint.checkpointId` and `PhmHealthChannelStatus.statusId` have been replicated in `HealthChannelExternalReportedStatus.statusId`.

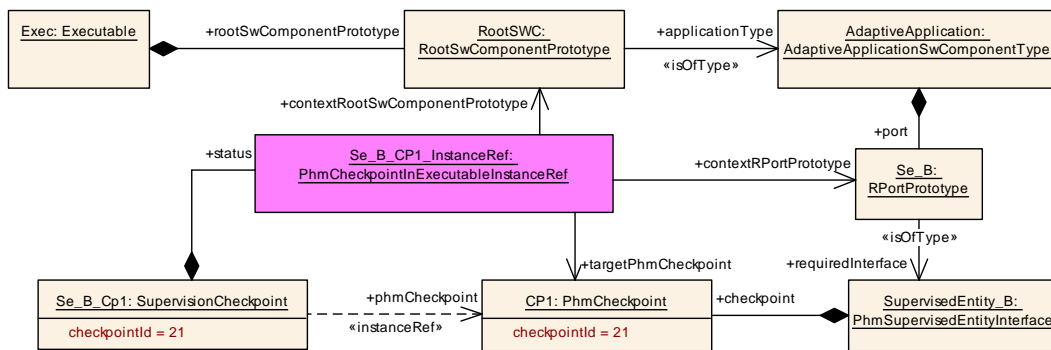


Figure A.20: Example modeling of Phm instance reference

Note that these instance references have a composite nature, which is shown in example figure A.20. Here it is shown that in order to instance reference from the `SupervisionCheckpoint Se_B_Cp1` to the `PhmCheckpoint CP1` there is the structured reference required consisting of

- `contextRootSwComponentPrototype`
- `contextRPortPrototype`
- `targetPhmCheckpoint`

A.9 Scenarios to define a Vector

This section contains a non-comprehensive list of possible scenarios for the definition of a `CppImplementationDataType` of category VECTOR.

Please note that the general information contained in this chapter does not exclusively apply on to the vector data type. The latter has been picked as an arbitrary example for the visualization of the effect of configuration settings on the language binding.

Consequently, there is no further discussion of this topic with respect to a different kind of container data type.

Please note that for these example scenarios the namespace of a `CustomCppImplementationDataType` is assumed to be set to `x::y` and the `shortName` is assumed to be set to `CustVec`.

The `shortName` of a `StdCppImplementationDataType` is assumed to be set to `MyVec`.

If a custom `Allocator` is used in a scenario the value of `Allocator.shortName` shall be assumed to have the value `CustAlloc`.

Scenario	array size	custom allocator	custom type	Resulting C++ Code
I	No	No	No	<code>using MyVec = ara::core::Vector<std::uint8_t></code>
II	Yes	No	No	<code>using MyVec = ara::core::Vector<std::uint8_t> //generator warning</code>
III	Yes	Yes	No	<code>using MyVec = ara::core::Vector<std::uint8_t, CustAlloc<std::uint8_t, MaxSize>></code>
IV	No	Yes	No	<code>using MyVec = ara::core::Vector<std::uint8_t, CustAlloc<std::uint8_t>></code>
V	Yes	Yes	Yes	<code>x::y::CustVec<ara::core::uint8_t, CustAlloc<std::uint8_t, MaxSize>></code>
VI	Yes	No	Yes	<code>x::y::CustVec<std::uint8_t></code>
VII	No	Yes	Yes	<code>x::y::CustVec<std::uint8_t, CustAlloc<std::uint8_t>></code>
VIII	No	No	Yes	<code>x::y::CustVec<std::uint8_t></code>

Table A.1: Example definitions of a `CppImplementationDataType` of category VECTOR

A.10 Example for the definition of state management

A.10.1 Consideration of User Perspective

The modeling of state management is described in sections 3.7 and 10.14.

Obviously, the definition of the meta-classes to serialize the state management configuration does not have to directly reflect the mental model which some creators of a specific state management instance have in mind.

This means that the design approach in the user domain might be entirely different from the definition of the respective meta-classes. Such a situation is manageable as long as the mental model applied on the side of the users can be mapped to the meta-classes and their relationships.

To be more concrete, some of the users who define state management configurations, **prefer to think in terms of tables that combine an input trigger or error value with a target state**, see Table A.2 as an example.

This chapter exemplifies such an approach for how a table-based configuration of state changes could look like and how the table columns map to the meta-model.

A.10.2 Scenario for Trigger

For the definition of the response to triggers, some people define a table, which maps the *trigger value* to the assumed *current state* and the *next state*.

In other words, if the *trigger value* is found in one row and the value of the current state in the state machine is equal to the assumed *current state* in the applicable table row, then the state machine shall be switched to the *next state* listed in the table row.

Please note that the concrete table entries for the states might consist of numerals or literals, depending on the personal preference of the user.

Of course, the meta-model allows to create a connection between the table values either by means of the numerical `ModeDeclaration.value` or the textual `ModeDeclaration.shortName`.

An example for such a table is listed in Table A.2.

Trigger Value	Current State	Next State
1001	0	1
1000	1	0
1000	2	0
1000	3	0
1000	4	0

Table A.2: Example table for associating trigger with state changes using the values

It is important that it is possible to map this mental model of state management configuration to the existing meta-model.

Alternatively, it would be possible to create the table using the `shortName` of the respective `ModeDeclarations` and thereby create the exact same semantics, see Table A.3.

Trigger Value	Current State	Next State
1001	StateOff	StateFull_primary
1000	StateFull_primary	StateOff
1000	State_Fallback	StateOff
1000	State3	StateOff
1000	State4	StateOff

Table A.3: Example table for associating trigger with state changes using the `shortName`

Thus, the correspondence of table columns to meta-model elements is documented in Table A.4.

Table Column of Table A.2	Meta-Model Element, see Figure 10.63
Trigger Value	<code>StateManagementCompareCondition.compareValue</code>
Current State	<code>StateManagementTriggerCompareRule.assumedCurrentState</code>
Next State	<code>StateManagementRequestRule.nextState</code>

Table A.4: Correspondence of table columns and meta-model elements for triggers

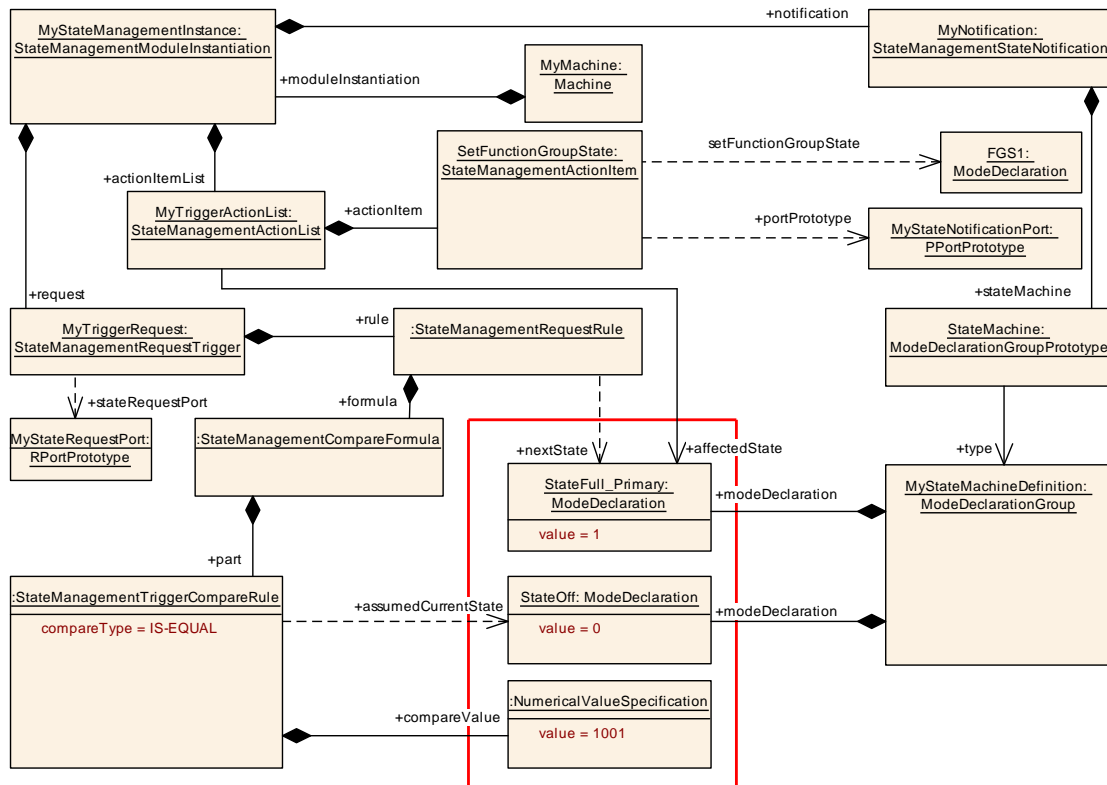


Figure A.21: Example state management modeling for a trigger request

In particular, the Figure A.21 and, with more detail, Listing A.7 depict the modeling of the relevant part for the first row of Table A.2.

The relevant parts of the table row are located inside the red box in Figure A.21.

The concrete usage of `StateManagementCompareCondition.compareValue` can be found in the listing as part of the `STATE-MANAGEMENT-TRIGGER-COMPARE-RULE`, specifically by `COMPARE-TYPE` and `COMPARE-VALUE`.

The `StateManagementTriggerCompareRule.assumedCurrentState` is represented by the `ASSUMED-CURRENT-STATE-IREF`.

And finally, the `StateManagementRequestRule.nextState` can be found at the `NEXT-STATE-IREF` inside the `STATE-MANAGEMENT-RQUEST-RULE`.

```

<STATE-MANAGEMENT-REQUEST-TRIGGER>
  <SHORT-NAME>MyTriggerRequest</SHORT-NAME>
  <STATE-REQUEST-PORT-IREF>
    <CONTEXT-ROOT-SW-COMPONENT-PROTOTYPE-REF DEST="ROOT-SW-COMPONENT-
      PROTOTYPE">/Executables/MyStateManager/MyRootComponent</CONTEXT-ROOT
      -SW-COMPONENT-PROTOTYPE-REF>
    <TARGET-R-PORT-PROTOTYPE-REF DEST="R-PORT-PROTOTYPE">/SwComponentTypes/
      StateManagerComp/MyStateRequestPort</TARGET-R-PORT-PROTOTYPE-REF>
  </STATE-REQUEST-PORT-IREF>
  <RULES>
    <STATE-MANAGEMENT-REQUEST-RULE>
      <FORMULA>
        <PARTS>
          <STATE-MANAGEMENT-TRIGGER-COMPARE-RULE>
            <COMPARE-TYPE>IS-EQUAL</COMPARE-TYPE>
            <COMPARE-VALUE>
              <NUMERICAL-VALUE-SPECIFICATION>
                <VALUE>1001</VALUE>
              </NUMERICAL-VALUE-SPECIFICATION>
            </COMPARE-VALUE>
            <ASSUMED-CURRENT-STATE-IREF>
              <CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF DEST="MODE-
                DECLARATION-GROUP-PROTOTYPE">/Machines/MyMachine/
                MyStateManagementInstance/MyNotification/StateMachine</
                CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF>
              <TARGET-MODE-DECLARATION-REF DEST="MODE-DECLARATION">/
                ModeDeclarationGroups/MyStateMachineDefinition/StateOff</
                TARGET-MODE-DECLARATION-REF>
            </ASSUMED-CURRENT-STATE-IREF>
          </STATE-MANAGEMENT-TRIGGER-COMPARE-RULE>
        </PARTS>
      </FORMULA>
      <NEXT-STATE-IREF>
        <CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF DEST="MODE-
          DECLARATION-GROUP-PROTOTYPE">/Machines/MyMachine/
          MyStateManagementInstance/MyNotification/StateMachine</CONTEXT-
          MODE-DECLARATION-GROUP-PROTOTYPE-REF>
        <TARGET-MODE-DECLARATION-REF DEST="MODE-DECLARATION">/
          ModeDeclarationGroups/MyStateMachineDefinition/StateFull_primary
        </TARGET-MODE-DECLARATION-REF>
      </NEXT-STATE-IREF>
    </STATE-MANAGEMENT-REQUEST-RULE>
  </RULES>
</STATE-MANAGEMENT-REQUEST-TRIGGER>
    
```

```

        </STATE-MANAGEMENT-REQUEST-RULE>
    </RULES>
</STATE-MANAGEMENT-REQUEST-TRIGGER>
    
```

Listing A.7: Example for the definition of a [StateManagementRequestTrigger](#)

The [ModeDeclarationGroup](#) that types the internal state machine is depicted in Listing A.8. The definition of values that represent the states in Table A.2 are visible in the listing, see VALUE.

```

<MODE-DECLARATION-GROUP>
  <SHORT-NAME>MyStateMachineDefinition</SHORT-NAME>
  <MODE-DECLARATIONS>
    <MODE-DECLARATION>
      <SHORT-NAME>StateOff</SHORT-NAME>
      <VALUE>0</VALUE>
    </MODE-DECLARATION>
    <MODE-DECLARATION>
      <SHORT-NAME>StateFull_primary</SHORT-NAME>
      <VALUE>1</VALUE>
    </MODE-DECLARATION>
    <MODE-DECLARATION>
      <SHORT-NAME>State_Fallback</SHORT-NAME>
      <VALUE>2</VALUE>
    </MODE-DECLARATION>
  </MODE-DECLARATIONS>
</MODE-DECLARATION-GROUP>
    
```

Listing A.8: Example for the definition of a [ModeDeclarationGroup](#) to define the states of an internal state machine

The modeling of the applicable [StateManagementActionList](#) is sketched in Listing A.9.

Please note that the modeling of the [PortPrototypes](#) and the internal structure of the [Executable](#) is not explicitly documented in this example because there are other example demonstrating this aspect already.

```

<STATE-MANAGEMENT-ACTION-LIST>
  <SHORT-NAME>MyTriggerActionList</SHORT-NAME>
  <ACTION-ITEMS>
    <STATE-MANAGEMENT-SET-FUNCTION-GROUP-STATE-ACTION-ITEM>
      <SHORT-NAME>SetFunctionGroupState</SHORT-NAME>
      <PORT-PROTOTYPE-IREF>
        <CONTEXT-ROOT-SW-COMPONENT-PROTOTYPE-REF DEST="ROOT-SW-COMPONENT-
          PROTOTYPE">/Executables/MyStateManager/MyRootComponent</CONTEXT-
          ROOT-SW-COMPONENT-PROTOTYPE-REF>
        <TARGET-P-PORT-PROTOTYPE-REF DEST="P-PORT-PROTOTYPE">/
          SwComponentTypes/StateManagerComp/MyStateNotificationPort</
          TARGET-P-PORT-PROTOTYPE-REF>
      </PORT-PROTOTYPE-IREF>
      <SET-FUNCTION-GROUP-STATE-IREF>
        <CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF DEST="MODE-
          DECLARATION-GROUP-PROTOTYPE">/FunctionGroups/MyFumctionGroups/
          FG1</CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF>
    </STATE-MANAGEMENT-SET-FUNCTION-GROUP-STATE-ACTION-ITEM>
  </ACTION-ITEMS>
</STATE-MANAGEMENT-ACTION-LIST>
    
```

```

        <TARGET-MODE-DECLARATION-REF DEST="MODE-DECLARATION">/
            ModeDeclarationGroups/MyFunctionGroupStates/FGS1</TARGET-MODE-
                DECLARATION-REF>
        </SET-FUNCTION-GROUP-STATE-IREF>
    </STATE-MANAGEMENT-SET-FUNCTION-GROUP-STATE-ACTION-ITEM>
</ACTION-ITEMS>
</STATE-MANAGEMENT-ACTION-LIST>
    
```

Listing A.9: Example for the definition of a [StateManagementActionList](#) for the trigger request

The modeling of the [FunctionGroupSet](#) mentioned in the example is sketched in Listing A.10.

```

<FUNCTION-GROUP-SET>
    <SHORT-NAME>MyFunctionGroups</SHORT-NAME>
    <FUNCTION-GROUPS>
        <MODE-DECLARATION-GROUP-PROTOTYPE>
            <SHORT-NAME>FG1</SHORT-NAME>
            <TYPE-TREF DEST="MODE-DECLARATION-GROUP">/ModeDeclarationGroups/
                MyFunctionGroupStates</TYPE-TREF>
        </MODE-DECLARATION-GROUP-PROTOTYPE>
    </FUNCTION-GROUPS>
</FUNCTION-GROUP-SET>
    
```

Listing A.10: Example for the definition of a [FunctionGroupSet](#) for the discussed example

The modeling of the [ModeDeclarationGroup](#) that defines the [Function Group States](#) named “FGS1” and “FGS2” that are used in the example is sketched in Listing A.11.

```

<MODE-DECLARATION-GROUP>
    <SHORT-NAME>MyFunctionGroupStates</SHORT-NAME>
    <MODE-DECLARATIONS>
        <MODE-DECLARATION>
            <SHORT-NAME>FGS1</SHORT-NAME>
        </MODE-DECLARATION>
        <MODE-DECLARATION>
            <SHORT-NAME>FGS2</SHORT-NAME>
        </MODE-DECLARATION>
    </MODE-DECLARATIONS>
</MODE-DECLARATION-GROUP>
    
```

Listing A.11: Example for the definition of a [ModeDeclarationGroup](#) for defining the [Function Group States](#) used in the discussed example

Finally, the modeling of the [StateManagementStateNotification](#) is sketched in Listing A.12.

Please note that the definition of the `STATE-MACHINE` in Listing A.12 relates to the definition of internal states (modeled as a `MODE-DECLARATION-GROUP`), as sketched in Listing A.8.

```

<STATE-MANAGEMENT-STATE-NOTIFICATION>
    <SHORT-NAME>MyNotification</SHORT-NAME>
    
```

```

<NOTIFICATION-PORT-IREF>
  <CONTEXT-ROOT-SW-COMPONENT-PROTOTYPE-REF DEST="ROOT-SW-COMPONENT-
    PROTOTYPE"/>Executables/MyStateManager/MyRootComponent</CONTEXT-ROOT
    -SW-COMPONENT-PROTOTYPE-REF>
  <TARGET-P-PORT-PROTOTYPE-REF DEST="P-PORT-PROTOTYPE"/>SwComponentTypes/
    StateManagerComp/MyStateNotificationPort</TARGET-P-PORT-PROTOTYPE-
    REF>
</NOTIFICATION-PORT-IREF>
<STATE-MACHINE>
  <SHORT-NAME>StateMachine</SHORT-NAME>
  <TYPE-TREF DEST="MODE-DECLARATION-GROUP"/>/ModeDeclarationGroups/
    MyStateMachineDefinition</TYPE-TREF>
</STATE-MACHINE>
</STATE-MANAGEMENT-STATE-NOTIFICATION>
    
```

Listing A.12: Example for the definition of a [StateManagementStateNotification](#) for communicating state changes within the discussed example

A.10.3 Scenario for Error

For the definition of the response to errors, some people define a table, which maps the *trigger value* and the *next state* that is to be switched to if the particular error value is received.

In other words, if the value of *error code* is found in one row, then the state machine shall be switched to the *next state* listed in the table row, **independently** of the values of the current state of the state machine.

An example for such a table is listed in Table [A.5](#).

Error Code	Next State
11	2
12	3
111	2
23	4
24	0
244	5

Table A.5: Example table for associating error with state changes

The correspondence of table columns to meta-model elements is documented in Table [A.6](#).

Table Column of Table A.5	Meta-Model Element, see Figure 10.64
ErrorCode	<code>StateManagementCompareCondition.compareValue</code>
Next State	<code>StateManagementRequestRule.nextState</code>

Table A.6: Correspondence of table columns and meta-model elements for errors

In particular, the Figure A.22 and, with more detail, Listing A.13 depict the modeling of the relevant part for the first row of Table A.5.

The relevant parts of the table row are located inside the red box in Figure A.22.

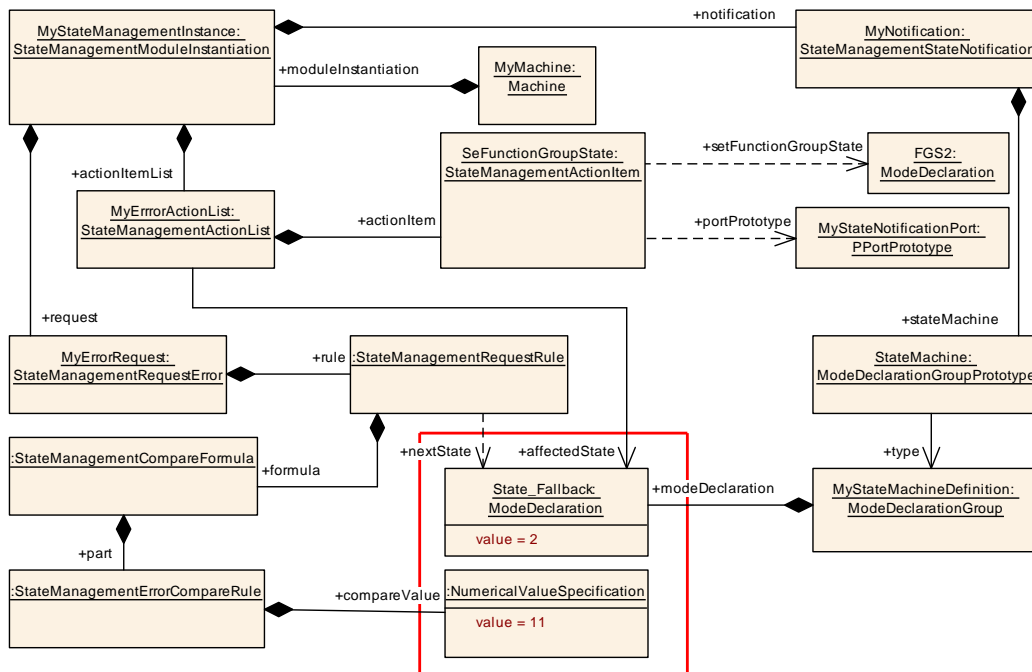


Figure A.22: Example state management modeling for an error request

This example features partly the same model elements as the previous trigger example.

But in this specific case, there is a different `StateManagementActionList` named “MyErrorActionList” that refers to different `modeDeclaration` named “State_Fallback” (that is represented by the numerical value 2) in the role `affectedState`.

Obviously, a `StateManagementRequestError` named “MyErrorRequest” exists that aggregates its own `rule`. The `StateManagementErrorCompareRule.compareValue` has the value 11.

This fits to the first row of Table A.5.

```
<STATE-MANAGEMENT-REQUEST-ERROR>
  <SHORT-NAME>MyErrorRequest</SHORT-NAME>
```

```

<STATE-REQUEST-PORT-IREF>
  <CONTEXT-ROOT-SW-COMPONENT-PROTOTYPE-REF DEST="ROOT-SW-COMPONENT-
    PROTOTYPE"/>/Executables/MyStateManager/MyRootComponent</CONTEXT-ROOT
    -SW-COMPONENT-PROTOTYPE-REF>
  <TARGET-R-PORT-PROTOTYPE-REF DEST="R-PORT-PROTOTYPE"/>/SwComponentTypes/
    StateManagerComp/MyErrorRequestPort</TARGET-R-PORT-PROTOTYPE-REF>
</STATE-REQUEST-PORT-IREF>
<RULES>
  <STATE-MANAGEMENT-REQUEST-RULE>
    <FORMULA>
      <PARTS>
        <STATE-MANAGEMENT-ERROR-COMPARE-RULE>
          <COMPARE-TYPE>IS-EQUAL</COMPARE-TYPE>
          <COMPARE-VALUE>
            <NUMERICAL-VALUE-SPECIFICATION>
              <VALUE>11</VALUE>
            </NUMERICAL-VALUE-SPECIFICATION>
          </COMPARE-VALUE>
        </STATE-MANAGEMENT-ERROR-COMPARE-RULE>
      </PARTS>
    </FORMULA>
    <NEXT-STATE-IREF>
      <CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF DEST="MODE-
        DECLARATION-GROUP-PROTOTYPE"/>/Machines/MyMachine/
        MyStateManagementInstance/MyNotification/StateMachine</CONTEXT-
        MODE-DECLARATION-GROUP-PROTOTYPE-REF>
      <TARGET-MODE-DECLARATION-REF DEST="MODE-DECLARATION"/>/
        ModeDeclarationGroups/MyStateMachineDefinition/State_Fallback</
        TARGET-MODE-DECLARATION-REF>
    </NEXT-STATE-IREF>
  </STATE-MANAGEMENT-REQUEST-RULE>
</RULES>
</STATE-MANAGEMENT-REQUEST-ERROR>
    
```

Listing A.13: Example for the definition of a [StateManagementRequestError](#)

The modeling of the applicable [StateManagementActionList](#) is sketched in Listing A.14.

```

<STATE-MANAGEMENT-ACTION-LIST>
  <SHORT-NAME>MyErrorActionList</SHORT-NAME>
  <ACTION-ITEMS>
    <STATE-MANAGEMENT-SET-FUNCTION-GROUP-STATE-ACTION-ITEM>
      <SHORT-NAME>SetFunctionGroupState</SHORT-NAME>
      <PORT-PROTOTYPE-IREF>
        <CONTEXT-ROOT-SW-COMPONENT-PROTOTYPE-REF DEST="ROOT-SW-COMPONENT-
          PROTOTYPE"/>/Executables/MyStateManager/MyRootComponent</CONTEXT-
          ROOT-SW-COMPONENT-PROTOTYPE-REF>
        <TARGET-P-PORT-PROTOTYPE-REF DEST="P-PORT-PROTOTYPE"/>/
          SwComponentTypes/StateManagerComp/MyStateNotificationPort</
          TARGET-P-PORT-PROTOTYPE-REF>
      </PORT-PROTOTYPE-IREF>
      <SET-FUNCTION-GROUP-STATE-IREF>
        <CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF DEST="MODE-
          DECLARATION-GROUP-PROTOTYPE"/>/FunctionGroups/MyFunctionGroups/
          FG1</CONTEXT-MODE-DECLARATION-GROUP-PROTOTYPE-REF>
      </SET-FUNCTION-GROUP-STATE-IREF>
    </STATE-MANAGEMENT-SET-FUNCTION-GROUP-STATE-ACTION-ITEM>
  </ACTION-ITEMS>
</STATE-MANAGEMENT-ACTION-LIST>
    
```



```
<TARGET-MODE-DECLARATION-REF DEST="MODE-DECLARATION">/
  ModeDeclarationGroups/MyFunctionGroupStates/FGS2</TARGET-MODE-
  DECLARATION-REF>
</SET-FUNCTION-GROUP-STATE-IREF>
</STATE-MANAGEMENT-SET-FUNCTION-GROUP-STATE-ACTION-ITEM>
</ACTION-ITEMS>
</STATE-MANAGEMENT-ACTION-LIST>
```

Listing A.14: Example for the definition of a [StateManagementActionList](#) for the error request

B Custom Model Extension

B.1 Overview

The AUTOSAR meta-model is obviously limited to cover the standardized part of AUTOSAR modeling. This means that the modeling stops in some cases although it is clear that the modeling capability provided by the meta-model is not sufficient to create a viable configuration.

One example for this aspect is the meta-class `ProvidedUserDefinedServiceInstance`. AUTOSAR intentionally does nothing but provide this meta-class as a basis for custom additions that configure custom transport for services.

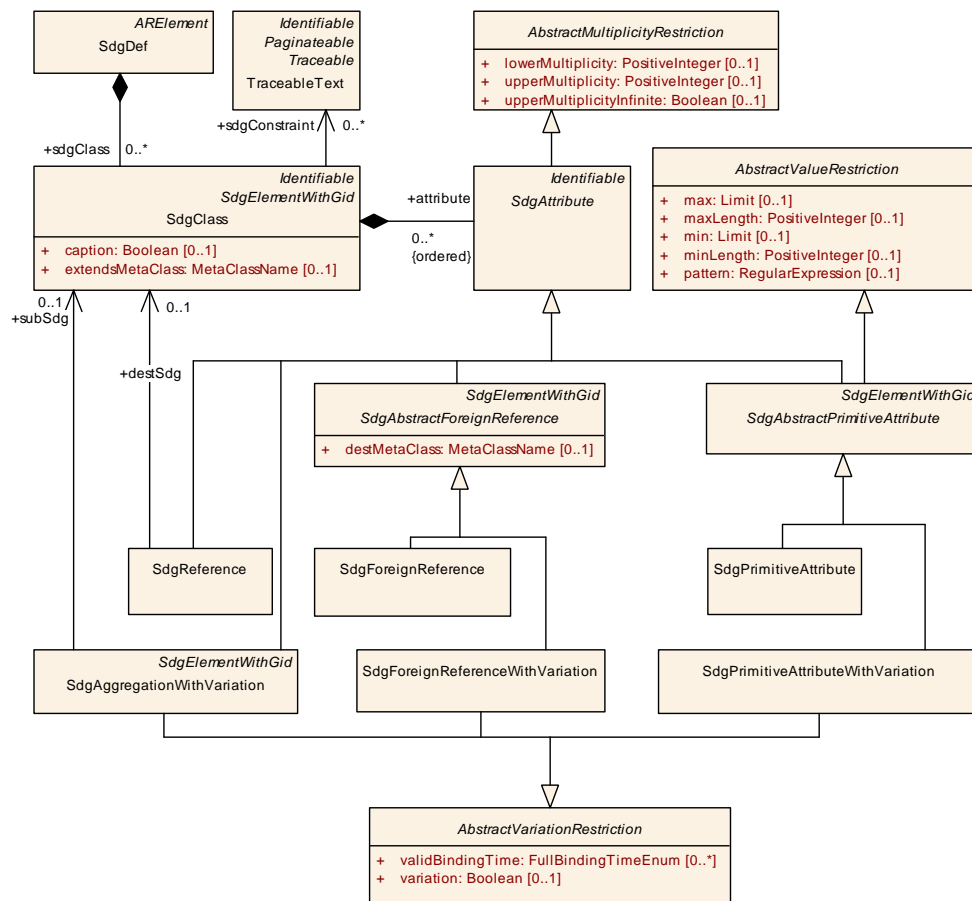


Figure B.1: Modeling of the custom model extensions

The necessary details that are required in order to actually work with a user-defined service instance are not mentioned because there are too many possibilities of how such a `ProvidedUserDefinedServiceInstance` could be modeled that AUTOSAR is simply unable to cover them all.

The typical solution for such a problem is to rely on the definition of *special data groups*, formalized as `Sdg`. However, the direct usage of an `Sdg` within a project comes with the risk that the `Sdg` is used slightly different in certain parts of the project.

Class	Sdg			
Package	M2::MSR::AsamHdo::SpecialData			
Note	<p>Sdg (SpecialDataGroup) is a generic model which can be used to keep arbitrary information which is not explicitly modeled in the meta-model.</p> <p>Sdg can have various contents as defined by sdgContentsType. Special Data should only be used moderately since all elements should be defined in the meta-model.</p> <p>Thereby SDG should be considered as a temporary solution when no explicit model is available. If an sdgCaption is available, it is possible to establish a reference to the sdg structure.</p>			
Base	ARObject			
Aggregated by	AdminData.sdg , BuildActionEnvironment.sdg , BuildActionInvoker.sdg , BuildActionIoElement.sdg , FileInfoComment.sdg , RptHook.sdg , SdgContents.sdg , VariationPoint.sdg			
Attribute	Type	Mult.	Kind	Note
gid	NameToken	1	attr	This attribute specifies an identifier. Gid comes from the SGML/XML-Term "Generic Identifier" which is the element name in XML. The role of this attribute is the same as the name of an XML - element. Tags: xml.attribute=true
sdgCaption	SdgCaption	0..1	aggr	This aggregation allows to assign the properties of Identifiable to the sdg . By this, a shortName etc. can be assigned to the Sdg . Tags: xml.sequenceOffset=20
sdgContentsType	SdgContents	0..1	aggr	This is the content of the Sdg . Tags: xml.roleElement=false xml.roleWrapperElement=false xml.sequenceOffset=30 xml.typeElement=false xml.typeWrapperElement=false

Table B.1: Sdg

It would therefore be good if there were a way to describe in terms of the AUTOSAR meta-model how a [Sdg](#) is supposed to be used.

Fortunately, this is possible by means of a corner of the meta-model that had been created for exactly this purpose: [SdgClass](#) aggregates abstract class [SdgAttribute](#) that in turn inherits to a bunch of different sub-classes.

Class	SdgClass			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	<p>An SdgClass specifies the name and structure of the SDG that may be used to store proprietary data in an AUTOSAR model.</p> <p>The SdgClass is similar to an UML stereotype.</p>			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable , SdgElementWithGid			
Aggregated by	SdgDef.sdgClass			
Attribute	Type	Mult.	Kind	Note
attribute (ordered)	SdgAttribute	*	aggr	Definition of the structure of the Sdg Tags: xml.sequenceOffset=30
caption	Boolean	0..1	attr	Specifies if a caption is required. Note: only Sdgs that have a caption can be referenced Tags: xml.sequenceOffset=20





Class	SdgClass			
extendsMeta Class	MetaClassName	0..1	attr	The AUTOSAR Meta-Class that may be extended by this SdgClass. Tags: xml.sequenceOffset=10
sdgConstraint	TraceableText	*	ref	Semantic constraints that restrict the structure of the special data group. Tags: xml.sequenceOffset=40

Table B.2: SdgClass

Class	SdgAttribute (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	Describes the attributes of an Sdg.			
Base	ARObject, AbstractMultiplicityRestriction, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	SdgAbstractForeignReference, SdgAbstractPrimitiveAttribute, SdgAggregationWithVariation, SdgReference			
Aggregated by	SdgClass.attribute			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table B.3: SdgAttribute

B.2 Custom Attribute Definition

B.2.1 Custom Primitive Attribute Definition

In other words, [SdgClass](#) and [SdgAttribute](#) mimic the pattern found in the meta-model itself: meta-classes have attributes of different kinds.

With this mechanism it is possible to extend meta-class [ProvidedUserDefinedServiceInstance](#) in order to e.g. add the ability to describe an instance Id. This chapter contains a comprehensive description of how the extension mechanism can be used to implement the instance Id.

The definition starts with an [SdgDef](#) that aggregates an [SdgClass](#) with the shortName [ProvidedUserDefinedServiceInstance](#). Attribute [extendsMetaClass](#) names meta-class [ProvidedUserDefinedServiceInstance](#) as the subject to extension.

Class	SdgDef			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	A SdgDef groups several SdgClasses which belong to the same extension. The concept of an SdgDef is similar to an UML Profile. Tags: atp.recommendedPackage=SdgDefs			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			





Class	SdgDef			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
sdgClass	SdgClass	*	aggr	The owned sdgClasses which define the structure of the Sdgs Tags: xml.namePlural=SDG-CLASSES

Table B.4: SdgDef

The extension itself is modeled by an [SdgPrimitiveAttribute](#) named instanceId that is mandatory for the implementation of the user-defined service and thus has lower and upper multiplicity set to 1. The supported value interval ranges from 0..4294967295.

Class	SdgPrimitiveAttribute			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	Describes primitive special data attributes without variation. This class accepts a special data "sd" attribute.			
Base	ARObject , AbstractMultiplicityRestriction , AbstractValueRestriction , Identifiable , MultilanguageReferrable , Referrable , SdgAbstractPrimitiveAttribute , SdgAttribute , SdgElementWithGid			
Aggregated by	SdgClass.attribute			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table B.5: SdgPrimitiveAttribute

```

<SDG-DEF>
  <SHORT-NAME>InstanceExtensions</SHORT-NAME>
  <SDG-CLASSES>
    <SDG-CLASS>
      <SHORT-NAME>ProvidedUserDefinedServiceInstance</SHORT-NAME>
      <GID>acme:instanceExtensions</GID>
      <EXTENDS-META-CLASS>ProvidedUserDefinedServiceInstance</EXTENDS-META-CLASS>
      <ATTRIBUTES>
        <SDG-PRIMITIVE-ATTRIBUTE>
          <SHORT-NAME>instanceId</SHORT-NAME>
          <CATEGORY>INTEGER</CATEGORY>
          <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
          <GID>acme:instanceId</GID>
          <MAX>4294967295</MAX>
          <MIN>0</MIN>
        </SDG-PRIMITIVE-ATTRIBUTE>
      </ATTRIBUTES>
    </SDG-CLASS>
  </SDG-CLASSES>
</SDG-DEF>
    
```

Listing B.1: Example for the definition of a custom service instance id via [SdgClass](#)

Please note the definition of `gid` with value "acme:instanceExtensions" on the level of the `SdgPrimitiveAttribute` and the `gid` with value "acme:instanceId" on the level of the `SdgAttribute`.

The usage of the extension is summarized below. Note the usage of the `gid` that reflects the definition in the `SdgClass` and `SdgPrimitiveAttribute`.

Please note further that the definition of the `SdgPrimitiveAttribute` defines the "data type" of the

```
<PROVIDED-USER-DEFINED-SERVICE-INSTANCE>
  <SHORT-NAME>UDSI</SHORT-NAME>
  <ADMIN-DATA>
    <SDGS>
      <SDG GID="acme:instanceExtensions">
        <SD GID="acme:instanceId">42</SD>
      </SDG>
    </SDGS>
  </ADMIN-DATA>
</PROVIDED-USER-DEFINED-SERVICE-INSTANCE>
```

Listing B.2: Example for the specification of the value of a custom service instance id

B.2.2 Custom Complex Attribute Definition

Other extensions, e.g. using `SdgAggregationWithVariation` can be used to implement the aggregation of a complex attribute (that in turn may own primitive attributes or references).

In this case it makes sense to put the role of the aggregation into the value of `SdgAggregationWithVariation.gid`.

Note that the `SdgAggregationWithVariation` doesn't aggregate further elements but refers to an `SdgClass` that in turn contains the attributes and references.

Class	SdgAggregationWithVariation			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	Describes that the Sdg may contain another Sdg. The gid of the nested Sdg is defined by subSdg. Represents 'sdg'.			
Base	<i>ARObject, AbstractMultiplicityRestriction, AbstractVariationRestriction, Identifiable, Multilanguage Referrable, Referrable, SdgAttribute, SdgElementWithGid</i>			
Aggregated by	<code>SdgClass.attribute</code>			
Attribute	Type	Mult.	Kind	Note
subSdg	<code>SdgClass</code>	0..1	ref	Supported sub Sdg Class

Table B.6: SdgAggregationWithVariation

```
<SDG-DEF>
  <SHORT-NAME>DepExt</SHORT-NAME>
  <SDG-CLASSES>
    <SDG-CLASS>
      <SHORT-NAME>UserDefinedServiceInterfaceDeployment</SHORT-NAME>
```

```

<GID>acme:deploymentExtensions</GID>
<EXTENDS-META-CLASS>UserDefinedServiceInterfaceDeployment</EXTENDS-
  META-CLASS>
<ATTRIBUTES>
  <SDG-AGGREGATION-WITH-VARIATION>
    <SHORT-NAME>Version</SHORT-NAME>
    <GID>acme:version</GID>
    <VARIATION>>false</VARIATION>
    <SUB-SDG-REF DEST="SDG-CLASS">/CustomME/DepExt/VersionInformation
      </SUB-SDG-REF>
    </SDG-AGGREGATION-WITH-VARIATION>
  </ATTRIBUTES>
</SDG-CLASS>
<SDG-CLASS>
  <SHORT-NAME>VersionInformation</SHORT-NAME>
  <GID>acme:deploymentExtensions</GID>
  <ATTRIBUTES>
    <SDG-PRIMITIVE-ATTRIBUTE>
      <SHORT-NAME>MajorVersion</SHORT-NAME>
      <CATEGORY>INTEGER</CATEGORY>
      <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
      <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
      <GID>acme:majorVersion</GID>
      <MAX>4294967295</MAX>
      <MIN>0</MIN>
    </SDG-PRIMITIVE-ATTRIBUTE>
    <SDG-PRIMITIVE-ATTRIBUTE>
      <SHORT-NAME>MinorVersion</SHORT-NAME>
      <CATEGORY>INTEGER</CATEGORY>
      <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
      <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
      <GID>acme:minorVersion</GID>
      <MAX>4294967295</MAX>
      <MIN>0</MIN>
    </SDG-PRIMITIVE-ATTRIBUTE>
  </ATTRIBUTES>
</SDG-CLASS>
</SDG-CLASSES>
</SDG-DEF>
    
```

Listing B.3: Example for the definition of a complex version information [SdgClass](#)

The modeling of the complex aggregation is sketched in Listing B.3. an [SdgClass](#) with the `gid` set to “acme:deploymentExtensions” defines an attribute that is an [SdgAggregationWithVariation](#) with the `shortName` “Version“ that has attribute `gid` set to “acme:version”.

This means that the [SdgAggregationWithVariation](#) with the `shortName` “Version“ is aggregated in the role “version” (derived from the value of the `gid`) at the [SdgClass](#).

The [SdgAggregationWithVariation](#) in turn references another [SdgClass](#) with the `shortName` set to “VersionInformation”. This [SdgClass](#) contains two [SdgPrimitiveAttributes](#) for carrying the optional major version and the minor version. The value range of both version information is from 0 to 4294967295.

The definition side of this example is sketched in Listing B.3, the respective value side is provided in Listing B.4.

```

<USER-DEFINED-SERVICE-INTERFACE-DEPLOYMENT>
  <SHORT-NAME>UDSID</SHORT-NAME>
  <ADMIN-DATA>
    <SDGS>
      <SDG GID="acme:deploymentExtensions">
        <SDG GID="acme:version">
          <SD GID="acme:majorVersion">1</SD>
          <SD GID="acme:minorVersion">0</SD>
        </SDG>
      </SDG>
    </SDGS>
  </ADMIN-DATA>
</USER-DEFINED-SERVICE-INTERFACE-DEPLOYMENT>
    
```

Listing B.4: Example for the specification of the value of a custom version information

B.3 Custom Foreign Reference Definition

Another aspect of custom modeling is the creation of references to meta-classes derived from [Referrable](#). For this purpose, the meta-class [SdgForeignReference](#) resp. [SdgForeignReferenceWithVariation](#).

Class	SdgForeignReference			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	A reference without variation support that can point to any referable object in an AUTOSAR Model. This class accepts the special data "Sdx" reference.			
Base	<i>ARObject, AbstractMultiplicityRestriction, Identifiable, MultilanguageReferrable, Referrable, SdgAbstractForeignReference, SdgAttribute, SdgElementWithGid</i>			
Aggregated by	SdgClass.attribute			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table B.7: SdgForeignReference

Class	SdgForeignReferenceWithVariation			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	A reference with variation support that can point to any referable object in an AUTOSAR Model. This class accepts the special data "Sdx" reference.			
Base	<i>ARObject, AbstractMultiplicityRestriction, AbstractVariationRestriction, Identifiable, MultilanguageReferrable, Referrable, SdgAbstractForeignReference, SdgAttribute, SdgElementWithGid</i>			
Aggregated by	SdgClass.attribute			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table B.8: SdgForeignReferenceWithVariation

The particle “foreign” in the name of these classes represents a hint that the reference’s target is situated outside the custom modeling “bubble” depicted in Figure B.1¹.

The creation of a reference to another meta-class obviously implies the specification of the role in which the reference shall be used.

In the case of the [SdgForeignReference](#) the role of the reference may be defined in the attribute `gid`, contributed by the inheritance from meta-class [SdgElementWithGid](#).

Class	SdgElementWithGid (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	A special data group element with gid is an abstract element that shall have a name (gid, "Generic Identifier").			
Base	ARObject			
Subclasses	SdgAbstractForeignReference , SdgAbstractPrimitiveAttribute , SdgAggregationWithVariation , SdgClass			
Attribute	Type	Mult.	Kind	Note
gid	NameToken	0..1	attr	Specifies the name that identifies the element.

Table B.9: SdgElementWithGid

In true AUTOSAR fashion, a reference should always announce the intended meta-class to which it refers to. In the case of the [SdgForeignReference](#), this information can be explicitly provided by means of the attribute `destMetaClass`, inherited from [SdgAbstractForeignReference](#).

Class	SdgAbstractForeignReference (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	An abstract reference that can point to any referable object in an AUTOSAR Model.			
Base	ARObject , AbstractMultiplicityRestriction , Identifiable , MultilanguageReferrable , Referrable , SdgAttribute , SdgElementWithGid			
Subclasses	SdgForeignReference , SdgForeignReferenceWithVariation			
Aggregated by	SdgClass.attribute			
Attribute	Type	Mult.	Kind	Note
destMetaClass	MetaClassName	0..1	attr	specifies the destination meta-class of the reference.

Table B.10: SdgAbstractForeignReference

The example created for the explanation of [SdgForeignReference](#) assumes that a [ProvidedUserDefinedServiceInstance](#) wants to re-use an existing configuration for SOME/IP SD.

For this purpose, a custom extension of the meta-class [ProvidedUserDefinedServiceInstance](#) with the ability to refer to at most one [SomeipSdServerServiceInstanceConfig](#) is created.

In particular, the extension consists of the definition of a [SdgForeignReference](#) with the `gid` set to the value “acme:sdServerTimeConfig” as the representation of the role of the reference is created.

¹Of course, this naming is also a hat tip to the meta-class `EcucForeignReferenceDef`

The nature of the `SdgForeignReference` defined in this example is determined by means of the value of attribute `destMetaClass`, in this case “SomeipSdServerServiceInstanceConfig”.

The custom definition of the `SdgForeignReference` is sketched in Listing B.5.

```

<SDG-DEF>
  <SHORT-NAME>InstanceExtensions</SHORT-NAME>
  <SDG-CLASSES>
    <SDG-CLASS>
      <SHORT-NAME>ProvidedUserDefinedServiceInstance</SHORT-NAME>
      <GID>acme:instanceExtensions</GID>
      <EXTENDS-META-CLASS>ProvidedUserDefinedServiceInstance</EXTENDS-META-CLASS>
      <ATTRIBUTES>
        <SDG-FOREIGN-REFERENCE>
          <SHORT-NAME>SdServerTimeConfig</SHORT-NAME>
          <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
          <GID>acme:sdServerTimeConfig</GID>
          <DEST-META-CLASS>SomeipSdServerServiceInstanceConfig</DEST-META-CLASS>
        </SDG-FOREIGN-REFERENCE>
      </ATTRIBUTES>
    </SDG-CLASS>
  </SDG-CLASSES>
</SDG-DEF>
    
```

Listing B.5: Example for the specification of a custom foreign reference

The value side of the example in Listing B.5 can be found in Listing B.6. Note that the formalization of the reference to the respective `SomeipSdServerServiceInstanceConfig` is implemented by means of the reference `SdgContents.sdx`, wrapped into an `Sdg` where the attribute `gid` is set to the role of the reference, in this case “acme:sdServerTimeConfig”.

Class	<<atpMixed>> <code>SdgContents</code>			
Package	M2::MSR::AsamHdo::SpecialData			
Note	This meta-class represents the possible contents of a special data group. It can be an arbitrary mix of references, of primitive special data and nested special data groups.			
Base	<code>ARObject</code>			
Aggregated by	<code>Sdg.sdgContentsType</code>			
Attribute	Type	Mult.	Kind	Note
sd	<code>Sd</code>	0..1	aggr	This is one particular special data element. Tags: xml.sequenceOffset=40
sdf	<code>Sdf</code>	0..1	aggr	This is one particular special data element. Tags: xml.sequenceOffset=60





Class	<<atpMixed>> SdgContents			
sdg	Sdg	0..1	aggr	This aggregation allows to express nested special data groups. By this, any structure can be represented in SpeicalData. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=sdg, sdg.variationPoint.shortLabel vh.latestBindingTime=postBuild xml.sequenceOffset=50
sdx	Referrable	0..1	ref	Reference to any identifiable element. This allows to use Sdg even to establish arbitrary relationships.
sdx	Referrable	0..1	ref	Additional reference with variant support. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=sdx.referrable, sdx.variationPoint.shortLabel vh.latestBindingTime=postBuild

Table B.11: SdgContents

```

<PROVIDED-USER-DEFINED-SERVICE-INSTANCE>
  <SHORT-NAME>UDSI</SHORT-NAME>
  <ADMIN-DATA>
    <SDGS>
      <SDG GID="acme:instanceExtensions">
        <SDG GID="acme:sdServerTimeConfig">
          <SDX-REF DEST="SOMEIP-SD-SERVER-SERVICE-INSTANCE-CONFIG"/>SD/
            MyConf</SDX-REF>
        </SDG>
      </SDG>
    </SDGS>
  </ADMIN-DATA>
</PROVIDED-USER-DEFINED-SERVICE-INSTANCE>
    
```

Listing B.6: Example for the specification of the value of a custom foreign reference

B.4 Custom Subclass Configuration

Using the mechanism of custom model extensions it is also possible to mimic the creation of custom “subclasses”.

A possible candidate for the creation of a “subclass” outside the explicitly formalized meta-model could be the [ProvidedUserDefinedServiceInstance](#). The intention could, for example, be to provide a configuration for an IPC-specific “subclass”.

A simple example of how an extension that defines a “subclass” might look like is sketched in Listing [B.7](#).

The specific approach in this case is to define an [SdgClass](#) to extend [ProvidedUserDefinedServiceInstance](#) and this extension refers - via the aggregation of an [SdgAggregationWithVariation](#) - to another [SdgClass](#) (in this case with the

`shortName` “IpcProvidedServiceInstanceAttributes”) where the attributes of the custom “subclass” are defined.

On the value side, the definition of the attribute values of the “subclass” are defined in a quite straight-forward manner (see Listing B.8).

Please note that the value side in this example does not reflect the definition side in terms of the usage of values of attribute `gid` 100%. The existence of the `Sdg-Class` with `shortName` “IpcProvidedServiceInstanceAttributes” is not represented on the value side.

But, on the other hand, the intended semantics of defining an instance identifier in the context of the custom model of a “ProvidedIpcServiceInstance” can be conveyed perfectly without it.

```

<SDG-DEF>
  <SHORT-NAME>SubclassConfiguration</SHORT-NAME>
  <SDG-CLASSES>
    <SDG-CLASS>
      <SHORT-NAME>ProvidedUserDefinedServiceInstance</SHORT-NAME>
      <GID>acme:providedIpcServiceInstance</GID>
      <EXTENDS-META-CLASS>ProvidedUserDefinedServiceInstance</EXTENDS-META-CLASS>
      <ATTRIBUTES>
        <SDG-AGGREGATION-WITH-VARIATION>
          <SHORT-NAME>IpcSubclass</SHORT-NAME>
          <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
          <GID>acme:attributes</GID>
          <VARIATION>>false</VARIATION>
          <SUB-SDG-REF DEST="SDG-CLASS"/>CustomME/SubclassConfiguration/IpcProvidedServiceInstanceAttributes</SUB-SDG-REF>
        </SDG-AGGREGATION-WITH-VARIATION>
      </ATTRIBUTES>
    </SDG-CLASS>
    <SDG-CLASS>
      <SHORT-NAME>IpcProvidedServiceInstanceAttributes</SHORT-NAME>
      <GID>acme:ipcProvidedServiceInstanceAttributes</GID>
      <ATTRIBUTES>
        <SDG-PRIMITIVE-ATTRIBUTE>
          <SHORT-NAME>instanceId</SHORT-NAME>
          <CATEGORY>INTEGER</CATEGORY>
          <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
          <GID>acme:instanceId</GID>
          <MAX>65535</MAX>
          <MIN>0</MIN>
        </SDG-PRIMITIVE-ATTRIBUTE>
      </ATTRIBUTES>
    </SDG-CLASS>
  </SDG-CLASSES>
    
```

Listing B.7: Example for the specification of a custom “subclass”

And since the point of the whole approach is the creation of a custom modeling anyway, the only relevant condition for the validity of such modeling is that the affected AUTOSAR tools know how to properly parse and interpret the resulting model.

```

<PROVIDED-USER-DEFINED-SERVICE-INSTANCE>
  <SHORT-NAME>ipcProvidedSI</SHORT-NAME>
  <ADMIN-DATA>
    <SDGS>
      <SDG GID="acme:providedIpcServiceInstance">
        <SDG GID="acme:attributes">
          <SD GID="acme:instanceId">3485</SD>
        </SDG>
      </SDG>
    </SDGS>
  </ADMIN-DATA>
</PROVIDED-USER-DEFINED-SERVICE-INSTANCE>
    
```

Listing B.8: Example for the specification of a service instance in an IPC “subclass”

B.5 Custom Constraints

Another aspect that can be solved by means of model customizations is the definition of model constraints that go beyond the potentially existing constraints formulated in AUTOSAR.

In the example sketched in Listing B.9 a constraint is formulated for attribute `Executable.minimumTimerGranularity`.

```

<SDG-DEF>
  <SHORT-NAME>ModelConstraint</SHORT-NAME>
  <SDG-CLASSES>
    <SDG-CLASS>
      <SHORT-NAME>Executable</SHORT-NAME>
      <GID>acme:executableExtensions</GID>
      <EXTENDS-META-CLASS>Executable</EXTENDS-META-CLASS>
      <ATTRIBUTES>
        <SDG-PRIMITIVE-ATTRIBUTE>
          <SHORT-NAME>minimumTimerGranularity</SHORT-NAME>
          <CATEGORY>FLOAT</CATEGORY>
          <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
          <MAX>0.5</MAX>
          <MIN>0.001</MIN>
        </SDG-PRIMITIVE-ATTRIBUTE>
      </ATTRIBUTES>
    </SDG-CLASS>
  </SDG-CLASSES>
</SDG-DEF>
    
```

Listing B.9: Example for the specification of a custom model constraint

On the one hand, the example expresses the expectation that the attribute `Executable.minimumTimerGranularity` shall exist and the second aspect of the constraint is that it shall have a value that’s between 0.001 and 0.5.

B.6 Definition of Reference from SdgClass to SdgClass

Another case that could be relevant for a custom model extension is the creation of a reference between two [Sdg](#) elements on the value side.

Semi-formal support for this scenario can be defined by means of the definition of two [SdgClass](#) elements where one defines a reference to the other.

A caveat applies. Of course, two [SdgClass](#) elements could reference each other by means of their [shortName](#)-paths (because they are derived from [Identifiable](#)).

But that's not the point, the intended reference on the value side shall exist from one [Sdg](#) (that corresponds to one of the [SdgClass](#) elements on the definition side) to another [Sdg](#) (which corresponds to the other [SdgClass](#) element on the definition side).

[Sdg](#) itself is not derived from [Referrable](#) and therefore does not have a [shortName](#) that could be used for reference building purposes.

In order to support the creation of a reference from one [Sdg](#) to another a mechanism was created using a reference from an [Sdg](#) to an [SdgCaption](#) in the role [sdx](#).

In other words, an [Sdg](#) may aggregate an [SdgCaption](#) in the role [sdgCaption](#). And if it does, it becomes (by extension) a valid target of a reference to this [SdgCaption](#).

Class	SdgCaption			
Package	M2::MSR::AsamHdo::SpecialData			
Note	This meta-class represents the caption of a special data group. This allows to have some parts of special data as identifiable.			
Base	ARObject , MultilanguageReferrable , Referrable			
Aggregated by	Sdg.sdgCaption			
Attribute	Type	Mult.	Kind	Note
desc	MultiLanguageOverview Paragraph	0..1	aggr	This represents a general but brief (one paragraph) description what the special data in question is about. It is only one paragraph! Desc is intended to be collected into overview tables. This property helps a human reader to identify the special data in question.

Table B.12: SdgCaption

Therefore, the [SdgClass](#) that represents the [Sdg](#) on the target side of the reference shall define attribute [sdgCaption](#) and set it to `True`.

Class	SdgReference			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef			
Note	Describes an attribute of a SdgClass which is used on the definition side to model a reference from one Sdg to another Sdg on the value side.			
Base	ARObject , AbstractMultiplicityRestriction , Identifiable , MultilanguageReferrable , Referrable , SdgAttribute			
Aggregated by	SdgClass.attribute			
Attribute	Type	Mult.	Kind	Note





Class	SdgReference			
destSdg	SdgClass	0..1	ref	Refers to a SdgClass which is used on the definition side to model the destination type of the referenced Sdg. On the value side the reference is realized by means of the originating Sdg defining an sdgx attribute which refers to the sdgCaption of the referenced Sdg.

Table B.13: SdgReference

The `SdgClass` on the source side of the reference shall define an `attribute` that is actually an `SdgReference` to the `SdgClass` that represents the target `Sdg` on the definition side by means of the reference in the role `destSdg`.

As a first step, the following model fragment defines a custom model extension of an IPC channel² (note that attribute `caption` is set to `True`):

```
<SDG-DEF>
  <SHORT-NAME>IpcChannels</SHORT-NAME>
  <SDG-CLASSES>
    <SDG-CLASS>
      <SHORT-NAME>IpcChannel</SHORT-NAME>
      <GID>acme:ipcChannels</GID>
      <CAPTION>true</CAPTION>
    </SDG-CLASS>
  </SDG-CLASSES>
</SDG-DEF>
```

Listing B.10: Example for the specification of a custom model extension that represents an IPC channel

This IPC channel (named “MyIpcChannel”) shall be referenced from the definition of an `SdgClass` that is supposed to extend the `ProvidedUserDefinedServiceInstance`:

```
<SDG-DEF>
  <SHORT-NAME>InstanceExtensions</SHORT-NAME>
  <SDG-CLASSES>
    <SDG-CLASS>
      <SHORT-NAME>ProvidedUserDefinedServiceInstance</SHORT-NAME>
      <GID>acme:instanceExtensions</GID>
      <EXTENDS-META-CLASS>ProvidedUserDefinedServiceInstance</EXTENDS-META-CLASS>
      <CAPTION>false</CAPTION>
      <ATTRIBUTES>
        <SDG-REFERENCE>
          <SHORT-NAME>IpcChannelRef</SHORT-NAME>
          <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
          <DEST-SDG-REF DEST="SDG-CLASS"/>SdgClasses/IpcChannels/IpcChannel
        </DEST-SDG-REF>
        </SDG-REFERENCE>
      </ATTRIBUTES>
    </SDG-CLASS>
  </SDG-CLASSES>
</SDG-DEF>
```

²Please note that this example represents an incomplete model that does not care about details of the actual configuration of the hypothetical IPC Channel and is entirely focused on the referencing topic.

```

        </SDG-CLASS>
    </SDG-CLASSES>
</SDG-DEF>

```

Listing B.11: Example for the specification of a custom model extension for a [ProvidedUserDefinedServiceInstance](#) with a reference to an IPC channel

The model on the value side where the [ProvidedUserDefinedServiceInstance](#) references the IPC channel is sketched by the following model fragment:

```

<AR-PACKAGE>
  <SHORT-NAME>ServiceInstances</SHORT-NAME>
  <ELEMENTS>
    <PROVIDED-USER-DEFINED-SERVICE-INSTANCE>
      <SHORT-NAME>MyService</SHORT-NAME>
      <ADMIN-DATA>
        <SDGS>
          <SDG GID="acme:ipcChannelRef">
            <SDX-REF DEST="SDG-CAPTION"/>/IpChannels/IpChannel1</SDX-REF>
          </SDG>
        </SDGS>
      </ADMIN-DATA>
    </PROVIDED-USER-DEFINED-SERVICE-INSTANCE>
  </ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
  <SHORT-NAME>IpChannels</SHORT-NAME>
  <ADMIN-DATA>
    <SDGS>
      <SDG GID="acme:ipcChannel1">
        <SDG-CAPTION>
          <SHORT-NAME>IpChannel1</SHORT-NAME>
        </SDG-CAPTION>
      </SDG>
    </SDGS>
  </ADMIN-DATA>
</AR-PACKAGE>

```

Listing B.12: Example for the specification of reference between [Sdg](#)

C General Modeling

This chapter has been created to explain model elements that are not directly related to specific design or deployment usage but have a more general scope. In other words, this chapter describes the structure and usage of some widely reusable modeling content.

C.1 Reference to a DataPrototype in a PortInterface

C.1.1 Reference to the inside of an [ApplicationDataType](#)

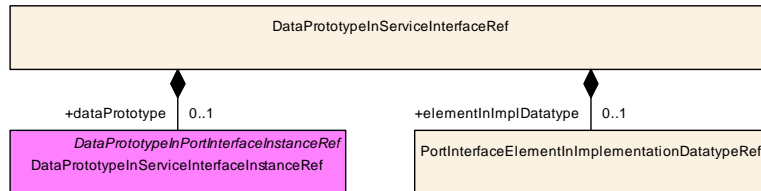


Figure C.1: Modeling of [DataPrototypeInServiceInterfaceRef](#)

Class	DataPrototypeInServiceInterfaceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInPortInterfaceInstanceRef			
Note	This meta-class represents the ability to refer to an AUTOSAR DataPrototype in the context of a Service Interface.			
Base	<i>ARObject</i>			
Aggregated by	SignalBasedEventElementToSignalTriggeringMapping.dataPrototypeInServiceInterfaceRef , SignalBasedFieldToSignalTriggeringMapping.dataPrototypeInServiceInterfaceRef , SomeipDataPrototypeTransformationProps.dataPrototype			
Attribute	Type	Mult.	Kind	Note
dataPrototype	DataPrototype	0..1	iref	This element represents the ability to: <ul style="list-style-type: none"> refer to a DataPrototype in the context of a ServiceInterface. refer to the internal structure of a DataPrototype in which is typed by an ApplicationDatatype in the context of a ServiceInterface. InstanceRef implemented by: DataPrototypeInServiceInterfaceInstanceRef
elementInImplDatatype	PortInterfaceElementInImplementationDatatypeRef	0..1	aggr	This element represents the ability to refer to the internal structure of an AutosarDataPrototype which is typed by an ImplementationDatatype in the context of a Service Interface.

Table C.1: [DataPrototypeInServiceInterfaceRef](#)

Please note that the modeling of the reference to a [DataPrototype](#) in the context of a [PortInterface](#) can only be executed as the abstract template for concrete specializations because the abstract meta-class [PortInterface](#) does not aggregate a [DataPrototype](#) directly.

The abstract modeling of meta-class `DataPrototypeInPortInterfaceInstanceRef` is depicted in Figure C.2.

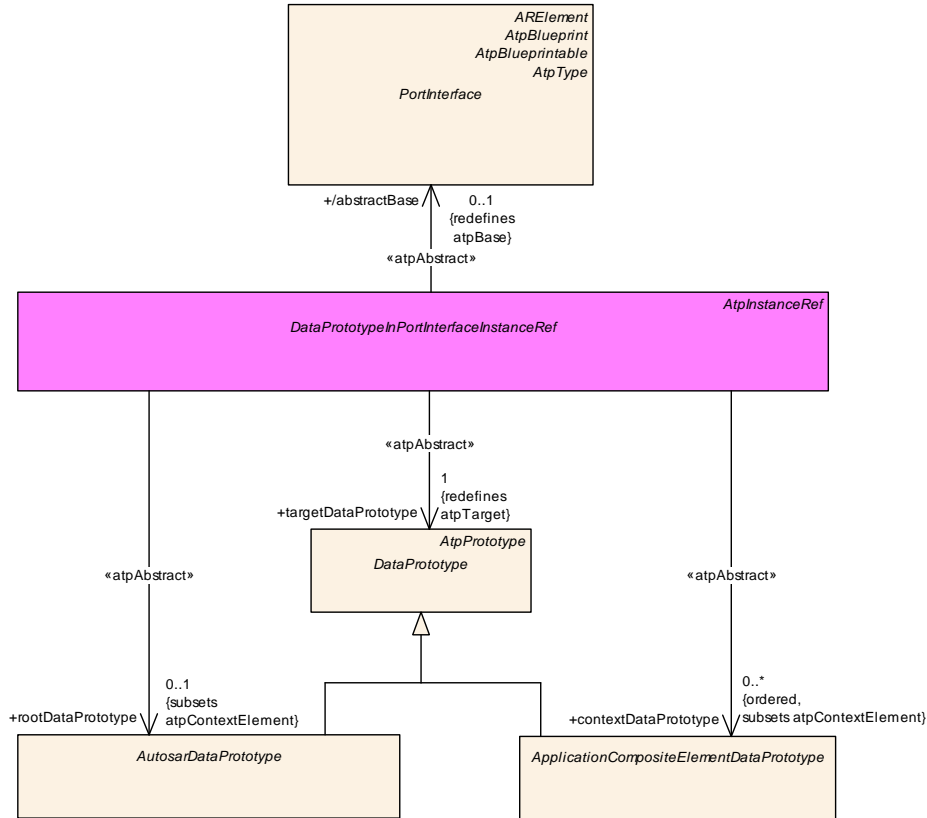


Figure C.2: Modeling of `DataPrototypeInPortInterfaceInstanceRef`

Class	<code>DataPrototypeInPortInterfaceInstanceRef</code> (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer::InstanceRef			
Note	This meta-class represents the ability to: <ul style="list-style-type: none"> refer to a <code>DataPrototype</code> in the context of a <code>PortInterface</code>. refer to the internal structure of a <code>DataPrototype</code> which is typed by an <code>ApplicationDatatype</code> in the context of a <code>PortInterface</code>. 			
Base	<code>ARObject</code> , <code>AtpInstanceRef</code>			
Subclasses	<code>DataPrototypeInServiceInterfaceInstanceRef</code>			
Attribute	Type	Mult.	Kind	Note
abstractBase	<code>PortInterface</code>	0..1	ref	Stereotypes: <code>atpAbstract</code>
contextData Prototype (ordered)	<code>ApplicationCompositeElementDataPrototype</code>	*	ref	Stereotypes: <code>atpAbstract</code> Tags: <code>xml.sequenceOffset=20</code>
rootData Prototype	<code>AutosarDataPrototype</code>	0..1	ref	Stereotypes: <code>atpAbstract</code> Tags: <code>xml.sequenceOffset=10</code>
targetData Prototype	<code>DataPrototype</code>	1	ref	Stereotypes: <code>atpAbstract</code> Tags: <code>xml.sequenceOffset=30</code>

Table C.2: `DataPrototypeInPortInterfaceInstanceRef`

The concrete specialization for the aggregation of a `DataPrototype` in the concrete `ServiceInterface` is depicted in Figure C.3.

The meta-class `DataPrototypeInServiceInterfaceInstanceRef` inherits from `DataPrototypeInPortInterfaceInstanceRef`.

The individual references modeled in the context of `DataPrototypeInServiceInterfaceInstanceRef` specialize the abstract structure defined in the context of `DataPrototypeInPortInterfaceInstanceRef`

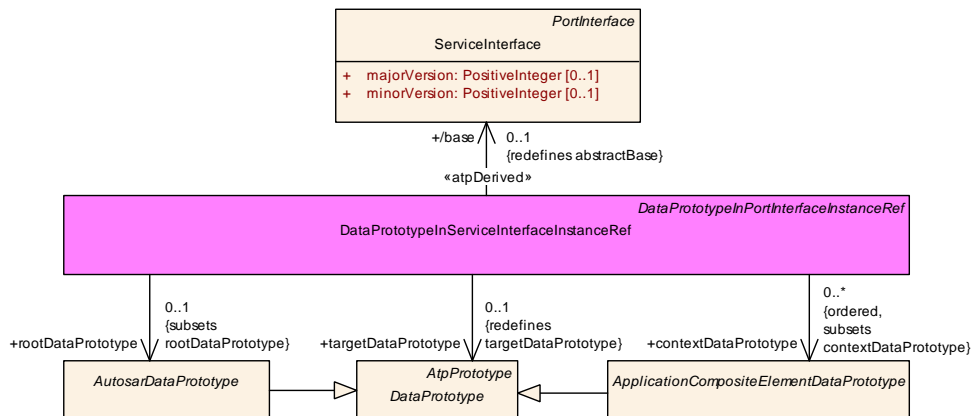


Figure C.3: Modeling of `DataPrototypeInServiceInterfaceInstanceRef`

Class	<code>DataPrototypeInServiceInterfaceInstanceRef</code>				
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInPortInterfaceInstanceRef				
Note					
Base	<code>ARObject</code> , <code>AtpInstanceRef</code> , <code>DataPrototypeInPortInterfaceInstanceRef</code>				
Aggregated by	<code>DataPrototypeInPortInterfaceRef.dataPrototypeInServiceInterface</code> , <code>DataPrototypeInServiceInterfaceRef.dataPrototype</code> , <code>SignalBasedFireAndForgetMethodToSignalTriggeringMapping.dataPrototypeInMethodArgumentInstanceRef</code>				
Attribute	Type	Mult.	Kind	Note	
base	<code>ServiceInterface</code>	0..1	ref	Stereotypes: <code>atpDerived</code>	
contextData Prototype (ordered)	<code>ApplicationCompositeElementDataPrototype</code>	*	ref	Tags: <code>xml.sequenceOffset=20</code>	
rootData Prototype	<code>AutosarDataPrototype</code>	0..1	ref	Tags: <code>xml.sequenceOffset=10</code>	
targetData Prototype	<code>DataPrototype</code>	0..1	ref	Tags: <code>xml.sequenceOffset=30</code>	

Table C.3: `DataPrototypeInServiceInterfaceInstanceRef`

C.1.2 Reference to the inside of a `CppImplementationDataType`

Please note that the modeling of instanceRef-like references into the internals of a `CppImplementationDataType` differs from the way how internals of an `ImplementationDataType` could be referenced.

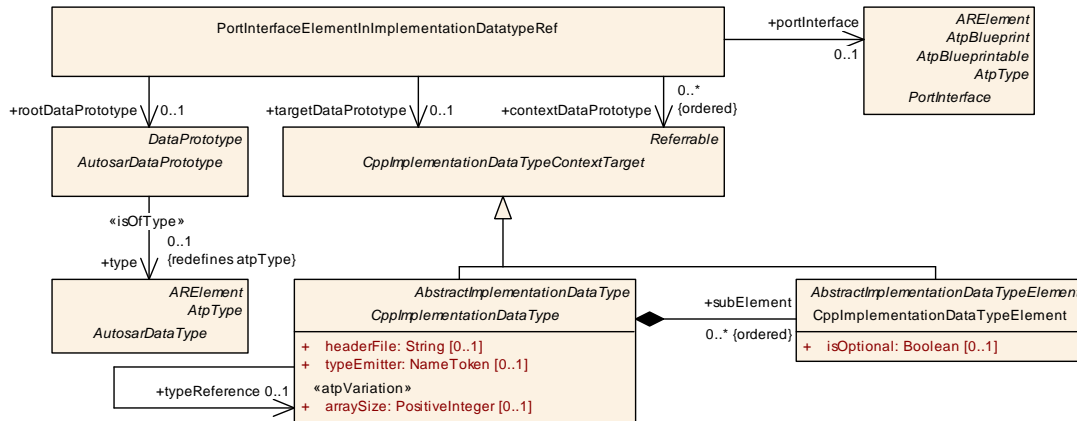


Figure C.4: Modeling of `PortInterfaceElementInImplementationDatatypeRef`

In particular, references to context elements can be directed to `ImplementationDataTypeElement` because both arrays and structures are modeled by means of `ImplementationDataTypeElement`.

This approach has changed with the advent of `CppImplementationDataType` and therefore the same approach is not possible for `CppImplementationDataTypeElement`.

In the case of `CppImplementationDataType`, both `CppImplementationDataTypeElement` and `CppImplementationDataType` can become the target of a context reference. And since the context reference is supposed to be ordered it is simply not possible to straight up model two context references, one for `CppImplementationDataType` and one for `CppImplementationDataTypeElement`.

Instead, it is necessary to introduce an abstract base class named `CppImplementationDataTypeContextTarget` for both `CppImplementationDataType` and `CppImplementationDataTypeElement` and then **direct context references at the abstract base class**.

Class	<code>PortInterfaceElementInImplementationDatatypeRef</code>			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General			
Note	This meta-class represents the ability to refer to the internal structure of an <code>AutosarDataPrototype</code> which is typed by an <code>ImplementationDatatype</code> in the context of a <code>PortInterface</code> . In other words, this meta-class shall not be used to model a reference to the <code>AutosarDataPrototype</code> as a target itself, even if the <code>AutosarDataPrototype</code> is typed by an <code>ImplementationDataType</code> and even if that <code>ImplementationDataType</code> represents a composite data type.			
Base	<code>AObject</code>			
Aggregated by	<code>DataPrototypeInServiceInterfaceRef.elementInImplDatatype</code>			
Attribute	Type	Mult.	Kind	Note
contextData Prototype (ordered)	<code>CppImplementationDataTypeContextTarget</code>	*	ref	This is a context in case there are subelements with explicit types. The reference has to be ordered to properly reflect the nested structure.
portInterface	<code>PortInterface</code>	0..1	ref	This is the <code>PortInterface</code> that contains the rootData Prototype.





Class	PortInterfaceElementInImplementationDatatypeRef			
rootDataPrototype	AutosarDataPrototype	0..1	ref	This rootDataPrototype defines the AutosarDataPrototype in which the target can be found.
targetDataPrototype	CppImplementationDataTypeContextTarget	0..1	ref	This is the target reference to a subElement that is defined inside of the rootDataPrototype.

Table C.4: PortInterfaceElementInImplementationDatatypeRef

Class	CppImplementationDataTypeContextTarget (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::CppImplementationDataType			
Note	This meta-class has the ability to serve as the context in instanceRef-like modeling for Cpp ImplementationDataType and CppImplementationDataTypeElement			
Base	ARObject, Referrable			
Subclasses	CppImplementationDataType , CppImplementationDataTypeElement			
Attribute	Type	Mult.	Kind	Note
-	-	-	-	-

Table C.5: CppImplementationDataTypeContextTarget

C.2 Reference to a AutosarDataPrototype in an Executable

The creation of the meta-model for creating a reference to an [AutosarDataPrototype](#) in the context of an [Executable](#) is executed in a two-step approach where first an abstract structure of the reference is created.

The abstract structure is the basis for the refinement with respect to specific roles of [AutosarDataPrototypes](#).

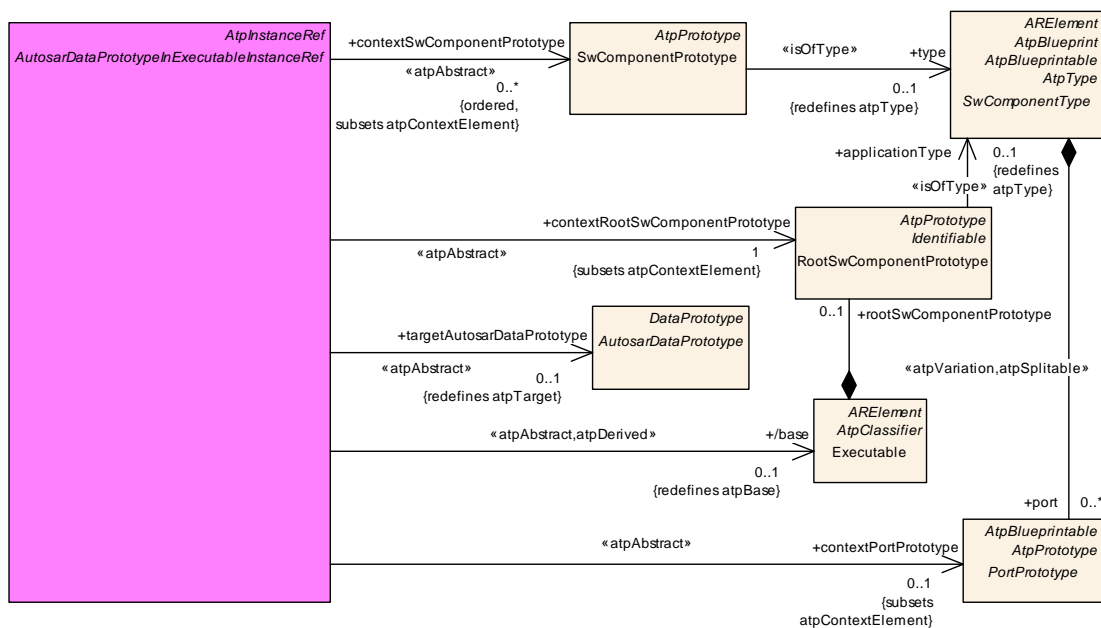


Figure C.5: Modeling of abstract [AutosarDataPrototypeInExecutableInstanceRef](#)

Class	<i>AutosarDataPrototypeInExecutableInstanceRef</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef			
Note				
Base	<i>ARObject</i> , <i>AtpInstanceRef</i>			
Subclasses	EventInExecutableInstanceRef , FieldInExecutableInstanceRef			
Attribute	Type	Mult.	Kind	Note
base	Executable	0..1	ref	Stereotypes: atpAbstract; atpDerived
contextPort Prototype	PortPrototype	0..1	ref	Stereotypes: atpAbstract Tags: xml.sequenceOffset=30
contextRootSw Component Prototype	RootSwComponent Prototype	1	ref	Stereotypes: atpAbstract Tags: xml.sequenceOffset=10
contextSw Component Prototype (ordered)	SwComponent Prototype	*	ref	Stereotypes: atpAbstract Tags: xml.sequenceOffset=20
targetAutosar DataPrototype	AutosarDataPrototype	0..1	ref	Stereotypes: atpAbstract Tags: xml.sequenceOffset=40

Table C.6: AutosarDataPrototypeInExecutableInstanceRef

Two specializations of [AutosarDataPrototypeInExecutableInstanceRef](#) exist:

- [EventInExecutableInstanceRef](#)
- [FieldInExecutableInstanceRef](#)

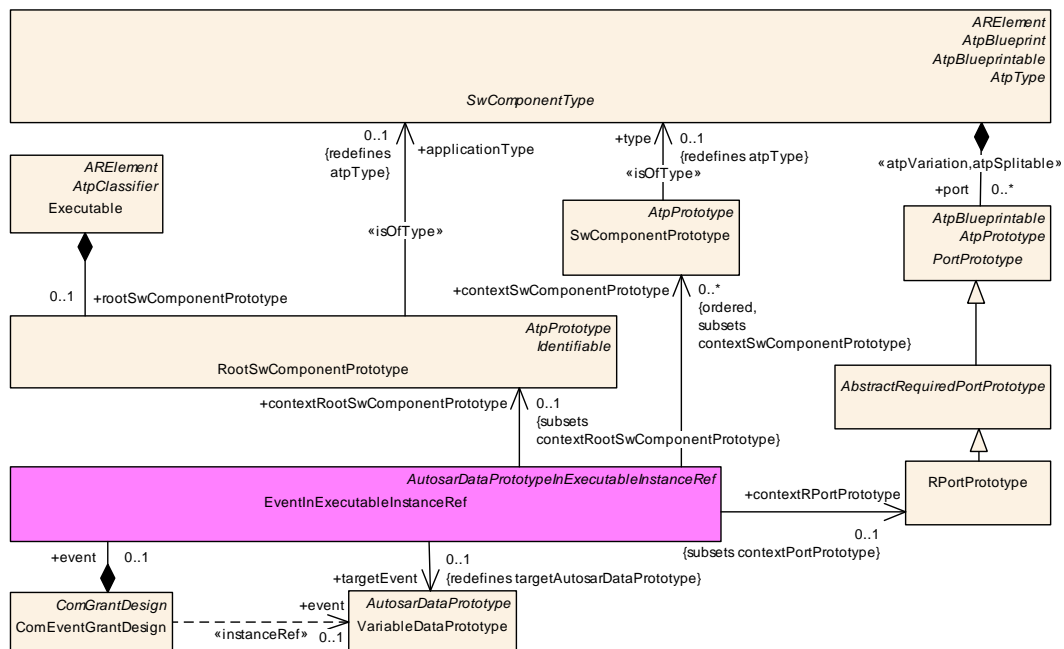
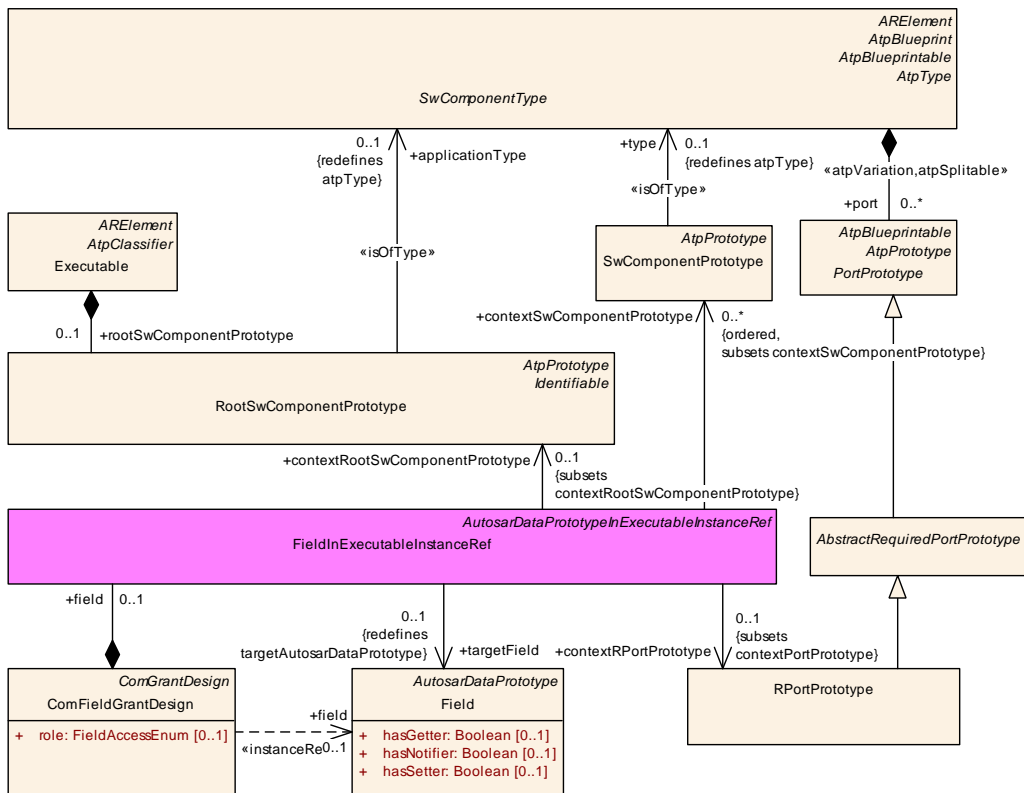


Figure C.6: Modeling of concrete `EventInExecutableInstanceRef` derived from `AutosarDataPrototypeInExecutableInstanceRef`

Class	EventInExecutableInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef			
Note				
Base	ARObject, AtpInstanceRef, AutosarDataPrototypeInExecutableInstanceRef			
Aggregated by	ComEventGrantDesign.event			
Attribute	Type	Mult.	Kind	Note
contextRootSw Component Prototype	RootSwComponent Prototype	0..1	ref	Tags:xml.sequenceOffset=10
contextRPort Prototype	RPortPrototype	0..1	ref	Tags:xml.sequenceOffset=30
contextSw Component Prototype (ordered)	SwComponent Prototype	*	ref	Tags:xml.sequenceOffset=20
targetEvent	VariableDataPrototype	0..1	ref	Tags:xml.sequenceOffset=40

Table C.7: EventInExecutableInstanceRef

Figure C.7: Modeling of concrete FieldInExecutableInstanceRef derived from AutosarDataPrototypeInExecutableInstanceRef

Class	FieldInExecutableInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef			
Note				
Base	ARObject, AtpInstanceRef, AutosarDataPrototypeInExecutableInstanceRef			





Class	FieldInExecutableInstanceRef			
Aggregated by	ComFieldGrantDesign.field			
Attribute	Type	Mult.	Kind	Note
contextRootSwComponentPrototype	RootSwComponentPrototype	0..1	ref	Tags:xml.sequenceOffset=10
contextRPortPrototype	RPortPrototype	0..1	ref	Tags:xml.sequenceOffset=30
contextSwComponentPrototype (ordered)	SwComponentPrototype	*	ref	Tags:xml.sequenceOffset=20
targetField	Field	0..1	ref	Tags:xml.sequenceOffset=40

Table C.8: FieldInExecutableInstanceRef

C.3 Reference to a PortPrototype in an Executable

The creation of the meta-model for creating a reference to a [PortPrototype](#) in the context of an [Executable](#) is executed in a two-step approach where first an abstract structure of the reference is created.

The abstract structure is the basis for the refinement with respect to specific roles of [PortPrototypes](#).

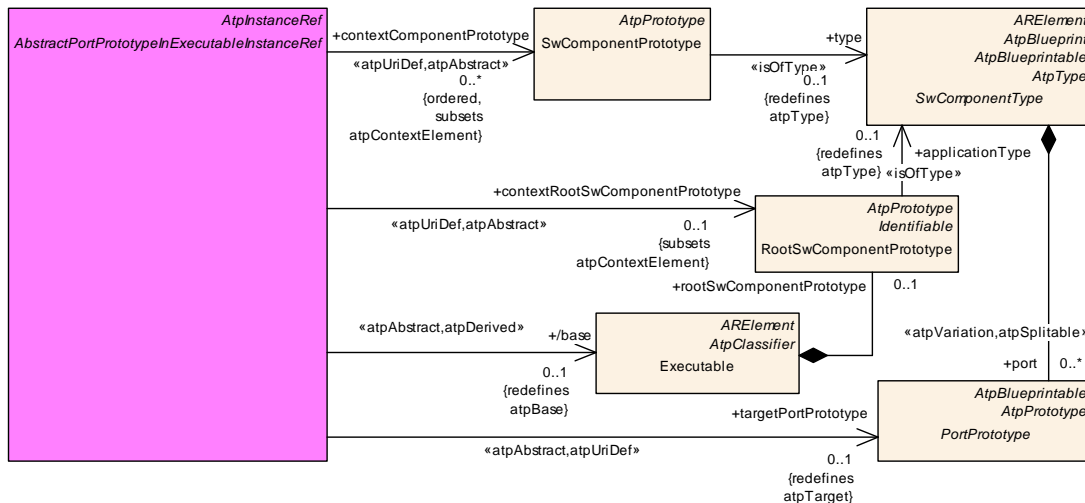


Figure C.8: Modeling of abstract [AbstractPortPrototypeInExecutableInstanceRef](#)

Class	AbstractPortPrototypeInExecutableInstanceRef (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef			
Note				
Base	ARObject, AtpInstanceRef			
Subclasses	PPortPrototypeInExecutableInstanceRef, PortPrototypeInExecutableInstanceRef, RPortPrototypeInExecutableInstanceRef			
Attribute	Type	Mult.	Kind	Note
base	Executable	0..1	ref	Stereotypes: atpAbstract; atpDerived
context Component Prototype (ordered)	SwComponent Prototype	*	ref	Stereotypes: atpAbstract; atpUriDef Tags: xml.sequenceOffset=20
contextRootSw Component Prototype	RootSwComponent Prototype	0..1	ref	Stereotypes: atpAbstract; atpUriDef Tags: xml.sequenceOffset=10
targetPort Prototype	PortPrototype	0..1	ref	Stereotypes: atpAbstract; atpUriDef Tags: xml.sequenceOffset=30

Table C.9: AbstractPortPrototypeInExecutableInstanceRef

Three specializations of [AbstractPortPrototypeInExecutableInstanceRef](#) exist:

- [PPortPrototypeInExecutableInstanceRef](#)
- [RPortPrototypeInExecutableInstanceRef](#)
- [PortPrototypeInExecutableInstanceRef](#)

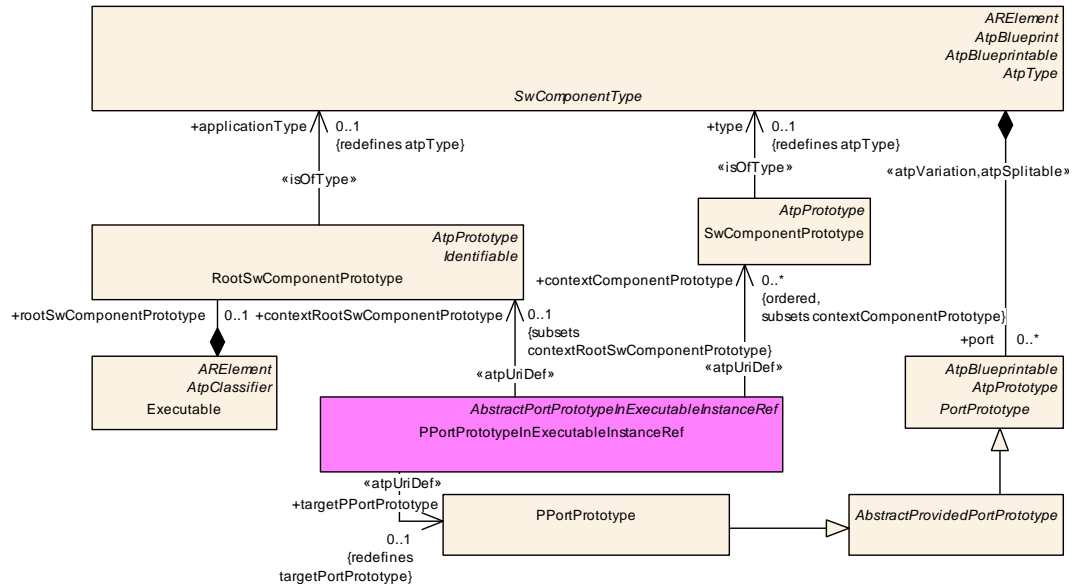
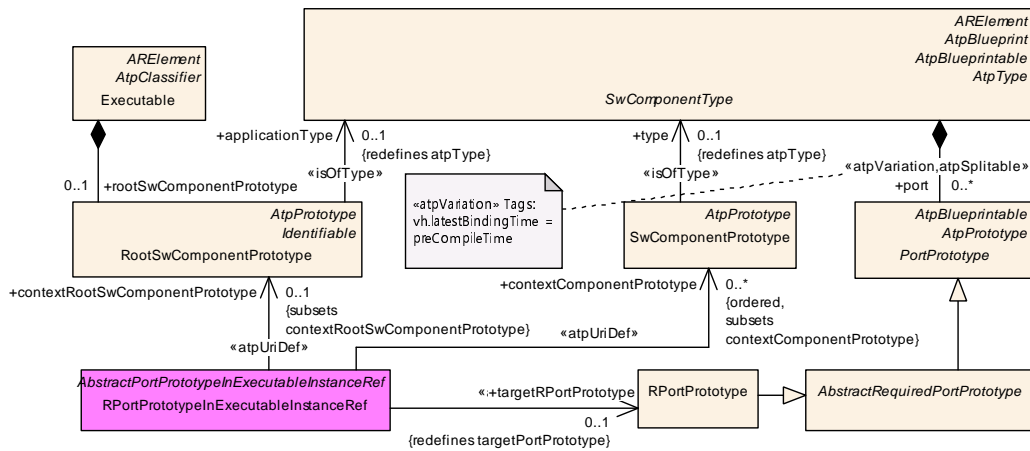


Figure C.9: Modeling of concrete [PPortPrototypeInExecutableInstanceRef](#) derived from [AbstractPortPrototypeInExecutableInstanceRef](#)

Class	PPortPrototypeInExecutableInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef			
Note				
Base	ARObject, AbstractPortPrototypeInExecutableInstanceRef , AtpInstanceRef			
Aggregated by	ComOfferServiceGrantDesign.providedServicePort, CompositionPPortToExecutablePPortMapping.executableProvidedPort, DiagnosticAuthenticationPortMapping.pPortPrototypeInExecutable, DiagnosticDataPortMapping.pPortPrototypeInExecutable, DiagnosticEnvDataElementCondition.pPortPrototype, DiagnosticSecurityLevelPortMapping.pPortPrototypeInExecutable, DiagnosticServiceGenericMapping.pPortPrototypeInExecutable, DiagnosticServiceValidationMapping.pPortPrototypeInExecutable, DiagnosticSovdAuthorizationPortMapping.pPortPrototypeInExecutable, DiagnosticSovdProximityChallengePortMapping.pPortPrototypeInExecutable, DltLogSinkToPortPrototypeMapping.pPortPrototype, RecoveryNotificationToPPortPrototypeMapping.recoveryAction, StateManagementSetFunctionGroupStateActionItem.portPrototype, StateManagementStateNotification.notificationPort, TimeSyncPortPrototypeToTimeBaseMapping.timeSyncPPortPrototype			
Attribute	Type	Mult.	Kind	Note
contextComponentPrototype (ordered)	SwComponentPrototype	*	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=20
contextRootSwComponentPrototype	RootSwComponentPrototype	0..1	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=10
targetPPortPrototype	PPortPrototype	0..1	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=30

Table C.10: PPortPrototypeInExecutableInstanceRef

Figure C.10: Modeling of concrete [RPortPrototypeInExecutableInstanceRef](#) derived from [AbstractPortPrototypeInExecutableInstanceRef](#)

Class	RPortPrototypeInExecutableInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef			
Note				
Base	ARObject, AbstractPortPrototypeInExecutableInstanceRef , AtpInstanceRef			





Class	RPortPrototypeInExecutableInstanceRef			
Aggregated by	ComFindServiceGrantDesign.requiredServicePort, CompositionRPortToExecutableRPortMapping.executableRequiredPort, CryptoCertificateToPortPrototypeMapping.portPrototype, CryptoKeySlotToPortPrototypeMapping.portPrototype, CryptoProviderToPortPrototypeMapping.portPrototype, DiagnosticClearConditionPortMapping.rPortPrototypeInExecutable, DiagnosticEnableConditionPortMapping.rPortPrototypeInExecutable, DiagnosticEventPortMapping.rPortPrototypeInExecutable, DiagnosticExternalAuthenticationPortMapping.rPortPrototypeInExecutable, DiagnosticIndicatorPortMapping.rPortPrototypeInExecutable, DiagnosticMemoryDestinationPortMapping.rPortPrototypeInExecutable, DiagnosticMonitorPortMapping.rPortPrototypeInExecutable, DiagnosticOperationCyclePortMapping.rPortPrototypeInExecutable, DltLogSinkToPortPrototypeMapping.rPortPrototype, HealthChannelExternalStatus.healthChannel, NoSupervision.targetPhmSupervisedEntity, RawDataStreamMapping.portPrototype, SecurityEventMapping.reportingPortPrototype, StateManagementStateRequest.stateRequestPort, TimeSyncPortPrototypeToTimeBaseMapping.timeSyncRPortPrototype			
Attribute	Type	Mult.	Kind	Note
contextComponentPrototype (ordered)	SwComponentPrototype	*	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=20
contextRootSwComponentPrototype	RootSwComponentPrototype	0..1	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=10
targetRPortPrototype	RPortPrototype	0..1	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=30

Table C.11: RPortPrototypeInExecutableInstanceRef

Class	PortPrototypeInExecutableInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest::InstanceRefs			
Note				
Base	ARObject, AbstractPortPrototypeInExecutableInstanceRef, AtpInstanceRef			
Aggregated by	PersistencePortPrototypeToDeploymentMapping.portPrototype, ServiceInstanceToPortPrototypeMapping.portPrototype			
Attribute	Type	Mult.	Kind	Note
base	Executable	0..1	ref	Stereotypes: atpDerived Tags: xml.sequenceOffset=10
contextComponentPrototype (ordered)	SwComponentPrototype	*	ref	Tags: xml.sequenceOffset=30
targetPortPrototype	PortPrototype	0..1	ref	Tags: xml.sequenceOffset=40

Table C.12: PortPrototypeInExecutableInstanceRef

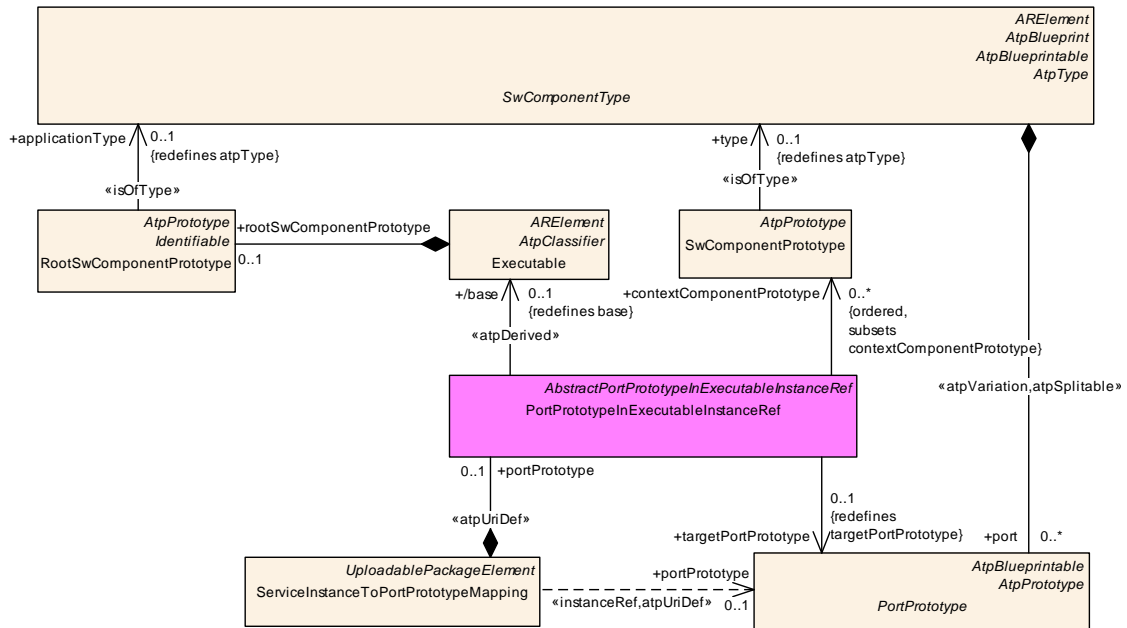


Figure C.11: Modeling of **PortPrototypeInExecutableInstanceRef**

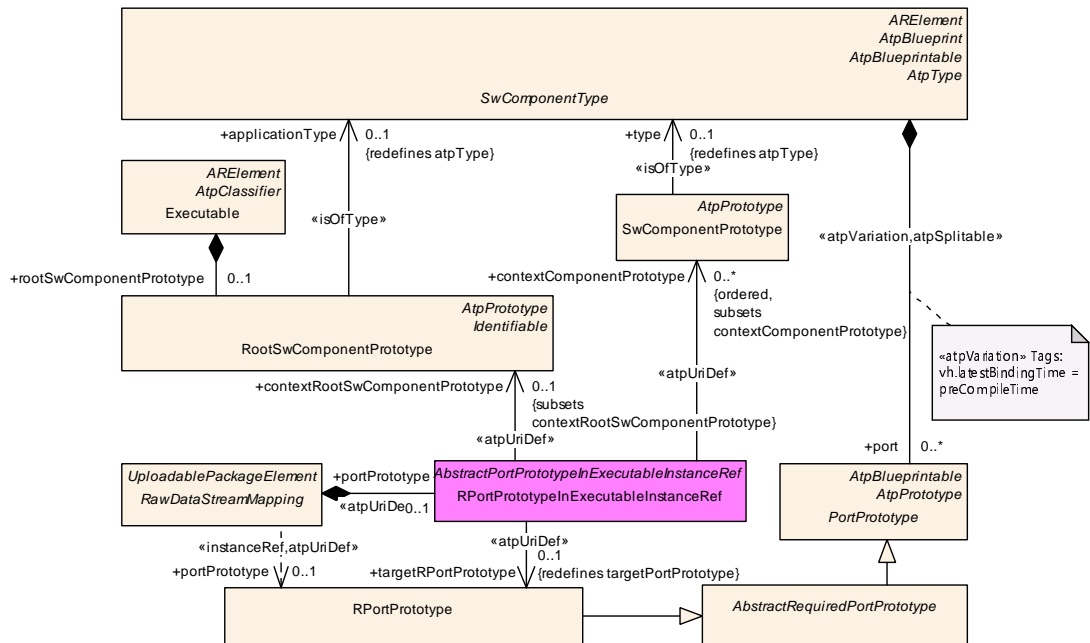


Figure C.12: Modeling of raw data streaming by means of an **RPortPrototype**

C.4 Modeling of a Method in an Executable

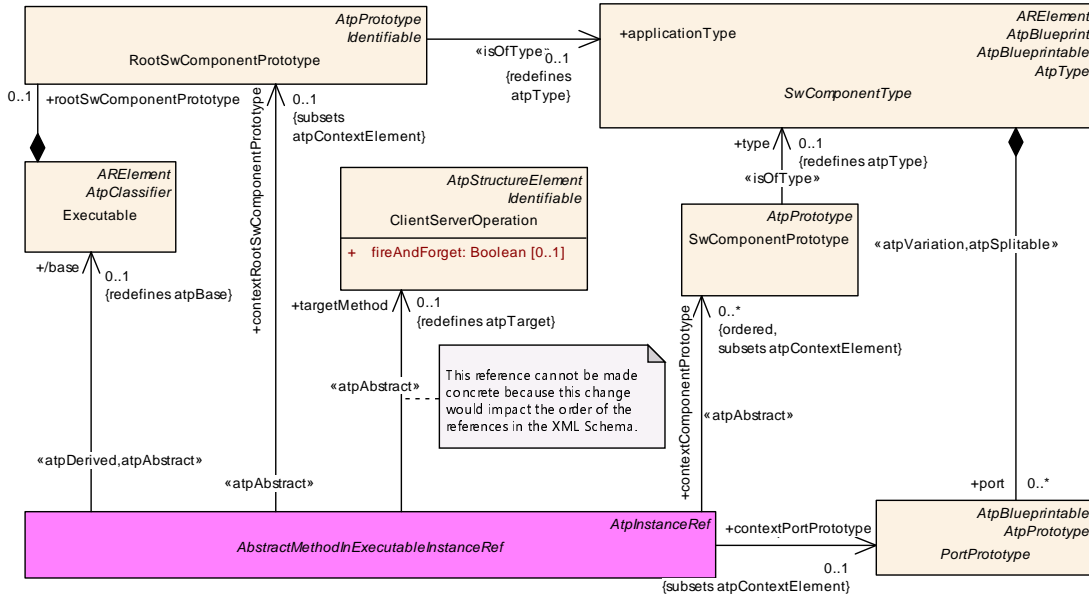


Figure C.13: Modeling of `AbstractMethodInExecutableInstanceRef`

Class	<code>AbstractMethodInExecutableInstanceRef</code> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef::MethodInExecutable			
Note				
Base	<code>ARObject</code> , <code>AtpInstanceRef</code>			
Subclasses	<code>RequiredMethodInExecutableInstanceRef</code>			
Attribute	Type	Mult.	Kind	Note
base	<code>Executable</code>	0..1	ref	Stereotypes: <code>atpAbstract</code> ; <code>atpDerived</code>
context Component Prototype (ordered)	<code>SwComponent Prototype</code>	*	ref	Stereotypes: <code>atpAbstract</code> Tags: <code>xml.sequenceOffset=20</code>
contextPort Prototype	<code>PortPrototype</code>	0..1	ref	Stereotypes: <code>atpAbstract</code> Tags: <code>xml.sequenceOffset=30</code>
contextRootSw Component Prototype	<code>RootSwComponent Prototype</code>	0..1	ref	Stereotypes: <code>atpAbstract</code> Tags: <code>xml.sequenceOffset=10</code>
targetMethod	<code>ClientServerOperation</code>	0..1	ref	Stereotypes: <code>atpAbstract</code> Tags: <code>xml.sequenceOffset=40</code>

Table C.13: `AbstractMethodInExecutableInstanceRef`

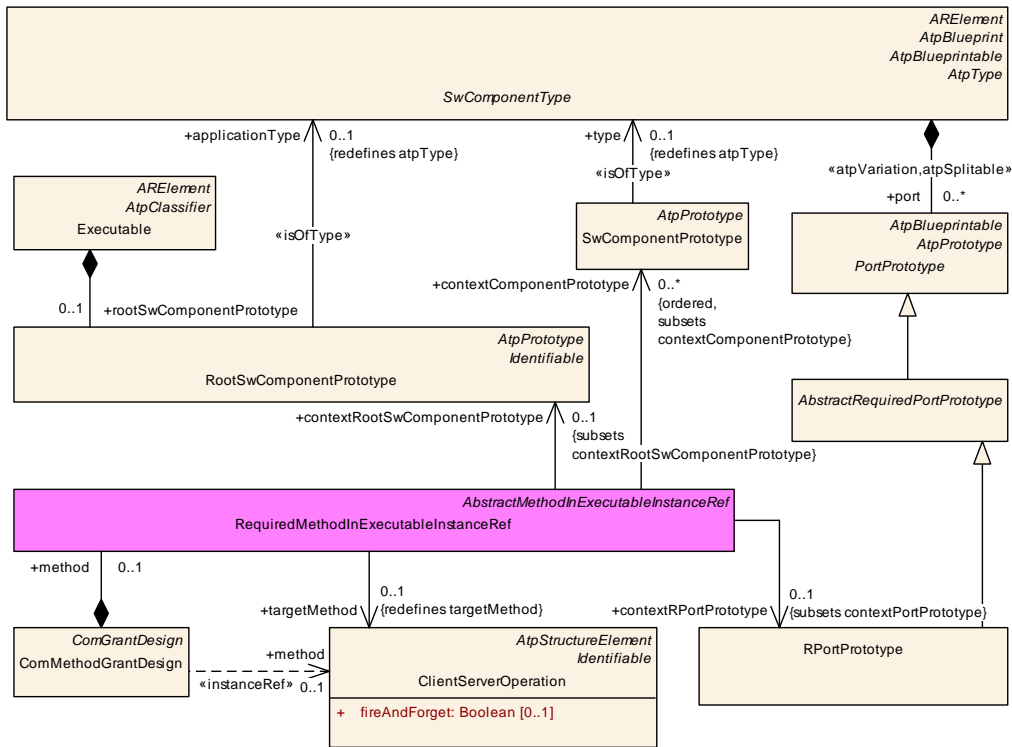


Figure C.14: Modeling of `RequiredMethodInExecutableInstanceRef`

Class	RequiredMethodInExecutableInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef::MethodInExecutable			
Note				
Base	<i>ARObject</i> , <i>AbstractMethodInExecutableInstanceRef</i> , <i>AtpInstanceRef</i>			
Aggregated by	<i>ComMethodGrantDesign.method</i>			
Attribute	Type	Mult.	Kind	Note
contextComponentPrototype (ordered)	SwComponentPrototype	*	ref	Tags:xml.sequenceOffset=20
contextRootSwComponentPrototype	RootSwComponentPrototype	0..1	ref	Tags:xml.sequenceOffset=10
contextRPortPrototype	RPortPrototype	0..1	ref	Tags:xml.sequenceOffset=30
targetMethod	ClientServerOperation	0..1	ref	Tags:xml.sequenceOffset=40

Table C.14: RequiredMethodInExecutableInstanceRef

C.5 Modeling of Diagnostic-related InstanceRefs

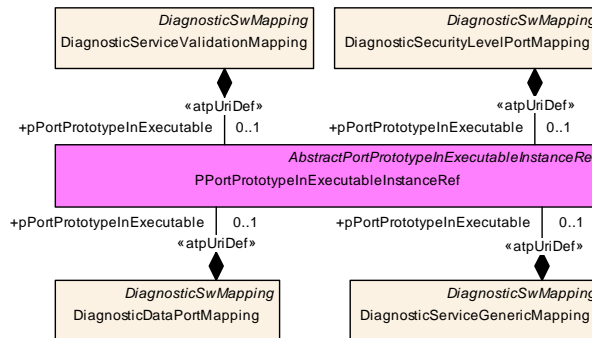


Figure C.15: Modeling of various **DiagnosticSwMappings** based on **PPortPrototypeInExecutableInstanceRef**

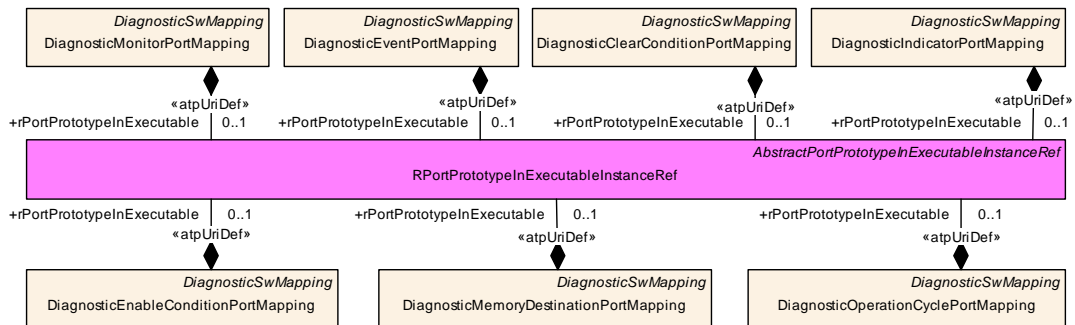


Figure C.16: Modeling of various **DiagnosticSwMappings** based on **RPortPrototypeInExecutableInstanceRef**

C.6 Modeling of PHM-related InstanceRefs

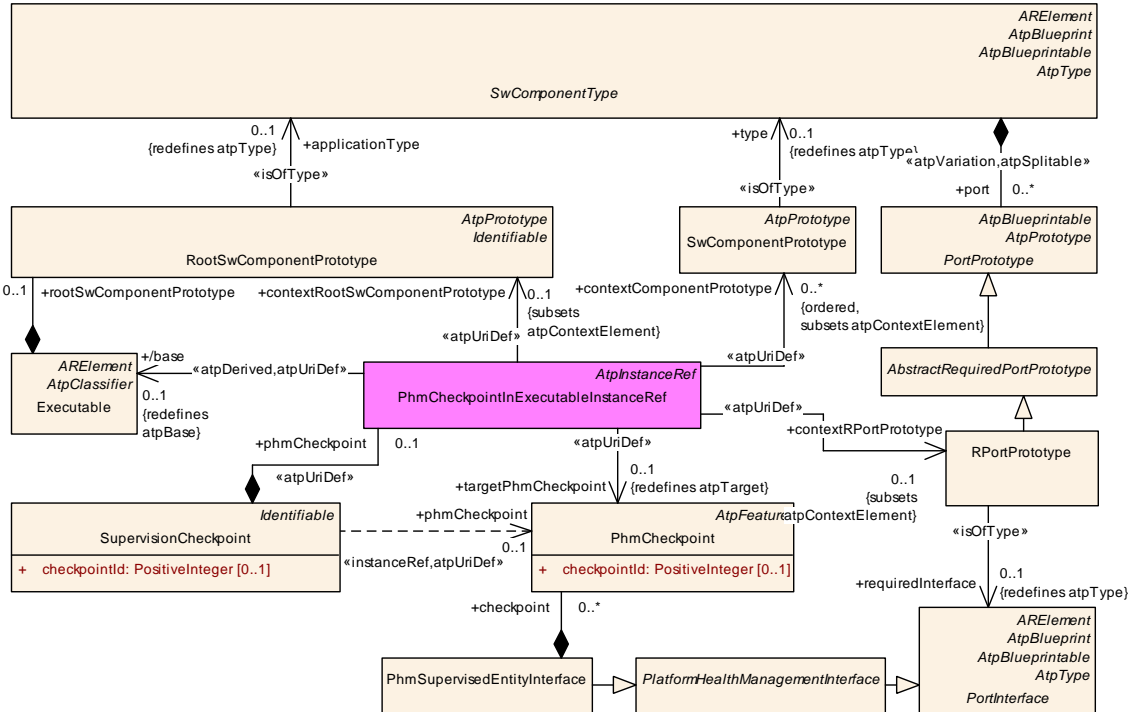


Figure C.17: Modeling of **PhmCheckpointInExecutableInstanceRef**

Class	PhmCheckpointInExecutableInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealth Management::InstanceRefs			
Note				
Base	ARObject, AtpInstanceRef			
Aggregated by	SupervisionCheckpoint.phmCheckpoint			
Attribute	Type	Mult.	Kind	Note
base	Executable	0..1	ref	Stereotypes: atpDerived; atpUriDef Tags: xml.sequenceOffset=10
context Component Prototype (ordered)	SwComponent Prototype	*	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=30
contextRootSw Component Prototype	RootSwComponent Prototype	0..1	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=20
contextRPort Prototype	RPortPrototype	0..1	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=40
targetPhm Checkpoint	PhmCheckpoint	0..1	ref	Stereotypes: atpUriDef Tags: xml.sequenceOffset=50

Table C.15: PhmCheckpointInExecutableInstanceRef

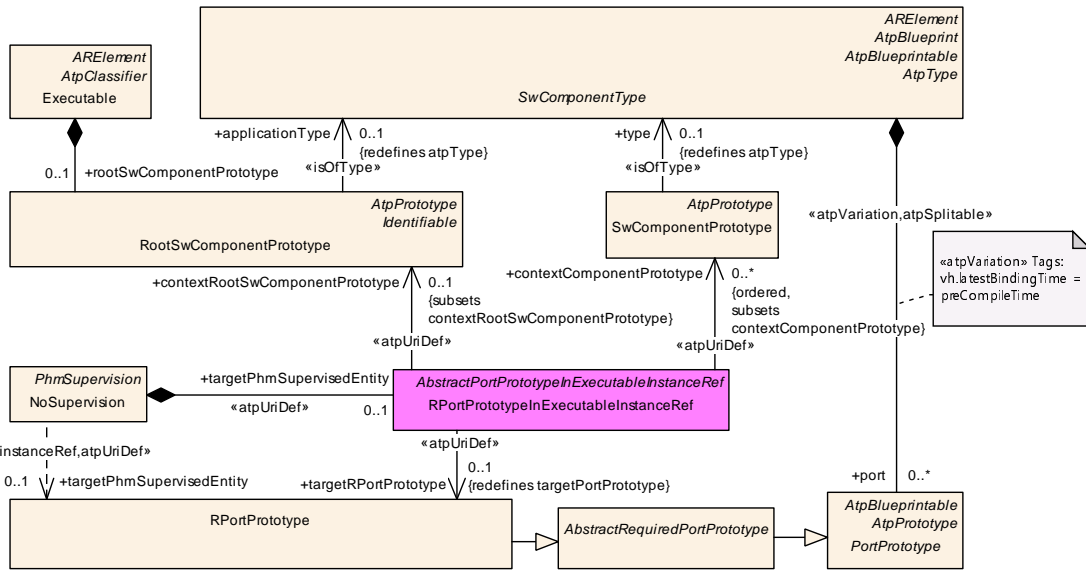


Figure C.18: Modeling of NoSupervision RPortPrototypeInExecutableInstanceRef

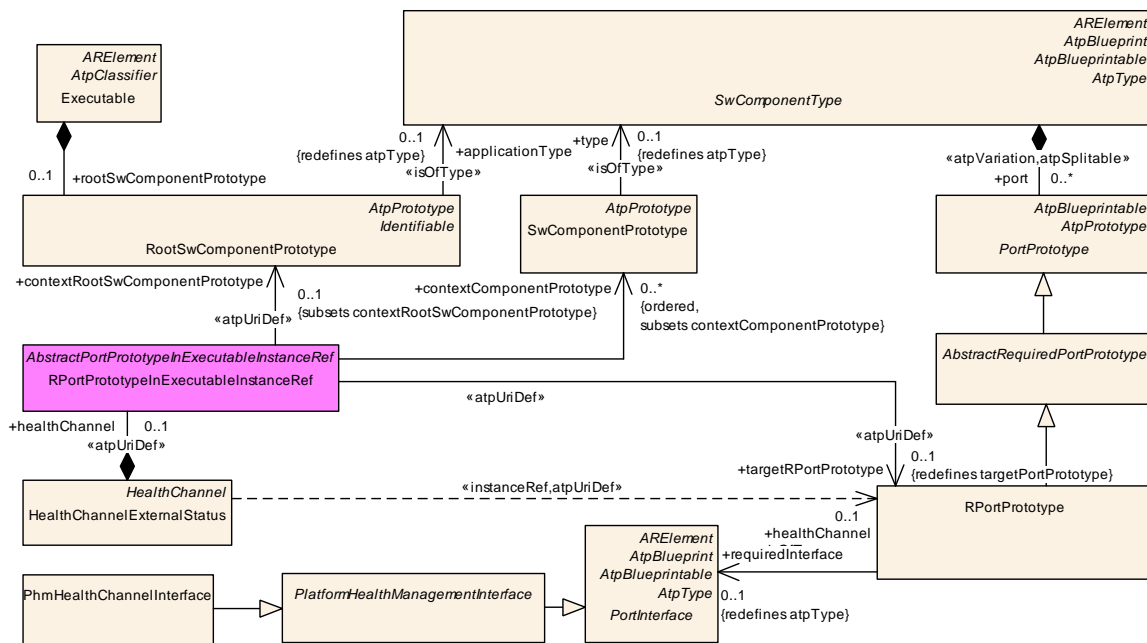


Figure C.19: Modeling of HealthChannelExternalStatus

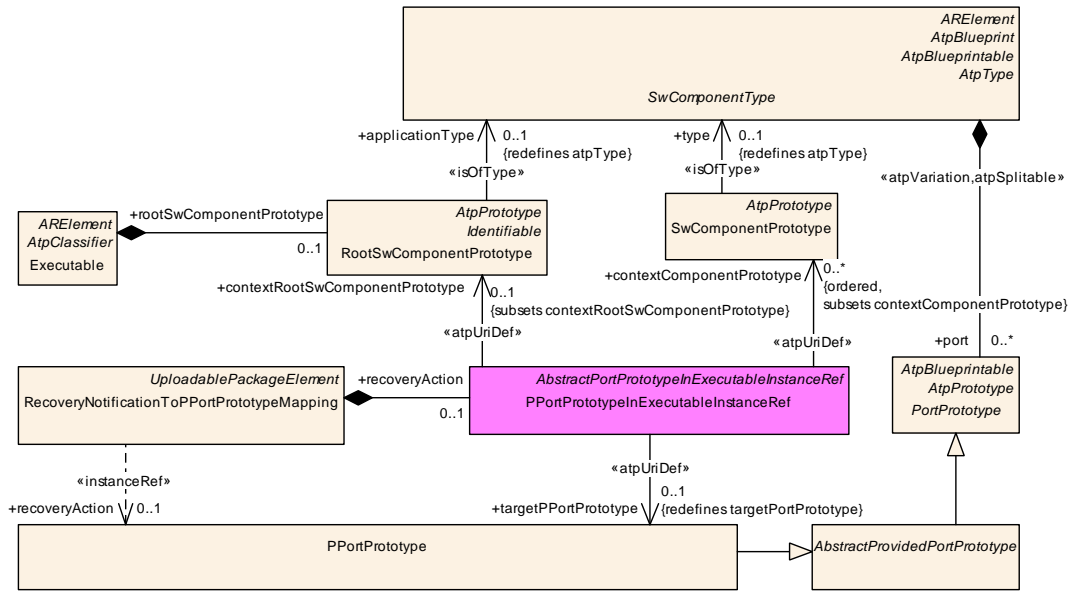


Figure C.20: Modeling of **RecoveryNotificationToPPortPrototypeMapping**

C.7 Modeling of Time-related InstanceRefs

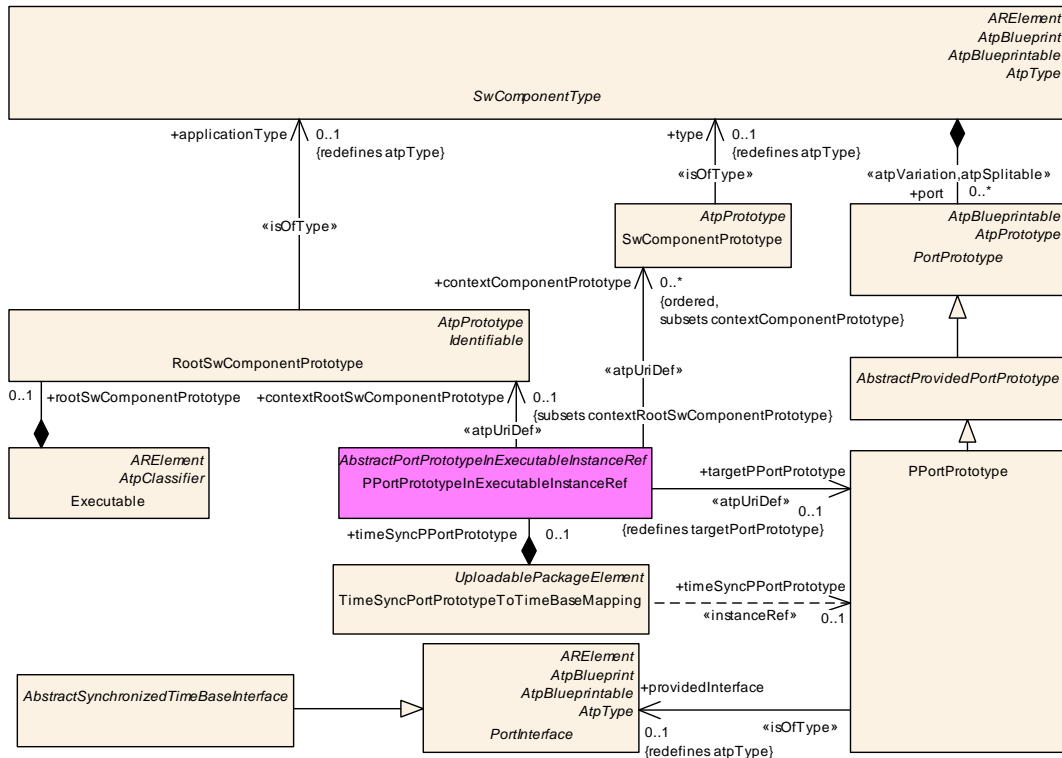


Figure C.21: Modeling of **TimeSyncPortPrototypeToTimeBaseMapping.timeSyncPortPrototype**

C.8 Modeling of Persistency-related InstanceRefs

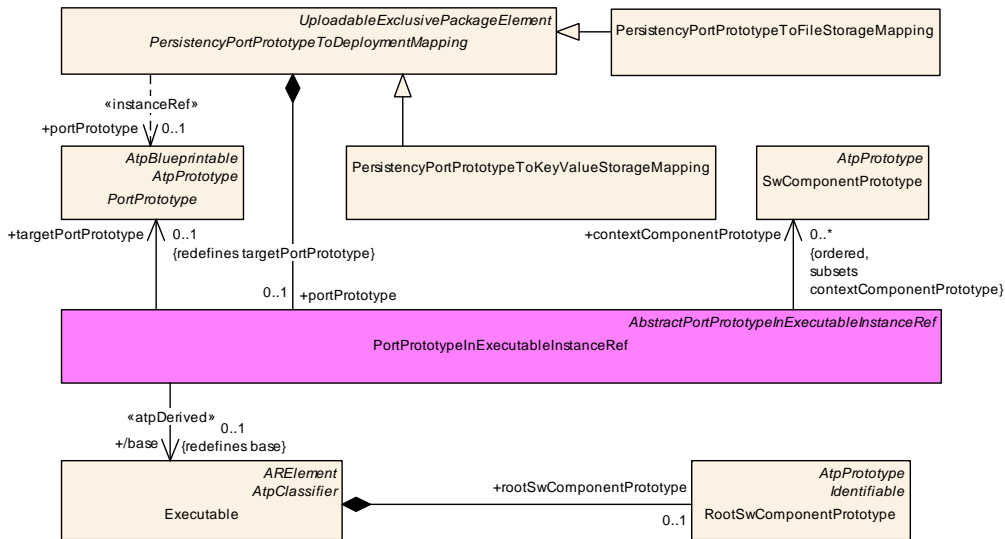


Figure C.22: Modeling of **PersistencyPortPrototypeToDeploymentMapping**

C.9 Modeling of SoftwareClusterDesign-related InstanceRefs

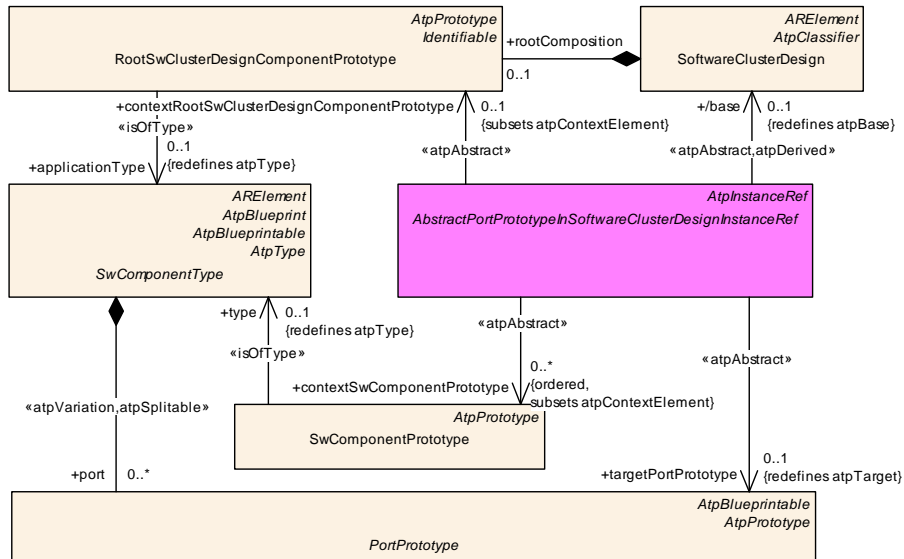
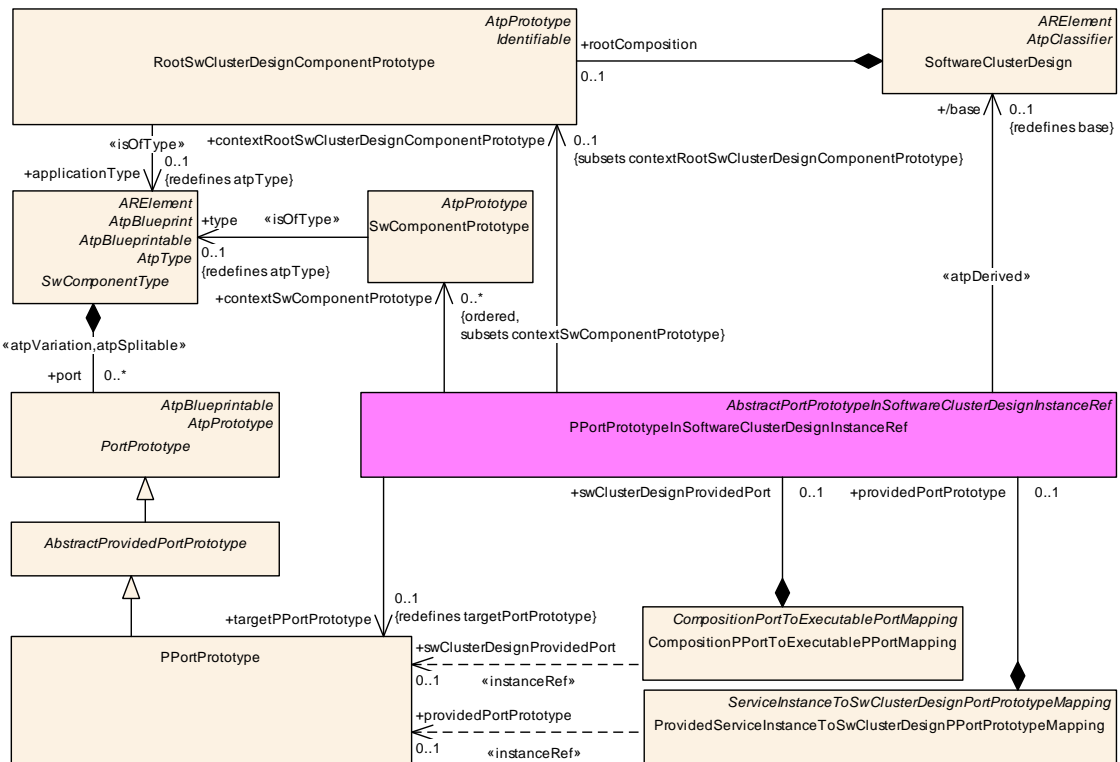


Figure C.23: Modeling of **AbstractPortPrototypeInSoftwareClusterDesignInstanceRef**

Class	AbstractPortPrototypeInSoftwareClusterDesignInstanceRef (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInSoftwareClusterDesignInstanceRef			
Note				
Base	ARObject, AtpInstanceRef			
Subclasses	PPortPrototypeInSoftwareClusterDesignInstanceRef, RPortPrototypeInSoftwareClusterDesignInstanceRef			
Attribute	Type	Mult.	Kind	Note
base	SoftwareClusterDesign	0..1	ref	Stereotypes: atpAbstract; atpDerived
contextRootSwClusterDesignComponentPrototype	RootSwClusterDesignComponentPrototype	0..1	ref	Stereotypes: atpAbstract Tags: xml.sequenceOffset=10
contextSwComponentPrototype (ordered)	SwComponentPrototype	*	ref	Stereotypes: atpAbstract Tags: xml.sequenceOffset=20
targetPortPrototype	PortPrototype	0..1	ref	Stereotypes: atpAbstract Tags: xml.sequenceOffset=30

Table C.16: AbstractPortPrototypeInSoftwareClusterDesignInstanceRef

Figure C.24: Modeling of PPortPrototypeInSoftwareClusterDesignInstanceRef

Class	PPortPrototypeInSoftwareClusterDesignInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInSoftwareClusterDesignInstanceRef			
Note				
Base	ARObject, AbstractPortPrototypeInSoftwareClusterDesignInstanceRef, AtpInstanceRef			





Class	PPortPrototypeInSoftwareClusterDesignInstanceRef			
Aggregated by	CompositionPPortToExecutablePPortMapping.swClusterDesignProvidedPort, ProvidedServiceInstanceToSwClusterDesignPPortPrototypeMapping.providedPortPrototype			
Attribute	Type	Mult.	Kind	Note
base	SoftwareClusterDesign	0..1	ref	Stereotypes: atpDerived
contextRootSwClusterDesignComponentPrototype	RootSwClusterDesignComponentPrototype	0..1	ref	Tags:xml.sequenceOffset=10
contextSwComponentPrototype (ordered)	SwComponentPrototype	*	ref	Tags:xml.sequenceOffset=20
targetPPortPrototype	PPortPrototype	0..1	ref	Tags:xml.sequenceOffset=30

Table C.17: PPortPrototypeInSoftwareClusterDesignInstanceRef

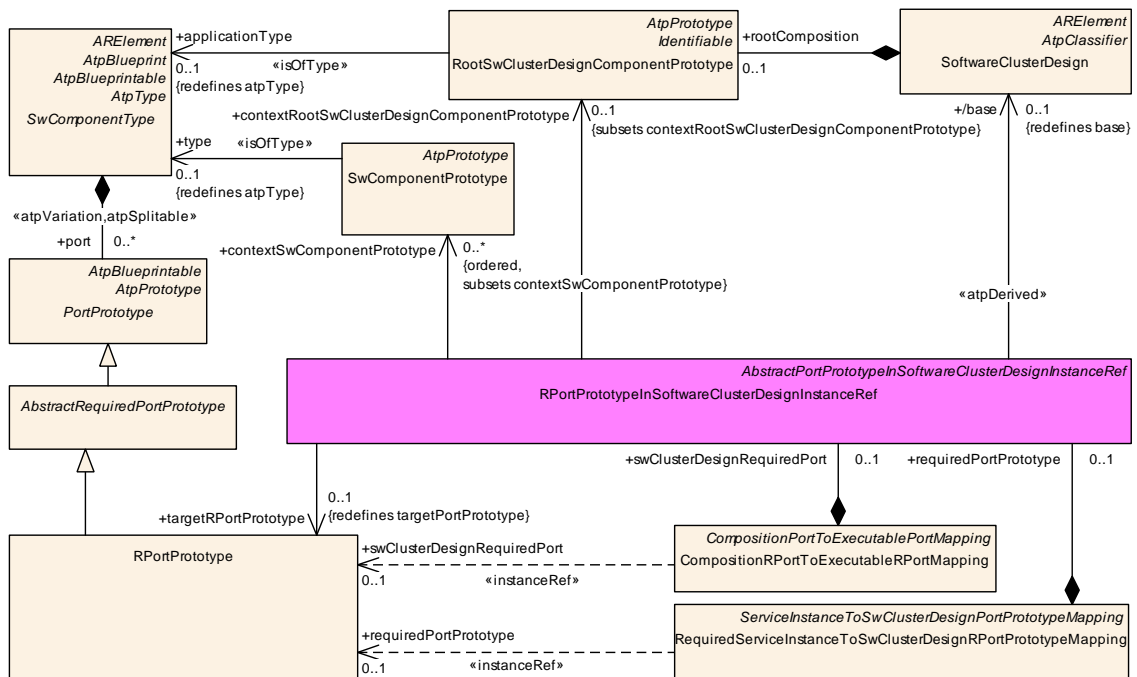


Figure C.25: Modeling of RPortPrototypeInSoftwareClusterDesignInstanceRef

Class	RPortPrototypeInSoftwareClusterDesignInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInSoftwareClusterDesignInstanceRef			
Note				
Base	ARObject, AbstractPortPrototypeInSoftwareClusterDesignInstanceRef, AtpInstanceRef			
Aggregated by	CompositionRPortToExecutableRPortMapping.swClusterDesignRequiredPort, RequiredServiceInstanceToSwClusterDesignRPortPrototypeMapping.requiredPortPrototype			
Attribute	Type	Mult.	Kind	Note
base	SoftwareClusterDesign	0..1	ref	Stereotypes: atpDerived





Class	RPortPrototypeInSoftwareClusterDesignInstanceRef			
contextRootSw ClusterDesign Component Prototype	RootSwClusterDesign ComponentPrototype	0..1	ref	Tags: xml.sequenceOffset=10
contextSw Component Prototype (ordered)	SwComponent Prototype	*	ref	Tags: xml.sequenceOffset=20
targetRPort Prototype	RPortPrototype	0..1	ref	Tags: xml.sequenceOffset=30

Table C.18: RPortPrototypeInSoftwareClusterDesignInstanceRef

C.10 Modeling of State-Management-related InstanceRefs

This section illustrates the concrete modeling of the instance references used in the modeling of the state management deployment in this document.

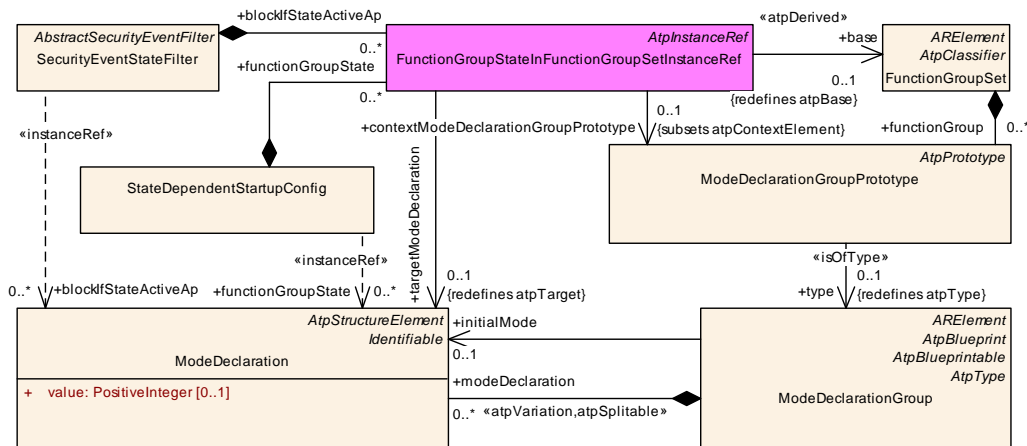


Figure C.26: Modeling of FunctionGroupStateInFunctionGroupSetInstanceRef

Class	FunctionGroupStateInFunctionGroupSetInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest::InstanceRefs			
Note				
Base	<i>ARObject</i> , <i>AtpInstanceRef</i>			
Aggregated by	FunctionGroupPhmStateReference.functionGroupState , NmHandleToFunctionGroupStateMapping.functionGroupState , SecurityEventStateFilter.blockIfStateActiveAp , StateDependentStartupConfig.functionGroupState , StateManagementSetFunctionGroupStateActionItem.setFunctionGroupState			
Attribute	Type	Mult.	Kind	Note
base	FunctionGroupSet	0..1	ref	Stereotypes: atpDerived
contextMode Declaration GroupPrototype	ModeDeclarationGroup Prototype	0..1	ref	Tags: xml.sequenceOffset=10
targetMode Declaration	ModeDeclaration	0..1	ref	Tags: xml.sequenceOffset=20

Table C.19: FunctionGroupStateInFunctionGroupSetInstanceRef

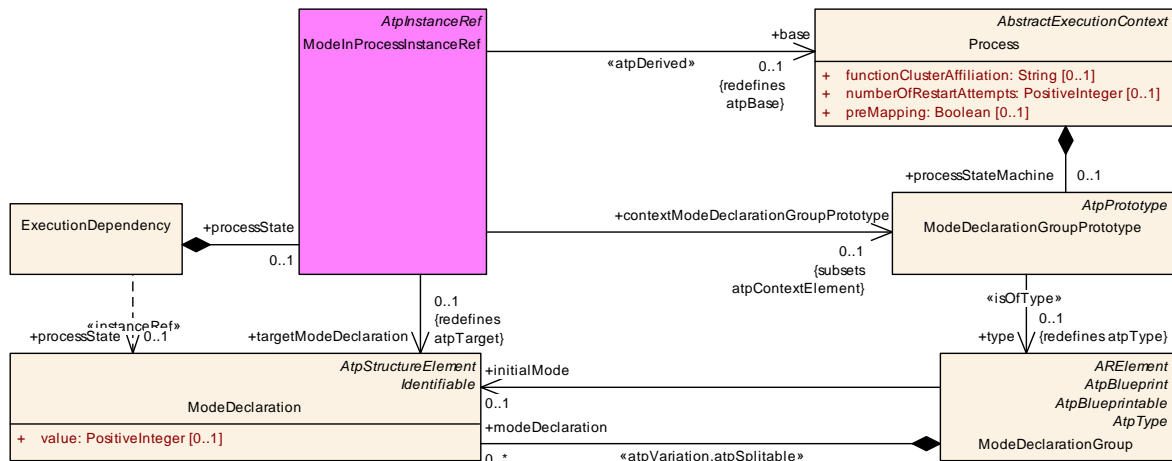


Figure C.27: Modeling of ModeInProcessInstanceRef

Class	ModeInProcessInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest::InstanceRefs			
Note				
Base	ARObject, AtpInstanceRef			
Aggregated by	ExecutionDependency.processState			
Attribute	Type	Mult.	Kind	Note
base	Process	0..1	ref	Stereotypes: atpDerived Tags: xml.sequenceOffset=10
contextMode Declaration GroupPrototype	ModeDeclarationGroup Prototype	0..1	ref	Tags: xml.sequenceOffset=20
targetMode Declaration	ModeDeclaration	0..1	ref	Tags: xml.sequenceOffset=30

Table C.20: ModeInProcessInstanceRef

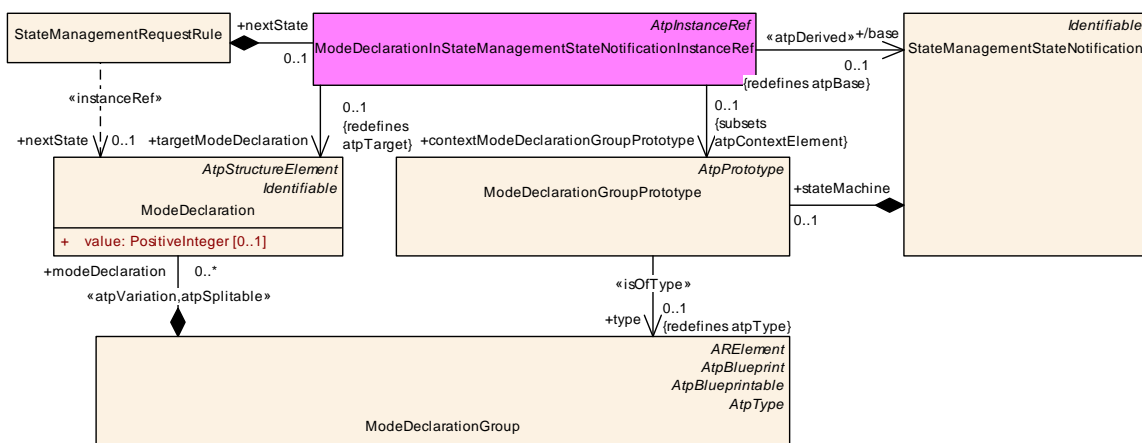


Figure C.28: Modeling of ModeDeclarationInStateManagementStateNotificationInstanceRef

Class	ModeDeclarationInStateManagementStateNotificationInstanceRef			
Package	M2::AUTOSARTemplates::AdaptivePlatform::General::SomethingInExecutableInstanceRef			
Note	Tags: atp.Status=draft			
Base	<i>ARObject, AtpInstanceRef</i>			
Aggregated by	StateManagementActionList.affectedState, StateManagementRequestRule.nextState, StateManagementTriggerCompareRule.assumedCurrentState			
Attribute	Type	Mult.	Kind	Note
base	StateManagementStateNotification	0..1	ref	Stereotypes: atpDerived Tags: atp.Status=draft
contextModeDeclarationGroupPrototype	ModeDeclarationGroupPrototype	0..1	ref	Tags: atp.Status=draft xml.sequenceOffset=10
targetModeDeclaration	ModeDeclaration	0..1	ref	Tags: atp.Status=draft xml.sequenceOffset=20

Table C.21: ModeDeclarationInStateManagementStateNotificationInstanceRef

D Mentioned Class Tables

For the sake of completeness, this chapter contains a set of class tables representing meta-classes mentioned in the context of this document but which are not contained directly in the scope of describing specific meta-model semantics.

Class	ARElement (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::ARPackage			
Note	An element that can be defined stand-alone, i.e. without being part of another element (except for packages of course).			
Base	ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	AbstractIamRemoteSubject , AclObjectSet , AclOperation , AclPermission , AclRole , AliasNameSet , Allocator , ApApplicationError , ApApplicationErrorDomain , ApApplicationErrorSet , AutosarDataType , BaseType , BlueprintMappingSet , BuildActionManifest , CalibrationParameterValueSet , CanXIProps , ClientIdDefinitionSet , Collection , CompositionPortToExecutablePortMapping , CompuMethod , ConsistencyNeedsBlueprintSet , ConstantSpecification , ConstantSpecificationMappingSet , CryptoEllipticCurveProps , CryptoServiceCertificate , CryptoServiceKey , CryptoServicePrimitive , CryptoServiceQueue , CryptoSignatureScheme , DataConstr , DataExchangePoint , DataTransformationSet , DataTypeMappingSet , DiagnosticCommonElement , DiagnosticConnection , DiagnosticContributionSet , DltContext , DltEcuDocumentation , E2EProfileCompatibilityProps , E2EProfileConfigurationSet , EndToEndProtectionSet , EthIpProps , EthTcplpCmpProps , EthTcplpProps , EvaluatedVariantSet , Executable , FMFeature , FMFeatureMap , FMFeatureModel , FMFeatureSelectionSet , FirewallRule , FunctionGroupSet , GeneralPurposeConnection , Grant , GrantDesign , HwCategory , HwElement , HwType , IPSecConfigProps , IdsCommonElement , IdsDesign , InterfaceMapping , InterpolationRoutineMappingSet , KeywordSet , LTMessageCollectionToPortPrototypeMapping , LifeCycleInfoSet , LifeCycleStateDefinitionGroup , LogAndTraceMessageCollectionSet , MacSecGlobalKeyProps , MacSecParticipantSet , Machine , McFunction , McGroup , ModeDeclarationGroup , ModeDeclarationMappingSet , PhmContributionToMachineMapping , PhysicalDimension , PhysicalDimensionMappingSet , PlatformModuleEndpointConfiguration , PortInterface , PortInterfaceMappingSet , PortInterfaceToDataTypeMapping , PortPrototypeBlueprint , PostBuildVariantCriterion , PostBuildVariantCriterionValueSet , PredefinedVariant , ProcessDesign , ProcessDesignToMachineDesignMapping , RapidPrototypingScenario , SdgDef , SecureComProps , SecurityEventReportToSecurityEventDefinitionMapping , ServiceInstanceToSignalMapping , ServiceInstanceToSwClusterDesignPortPrototypeMapping , ServiceInterfaceElementMapping , ServiceInterfacePedigree , SignalServiceTranslationPropsSet , SoftwareCluster , SoftwareClusterDesign , SoftwarePackage , SomeipDataPrototypeTransformationProps , SomeipRemoteMulticastConfig , SomeipRemoteUnicastConfig , SomeipSdClientEventGroupTimingConfig , SomeipSdClientServiceInstanceConfig , SomeipSdServerEventGroupTimingConfig , SomeipSdServerServiceInstanceConfig , StartupConfig , StateDependentFirewall , SwAddrMethod , SwAxisType , SwComponentType , SwRecordLayout , SwSystemconst , SwSystemconstantValueSet , System , SystemSignal , SystemSignalGroup , TimingExtension , TlsConnectionGroup , TlvDataIdDefinitionSet , TransformationPropsSet , TransformationPropsToServiceInterfaceElementMapping , Unit , UnitGroup , UploadablePackageElement , VehiclePackage , ViewMapSet			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.1: ARElement

Class	ARPackage
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::ARPackage
Note	AUTOSAR package, allowing to create top level packages to structure the contained ARElements. ARPackages are open sets. This means that in a file based description system multiple files can be used to partially describe the contents of a package. This is an extended version of MSR's SW-SYSTEM.
Base	ARObject , AtpBlueprint , AtpBlueprintable , CollectableElement , Identifiable , MultilanguageReferrable , Referrable
Aggregated by	ARPackage.arPackage , AUTOSAR.arPackage





Class		ARPackage		
Attribute	Type	Mult.	Kind	Note
arPackage	ARPackage	*	aggr	This represents a sub package within an ARPackage, thus allowing for an unlimited package hierarchy. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=arPackage.shortName, arPackage.variationPoint.shortLabel vh.latestBindingTime=blueprintDerivationTime xml.sequenceOffset=30
element	PackageableElement	*	aggr	Elements that are part of this package Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=element.shortName, element.variationPoint.shortLabel vh.latestBindingTime=systemDesignTime xml.sequenceOffset=20
referenceBase	ReferenceBase	*	aggr	This denotes the reference bases for the package. This is the basis for all relative references within the package. The base needs to be selected according to the base attribute within the references. Stereotypes: atpSplitable Tags: atp.Splitkey=referenceBase.shortLabel xml.sequenceOffset=10

Table D.2: ARPackage

Class		AUTOSAR		
Package		M2::AUTOSARTemplates::AutosarTopLevelStructure		
Note		Root element of an AUTOSAR description, also the root element in corresponding XML documents. Tags: xml.globalElement=true		
Base		ARObject		
Attribute	Type	Mult.	Kind	Note
adminData	AdminData	0..1	aggr	This represents the administrative data of an Autosar file. Tags: xml.sequenceOffset=10
arPackage	ARPackage	*	aggr	This is the top level package in an AUTOSAR model. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=arPackage.shortName, arPackage.variationPoint.shortLabel vh.latestBindingTime=blueprintDerivationTime xml.sequenceOffset=30
fileInfoComment	FileInfoComment	0..1	aggr	This represents a possibility to provide a structured comment in an AUTOSAR file. Stereotypes: atpStructuredComment Tags: xml.roleElement=true xml.sequenceOffset=-10 xml.typeElement=false





Class	AUTOSAR			
introduction	DocumentationBlock	0..1	aggr	This represents an introduction on the Autosar file. It is intended for example to represent disclaimers and legal notes. Tags: xml.sequenceOffset=20

Table D.3: AUTOSAR

Class	AbstractProvidedPortPrototype (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	This abstract class provides the ability to become a provided PortPrototype.			
Base	ARObject, AtpBlueprintable, AtpFeature, AtpPrototype, Identifiable , MultilanguageReferrable , PortPrototype , Referrable			
Subclasses	PPortPrototype, PRPortPrototype			
Aggregated by	AtpClassifier.atpFeature, SwComponentType.port			
Attribute	Type	Mult.	Kind	Note
providedComSpec	PPortComSpec	*	aggr	Provided communication attributes per interface element (data element or operation).

Table D.4: AbstractProvidedPortPrototype

Class	AbstractRequiredPortPrototype (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	This abstract class provides the ability to become a required PortPrototype.			
Base	ARObject, AtpBlueprintable, AtpFeature, AtpPrototype, Identifiable , MultilanguageReferrable , PortPrototype , Referrable			
Subclasses	PRPortPrototype, RPortPrototype			
Aggregated by	AtpClassifier.atpFeature, SwComponentType.port			
Attribute	Type	Mult.	Kind	Note
requiredComSpec	RPortComSpec	*	aggr	Required communication attributes, one for each interface element.

Table D.5: AbstractRequiredPortPrototype

Class	AbstractServiceInstance (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	Provided and Consumed Ethernet Service Instances that are available at the ApplicationEndpoint.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Subclasses	ConsumedServiceInstance, ProvidedServiceInstance			
Aggregated by	ServiceInstanceCollectionSet.serviceInstance			
Attribute	Type	Mult.	Kind	Note





Class	AbstractServiceInstance (abstract)			
capabilityRecord	TagWithOptionalValue	*	aggr	A sequence of records to store arbitrary name/value pairs conveying additional information about the named service. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=capabilityRecord, capabilityRecord.variationPoint.shortLabel vh.latestBindingTime=postBuild
majorVersion	PositiveInteger	0..1	attr	Major Version of the ServiceInterface. Value can be set to a number that represents the Major Version of the service.
methodActivationRoutingGroup	PduActivationRoutingGroup	0..1	aggr	The ServiceDiscovery module is able to activate and deactivate the PDU routing for ClientServerOperations (SOME/IP methods). Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=methodActivationRoutingGroup.shortName, methodActivationRoutingGroup.variationPoint.shortLabel vh.latestBindingTime=postBuild
routingGroup	SoAdRoutingGroup	*	ref	The ServiceDiscovery module is able to activate and deactivate the PDU routing from and to TCP/IP-sockets. Tags: atp.Status=obsolete

Table D.6: AbstractServiceInstance

Class	AdminData			
Package	M2::MSR::AsamHdo::AdminData			
Note	AdminData represents the ability to express administrative information and custom extensions for an element. This administration information is to be treated as meta-data such as revision id or state of the file. There are basically the following kinds of meta-data <ul style="list-style-type: none"> • The language and/or used languages. • Revision information covering e.g. revision number, state, release date, changes. Note that this information can be given in general as well as related to a particular company. • Document meta-data specific for a company Beside that a custom extension of model-data is possible by <ul style="list-style-type: none"> • Special data 			
Base	ARObject			
Aggregated by	AUTOSAR.adminData , Describable.adminData , Identifiable.adminData			
Attribute	Type	Mult.	Kind	Note
docRevision (ordered)	DocRevision	*	aggr	This allows to denote information about the current revision of the object. Note that information about previous revisions can also be logged here. The entries shall be sorted descendant by date in order to reflect the history. Therefore the most recent entry representing the current version is denoted first. Tags: xml.roleElement=true xml.roleWrapperElement=true xml.sequenceOffset=50 xml.typeElement=false xml.typeWrapperElement=false





Class	AdminData			
language	LEnum	0..1	attr	This attribute specifies the master language of the document or the document fragment. The master language is the one in which the document is maintained and from which the other languages are derived from. In particular in case of inconsistencies, the information in the master language is priority. Tags: xml.sequenceOffset=20
sdg	Sdg	*	aggr	This property allows to keep special data which is not represented by the standard model. It can be utilized to keep e.g. tool specific data. Stereotypes: atpSplitable Tags: atp.Splitkey=sdg xml.roleElement=true xml.roleWrapperElement=true xml.sequenceOffset=60 xml.typeElement=false xml.typeWrapperElement=false
usedLanguages	MultiLanguagePlainText	0..1	aggr	This property specifies the languages which are provided in the document. Therefore it should only be specified in the top level admin data. For each language provided in the document there is one entry in MultilanguagePlainText. The content of each entry can be used for illustration of the language. The used language itself depends on the language attribute in the entry. Tags: xml.sequenceOffset=30

Table D.7: AdminData

Class	ApplicationArrayType			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	An application data type which is an array, each element is of the same application data type. Tags: atp.recommendedPackage=ApplicationDataTypes			
Base	ARElement , ARObject , ApplicationCompositeDataType , ApplicationDataType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dynamicArraySizeProfile	String	0..1	attr	Specifies the profile which the array will follow if it is a variable size array.
element	ApplicationArrayElement	0..1	aggr	This association implements the concept of an array element. That is, in some cases it is necessary to be able to identify single array elements, e.g. as input values for an interpolation routine.

Table D.8: ApplicationArrayType

Class	ApplicationArrayElement			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::DataPrototypes			
Note	Describes the properties of the elements of an application array data type.			
Base	ARObject , ApplicationCompositeElementDataPrototype , AtpFeature , AtpPrototype , DataPrototype , Identifiable , MultilanguageReferrable , Referrable			





Class	ApplicationArrayElement			
Aggregated by	ApplicationArrayDataType.element , AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
arraySize Handling	ArraySizeHandling Enum	0..1	attr	The way how the size of the array is handled.
arraySize Semantics	ArraySizeSemantics Enum	0..1	attr	This attribute controls how the information about the array size shall be interpreted.
indexDataType	ApplicationPrimitive DataType	0..1	ref	This reference can be taken to assign a CompuMethod of category TEXTTABLE to the array. The texttable entries associate a textual value to an index number such that the element with that index number is represented by a symbolic name.
maxNumberOf Elements	PositiveInteger	0..1	attr	The maximum number of elements that the array can contain. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime

Table D.9: ApplicationArrayElement

Class	ApplicationCompositeDataType (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	Abstract base class for all application data types composed of other data types.			
Base	ARElement , ARObject , ApplicationDataType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	ApplicationArrayDataType , ApplicationAssocMapDataType , ApplicationRecordDataType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.10: ApplicationCompositeDataType

Class	ApplicationError			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	This is a user-defined error that is associated with an element of an AUTOSAR interface. It is specific for the particular functionality or service provided by the AUTOSAR software component.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	ClientServerInterface.possibleError			
Attribute	Type	Mult.	Kind	Note
errorCode	Integer	0..1	attr	The RTE generator is forced to assign this value to the corresponding error symbol. Note that for error codes certain ranges are predefined (see RTE specification).

Table D.11: ApplicationError

Class	ApplicationSwComponentType			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	The ApplicationSwComponentType is used to represent the application software. Tags: atp.recommendedPackage=SwComponentTypes			





Class	ApplicationSwComponentType			
Base	ARElement , ARObject , AtomicSwComponentType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable , SwComponentType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.12: ApplicationSwComponentType

Class	ApplicationValueSpecification			
Package	M2::AUTOSARTemplates::CommonStructure::Constants			
Note	This meta-class represents values for DataPrototypes typed by ApplicationDataTypes (this includes in particular compound primitives). For further details refer to ASAM CDF 2.0. This meta-class corresponds to some extent with SW-INSTANCE in ASAM CDF 2.0.			
Base	ARObject , CompositeRuleBasedValueArgument , ValueSpecification			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , CalibrationParameterValue.applInitValue , CalibrationParameterValue.implInitValue , CompositeRuleBasedValueSpecification.compoundPrimitiveArgument , ConstantSpecification.valueSpec , CryptoServiceKey.developmentValue , DiagnosticEnvDataCondition.compareValue , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , ISignal.initValue , ISignal.timeoutSubstitutionValue , NonqueuedReceiverComSpec.initValue , NonqueuedReceiverComSpec.timeoutSubstitutionValue , NonqueuedSenderComSpec.initValue , NvProvideComSpec.ramBlockInitValue , NvProvideComSpec.romBlockInitValue , NvRequireComSpec.initValue , ParameterDataPrototype.initValue , ParameterProvideComSpec.initValue , ParameterRequireComSpec.initValue , PersistencyDataRequiredComSpec.initValue , PersistencyKeyValuePair.initValue , PortDefinedArgumentValue.value , PortPrototypeBlueprintInitValue.value , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , SwDataDefProps.invalidValue , VariableDataPrototype.initValue			
Attribute	Type	Mult.	Kind	Note
category	Identifier	0..1	attr	Specifies to which category of ApplicationDataType this ApplicationValueSpecification can be applied (e.g. as an initial value), thus imposing constraints on the structure and semantics of the contained values, see [constr_1006] and [constr_2051].
swAxisCont (ordered)	SwAxisCont	*	aggr	This represents the axis values of a Compound Primitive Data Type (curve or map). The first swAxisCont describes the x-axis, the second swAxisCont describes the y-axis, the third swAxisCont describes the z-axis. In addition to this, the axis can be denoted in swAxisIndex.
swValueCont	SwValueCont	0..1	aggr	This represents the values of a Compound Primitive Data Type.

Table D.13: ApplicationValueSpecification

Class	ArgumentDataPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	An argument of an operation, much like a data element, but also carries direction information and is owned by a particular ClientServerOperation.			
Base	ARObject , AtpFeature , AtpPrototype , AutosarDataPrototype , DataPrototype , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	AtpClassifier.atpFeature , ClientServerOperation.argument			





Class		ArgumentDataPrototype		
Attribute	Type	Mult.	Kind	Note
direction	ArgumentDirectionEnum	0..1	attr	This attribute specifies the direction of the argument prototype.
serverArgumentImplPolicy	ServerArgumentImplPolicyEnum	0..1	attr	This defines how the argument type of the servers RunnableEntity is implemented. If the attribute is not defined this has the same semantics as if the attribute is set to the value useArgumentType for primitive arguments and structures.

Table D.14: ArgumentDataPrototype

Enumeration		ArgumentDirectionEnum
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::PrimitiveTypes	
Note	Use cases: <ul style="list-style-type: none"> Arguments in ClientServerOperation can have different directions that need to be formally indicated because they have an impact on how the function signature looks like eventually. Arguments in BswModuleEntry already determine a function signature, but the direction is used to specify the semantics, especially of pointer arguments. 	
Aggregated by	ArgumentDataPrototype.direction , SwServiceArg.direction	
Literal	Description	
in	The argument value is passed to the callee. Tags: atp.EnumerationLiteralIndex=0	
inout	The argument value is passed to the callee but also passed back from the callee to the caller. Tags: atp.EnumerationLiteralIndex=1	
out	The argument value is passed from the callee to the caller. Tags: atp.EnumerationLiteralIndex=2	

Table D.15: ArgumentDirectionEnum

Class		ArrayValueSpecification		
Package	M2::AUTOSARTemplates::CommonStructure::Constants			
Note	Specifies the values for an array.			
Base	ARObject , CompositeValueSpecification , ValueSpecification			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , CalibrationParameterValue.applInitValue , CalibrationParameterValue.implInitValue , CompositeRuleBasedValueSpecification.argument , ConstantSpecification.valueSpec , CryptoServiceKey.developmentValue , DiagnosticEnvDataCondition.compareValue , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , ISignal.initValue , ISignal.timeoutSubstitutionValue , NonqueuedReceiverComSpec.initValue , NonqueuedReceiverComSpec.timeoutSubstitutionValue , NonqueuedSenderComSpec.initValue , NvProvideComSpec.ramBlockInitValue , NvProvideComSpec.romBlockInitValue , NvRequireComSpec.initValue , ParameterDataPrototype.initValue , ParameterProvideComSpec.initValue , ParameterRequireComSpec.initValue , PersistencyDataRequiredComSpec.initValue , PersistencyKeyValuePair.initValue , PortDefinedArgumentValue.value , PortPrototypeBlueprintInitValue.value , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , SwDataDefProps.invalidValue , VariableDataPrototype.initValue			
Attribute	Type	Mult.	Kind	Note





Class	ArrayValueSpecification			
element (ordered)	ValueSpecification	*	aggr	The value for a single array element. All Value Specifications aggregated by ArrayValueSpecification shall have the same structure. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=element, element.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
intendedPartial Initialization Count	PositiveInteger	0..1	attr	This attribute shall only have a meaning for dynamic arrays and shall be taken as a sanity check: the number filled in the attribute shall be identical to the number of ArrayValueSpecification.element. If the attribute does not exist it means that no partial initialization is intended.

Table D.16: ArrayValueSpecification

Class	AssemblySwConnector			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Composition			
Note	AssemblySwConnectors are exclusively used to connect SwComponentPrototypes in the context of a CompositionSwComponentType.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable , MultilanguageReferrable , Referrable , SwConnector			
Aggregated by	AtpClassifier.atpFeature, CompositionSwComponentType.connector			
Attribute	Type	Mult.	Kind	Note
provider	AbstractProvidedPort Prototype	0..1	iref	Instance of providing port. InstanceRef implemented by: PPortInComposition InstanceRef
requester	AbstractRequiredPort Prototype	0..1	iref	Instance of requiring port. InstanceRef implemented by: RPortInComposition InstanceRef

Table D.17: AssemblySwConnector

Class	AutosarDataPrototype (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::DataPrototypes			
Note	Base class for prototypical roles of an AutosarDataType.			
Base	ARObject, AtpFeature, AtpPrototype, DataPrototype , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	ArgumentDataPrototype , Field , ParameterDataPrototype , PersistenceDataElement , VariableData Prototype			
Aggregated by	AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
type	AutosarDataType	0..1	tref	This represents the corresponding data type. Stereotypes: isOfType

Table D.18: AutosarDataPrototype

Class	AutosarDataType (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	Abstract base class for user defined AUTOSAR data types for software.			
Base	ARElement , ARObject , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	AbstractImplementationDataType , ApplicationDataType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
swDataDef Props	SwDataDefProps	0..1	aggr	The properties of this AutosarDataType. Stereotypes: atpSplittable Tags: atp.Splitkey=swDataDefProps

Table D.19: AutosarDataType

Class	BaseType (abstract)			
Package	M2::MSR::AsamHdo::BaseTypes			
Note	This abstract meta-class represents the ability to specify a platform dependent base type.			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	SwBaseType			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
baseType Definition	BaseTypeDefinition	1	aggr	This is the actual definition of the base type. Tags: xml.roleElement=false xml.roleWrapperElement=false xml.sequenceOffset=20 xml.typeElement=false xml.typeWrapperElement=false

Table D.20: BaseType

Class	BaseTypeDirectDefinition			
Package	M2::MSR::AsamHdo::BaseTypes			
Note	This BaseType is defined directly (as opposite to a derived BaseType)			
Base	ARObject , BaseTypeDefinition			
Aggregated by	BaseType.baseTypeDefinition			
Attribute	Type	Mult.	Kind	Note
baseType Encoding	BaseTypeEncoding String	0..1	attr	This specifies, how an object of the current BaseType is encoded, e.g. in an ECU within a message sequence. Tags: xml.sequenceOffset=90
baseTypeSize	PositiveInteger	0..1	attr	Describes the length of the data type specified in the container in bits. Tags: xml.sequenceOffset=70
byteOrder	ByteOrderEnum	0..1	attr	This attribute specifies the byte order of the base type. Tags: xml.sequenceOffset=110





Class	BaseTypeDirectDefinition			
memAlignment	PositiveInteger	0..1	attr	<p>This attribute describes the alignment of the memory object in bits. E.g. "8" specifies, that the object in question is aligned to a byte while "32" specifies that it is aligned four byte. If the value is set to "0" the meaning shall be interpreted as "unspecified".</p> <p>Tags:xml.sequenceOffset=100</p>
native Declaration	NativeDeclarationString	0..1	attr	<p>This attribute describes the declaration of such a base type in the native programming language, primarily in the Programming language C. This can then be used by a code generator to include the necessary declarations into a header file. For example</p> <p>BaseType with shortName: "MyUnsignedInt" native Declaration: "unsigned short"</p> <p>Results in</p> <pre>typedef unsigned short MyUnsignedInt;</pre> <p>If the attribute is not defined the referring Implementation DataTypes will not be generated as a typedef by RTE.</p> <p>If a nativeDeclaration type is given it shall fulfill the characteristic given by baseTypeEncoding and baseType Size.</p> <p>This is required to ensure the consistent handling and interpretation by software components, RTE, COM and MCM systems.</p> <p>Tags:xml.sequenceOffset=120</p>

Table D.21: BaseTypeDirectDefinition

Class	CanControllerXIConfiguration			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Can::CanTopology			
Note	This meta-class represents the CAN XL-specific controller attributes.			
Base	ARObject			
Aggregated by	AbstractCanCommunicationControllerAttributes.canControllerXIAttributes, CanXIProps.canXIConfig			
Attribute	Type	Mult.	Kind	Note
errorSignaling Enabled	Boolean	0..1	attr	<p>Specifies if error signaling shall be enabled. This is not possible when the transceiver is switched to PWM mode (trcvPwmModeEnabled set to TRUE).</p> <p>TRUE: Error signaling shall be enabled.</p> <p>FALSE: Error signaling shall be disabled.</p>
propSeg	PositiveInteger	0..1	attr	Specifies propagation delay in time quantas.
pwmL	PositiveInteger	0..1	attr	Specifies the PWM long phase length.
pwmO	PositiveInteger	0..1	attr	Specifies the PWM time offset.
pwmS	PositiveInteger	0..1	attr	Specifies the PWM short phase length.
sspOffset	PositiveInteger	0..1	attr	<p>Specifies the Transmitter Delay Compensation Offset in minimum time quanta. Transmitter Delay Compensation Offset is used to adjust the position of the Secondary Sample Point (SSP), relative to the beginning of the received bit. If this parameter is configured, the Transmitter Delay Compensation is done by measurement of the CAN controller. If not specified Transmitter Delay Compensation is disabled.</p>





Class	CanControllerXIConfiguration			
syncJumpWidth	PositiveInteger	0..1	attr	Specifies the synchronization jump width for the controller in time quantas.
timeSeg1	PositiveInteger	0..1	attr	Specifies phase segment 1 in time quantas.
timeSeg2	PositiveInteger	0..1	attr	Specifies phase segment 2 in time quantas.
trcvPwmMode Enabled	Boolean	0..1	attr	Specifies if the transceiver shall be set to the PWM mode. TRUE: The transceiver shall be switched to PWM mode. FALSE: The transceiver shall work in classic CAN mode.

Table D.22: CanControllerXIConfiguration

Class	CanControllerXIConfigurationRequirements			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Can::CanTopology			
Note	This element allows the specification of ranges for the CAN XL configuration parameters. These ranges are taken as requirements and have to be respected by the ECU developer.			
Base	ARObject			
Aggregated by	AbstractCanCommunicationControllerAttributes.canControllerXIRequirements, CanXIProps.canXIConfigReqs			
Attribute	Type	Mult.	Kind	Note
errorSignaling Enabled	Boolean	0..1	attr	Specifies if error signaling shall be enabled. This is not possible when the transceiver is switched to PWM mode (trcvPwmModeEnabled set to TRUE). TRUE: Error signaling shall be enabled. FALSE: Error signaling shall be disabled.
maxNumberOfTimeQuantaPerBit	Integer	0..1	attr	Maximum number of time quanta in the bit time.
maxPwmL	PositiveInteger	0..1	attr	Specifies the maximum PWM long phase length.
maxPwmO	PositiveInteger	0..1	attr	Specifies the minimum PWM time offset.
maxPwmS	PositiveInteger	0..1	attr	Specifies the maximum PWM short phase length.
maxSamplePoint	Float	0..1	attr	The max. value of the sample point as a percentage of the total bit time.
maxSyncJumpWidth	Float	0..1	attr	The max. Synchronization Jump Width value as a percentage of the total bit time. The (Re-)Synchronization Jump Width (SJW) defines how far a resynchronization may move the Sample Point inside the limits defined by the Phase Buffer Segments to compensate for edge phase errors.
maxTrcvDelay Compensation Offset	TimeValue	0..1	attr	Specifies the maximum Transceiver Delay Compensation Offset in seconds. If not specified Transceiver Delay Compensation is disabled.
minNumberOfTimeQuantaPerBit	Integer	0..1	attr	Minimum number of time quanta in the bit time.
minPwmL	PositiveInteger	0..1	attr	Specifies the minimum PWM long phase length.
minPwmO	PositiveInteger	0..1	attr	Specifies the maximum PWM time offset.
minPwmS	PositiveInteger	0..1	attr	Specifies the minimum PWM short phase length.
minSamplePoint	Float	0..1	attr	The min. value of the sample point as a percentage of the total bit time.





Class	CanControllerXIConfigurationRequirements			
minSyncJumpWidth	Float	0..1	attr	The min. Synchronization Jump Width value as a percentage of the total bit time. The (Re-)Synchronization Jump Width (SJW) defines how far a resynchronization may move the Sample Point inside the limits defined by the Phase Buffer Segments to compensate for edge phase errors.
minTrcvDelayCompensationOffset	TimeValue	0..1	attr	Specifies the minimum Transceiver Delay Compensation Offset in seconds. If not specified Transceiver Delay Compensation is disabled.
trcvPwmModeEnabled	Boolean	0..1	attr	Specifies if the transceiver shall be set to the PWM mode. TRUE: The transceiver shall be switched to PWM mode. FALSE: The transceiver shall work in classic CAN mode.

Table D.23: CanControllerXIConfigurationRequirements

Class	ClientServerInterface			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	A client/server interface declares a number of operations that can be invoked on a server by a client. Tags: atp.recommendedPackage=PortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
possibleError	ApplicationError	*	aggr	Application errors that are defined as part of this interface.

Table D.24: ClientServerInterface

Class	Collection			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::ElementCollection			
Note	<p>This meta-class specifies a collection of elements. A collection can be utilized to express additional aspects for a set of elements.</p> <p>Note that Collection is an ARElement. Therefore it is applicable e.g. for EvaluatedVariant, even if this is not obvious.</p> <p>Usually the category of a Collection is "SET". On the other hand, a Collection can also express an arbitrary relationship between elements. This is denoted by the category "RELATION" (see also [TPS_GST_00347]).</p> <p>In this case the collection represents an association from "sourceElement" to "targetElement" in the role "role".</p> <p>Tags:atp.recommendedPackage=Collections</p>			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
autoCollect	AutoCollectEnum	0..1	attr	This attribute reflects how far the referenced objects are part of the collection. Tags: xml.sequenceOffset=20





Class	Collection			
collected Instance	AtpFeature	*	iref	This instance ref supports the use case that a particular instance is part of the collection. Tags: xml.sequenceOffset=60 InstanceRef implemented by: AnyInstanceRef
collection Semantics	NameToken	0..1	attr	Provides the ability to express the semantics of a Collection depending on the intended use case. The collectionSemantics is specified as a NameToken which must be agreed by all stakeholders. Tags: xml.sequenceOffset=25
element	Identifiable	*	ref	This is an element in the collection. Note that Collection itself is collectable. Therefore collections can be nested. In case of category="RELATION" this represents the target end of the relation. Tags: xml.sequenceOffset=40
elementRole	Identifier	0..1	attr	This attribute allows to denote a particular role of the collection. Note that the applicable semantics shall be mutually agreed between the two parties. In particular it denotes the role of element in the context of sourceElement. Tags: xml.sequenceOffset=30
sourceElement	Identifiable	*	ref	Only if Category = "RELATION". This represents the source of a relation. Tags: xml.sequenceOffset=50
sourceInstance	AtpFeature	*	iref	Only if Category = "RELATION". This represents the source instance of a relation. Tags: xml.sequenceOffset=70 InstanceRef implemented by: AnyInstanceRef

Table D.25: Collection

Class	CommConnectorPort (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreTopology			
Note	<p>The Ecu communication relationship defines which signals, Pdus and frames are actually received and transmitted by this ECU.</p> <p>For each signal, Pdu or Frame that is transmitted or received and used by the Ecu an association between an ISignalPort, IPduPort or FramePort with the corresponding Triggering shall be created. An ISignalPort shall be created only if the corresponding signal is handled by COM (RTE or Signal Gateway). If a Pdu Gateway ECU only routes the Pdu without being interested in the content only a FramePort and an IPduPort needs to be created.</p>			
Base	<i>AObject</i> , Identifiable , <i>MultilanguageReferrable</i> , Referrable			
Subclasses	FramePort, IPduPort, ISignalPort			
Aggregated by	CommunicationConnector .ecuCommPortInstance			
Attribute	Type	Mult.	Kind	Note
communication Direction	Communication DirectionType	1	attr	Communication Direction of the Connector Port (input or output Port).

Table D.26: CommConnectorPort

Enumeration	CommunicationDirectionType
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication
Note	Describes the communication direction.
Aggregated by	CommConnectorPort.communicationDirection , IPSecRule.direction , ISignalIPduGroup.communicationDirection
Literal	Description
in	Reception (Input) Tags: atp.EnumerationLiteralIndex=0
out	Transmission (Output) Tags: atp.EnumerationLiteralIndex=1

Table D.27: CommunicationDirectionType

Class	CompuConst			
Package	M2::MSR::AsamHdo::ComputationMethod			
Note	This meta-class represents the fact that the value of a computation method scale is constant.			
Base	<i>ARObject</i>			
Aggregated by	Compu.compuDefaultValue, CompuScale.compuInverseValue , CompuScaleConstantContents.compuConst			
Attribute	Type	Mult.	Kind	Note
compuConstContent CompuConstType	CompuConstContent	0..1	aggr	This is the actual content of the constant compu method scale. Tags: xml.roleElement=false xml.roleWrapperElement=false xml.sequenceOffset=10 xml.typeElement=false xml.typeWrapperElement=false

Table D.28: CompuConst

Class	CompuConstTextContent			
Package	M2::MSR::AsamHdo::ComputationMethod			
Note	This meta-class represents the textual content of a scale.			
Base	<i>ARObject</i> , <i>CompuConstContent</i>			
Aggregated by	CompuConst.compuConstContent			
Attribute	Type	Mult.	Kind	Note
vt	VerbatimString	0..1	attr	This represents a textual constant in the computation method.

Table D.29: CompuConstTextContent

Class	CompuMethod
Package	M2::MSR::AsamHdo::ComputationMethod
Note	This meta-class represents the ability to express the relationship between a physical value and the mathematical representation. Note that this is still independent of the technical implementation in data types. It only specifies the formula how the internal value corresponds to its physical pendant. Tags: atp.recommendedPackage=CompuMethods





Class	CompuMethod			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , CollectableElement , Identifiable , Multilanguage , Referrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
compuInternalToPhys	Compu	0..1	aggr	This specifies the computation from internal values to physical values. Tags: xml.sequenceOffset=80
compuPhysToInternal	Compu	0..1	aggr	This represents the computation from physical values to the internal values. Tags: xml.sequenceOffset=90
displayFormat	DisplayFormatString	0..1	attr	This property specifies, how the physical value shall be displayed e.g. in documents or measurement and calibration tools. Tags: xml.sequenceOffset=20
unit	Unit	0..1	ref	This is the physical unit of the Physical values for which the CompuMethod applies. Tags: xml.sequenceOffset=30

Table D.30: CompuMethod

Class	CompuScale			
Package	M2::MSR::AsamHdo::ComputationMethod			
Note	This meta-class represents the ability to specify one segment of a segmented computation method.			
Base	ARObject			
Aggregated by	CompuScales.compuScale			
Attribute	Type	Mult.	Kind	Note
compuInverseValue	CompuConst	0..1	aggr	This is the inverse value of the constraint. This supports the case that the scale is not reversible per se. Tags: xml.sequenceOffset=60
compuScaleContents	CompuScaleContents	0..1	aggr	This represents the computation details of the scale. Tags: xml.roleElement=false xml.roleWrapperElement=false xml.sequenceOffset=70 xml.typeElement=false xml.typeWrapperElement=false
desc	MultiLanguageOverviewParagraph	0..1	aggr	<desc> represents a general but brief description of the object in question. Tags: xml.sequenceOffset=30
lowerLimit	Limit	0..1	attr	This specifies the lower limit of the scale. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime xml.sequenceOffset=40





Class	CompuScale			
mask	PositiveUnlimitedInteger	0..1	attr	<p>In difference to all the other computational methods every COMPU-SCALE will be applied including the bit MASK. Therefore it is allowed for this type of COMPU-METHOD, that COMPU-SCALES overlap.</p> <p>To calculate the string reverse to a value, the string has to be split and the according value for each substring has to be summed up. The sum is finally transmitted.</p> <p>The processing has to be done in order of the COMPU-SCALE elements.</p> <p>Tags:xml.sequenceOffset=35</p>
shortLabel	Identifier	0..1	attr	<p>This element specifies a short name for the particular scale. The name can for example be used to derive a programming language identifier.</p> <p>Tags:xml.sequenceOffset=20</p>
symbol	CIdentifier	0..1	attr	<p>The symbol, if provided, is used by code generators to get a C identifier for the CompuScale. The name will be used as is for the code generation, therefore it needs to be unique within the generation context.</p> <p>Tags:xml.sequenceOffset=25</p>
upperLimit	Limit	0..1	attr	<p>This specifies the upper limit of a of the scale.</p> <p>Stereotypes: atpVariation</p> <p>Tags: vh.latestBindingTime=preCompileTime xml.sequenceOffset=50</p>

Table D.31: CompuScale

Class	ConstantReference			
Package	M2::AUTOSARTemplates::CommonStructure::Constants			
Note	Instead of defining this value inline, a constant is referenced.			
Base	<i>ARObject</i> , <i>ValueSpecification</i>			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , CalibrationParameterValue.applInitValue , CalibrationParameterValue.implInitValue , ConstantSpecification.valueSpec , CryptoServiceKey.developmentValue , DiagnosticEnvDataCondition.compareValue , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , ISignal.initValue , ISignal.timeoutSubstitutionValue , NonqueuedReceiverComSpec.initValue , NonqueuedReceiverComSpec.timeoutSubstitutionValue , NonqueuedSenderComSpec.initValue , NvProvideComSpec.ramBlockInitValue , NvProvideComSpec.romBlockInitValue , NvRequireComSpec.initValue , ParameterDataPrototype.initValue , ParameterProvideComSpec.initValue , ParameterRequireComSpec.initValue , PersistencyDataRequiredComSpec.initValue , PersistencyKeyValuePair.initValue , PortDefinedArgumentValue.value , PortPrototypeBlueprintInitValue.value , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , SwDataDefProps.invalidValue , VariableDataPrototype.initValue			
Attribute	Type	Mult.	Kind	Note
constant	ConstantSpecification	0..1	ref	The referenced constant.

Table D.32: ConstantReference

Class	CouplingElement			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	A CouplingElement is used to connect EcuInstances to the VLAN of an EthernetCluster. Coupling Elements can reach from a simple hub to a complex managed switch or even devices with functionalities in higher layers. A CouplingElement that is not related to an EcuInstance occurs as a dedicated single device. Tags: atp.recommendedPackage=CouplingElements			
Base	ARObject, CollectableElement, FibexElement, Identifiable, MultilanguageReferrable, Packageable Element, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
communication Cluster	EthernetCluster	1	ref	This relationship defines to which cluster the Coupling Element belongs.
couplingPort	CouplingPort	*	aggr	Hardware Port of the CouplingElement that is used to connect this CouplingPort to EcuInstances or other CouplingElements. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=couplingPort.shortName, coupling Port.variationPoint.shortLabel vh.latestBindingTime=postBuild
couplingType	CouplingElementEnum	1	attr	Describes the coupling type of this CouplingElement.
ecuInstance	EcuInstance	0..1	ref	Optional reference to the ECU where the Coupling Element is located.
firewallRule	StateDependentFirewall	*	ref	Firewall rules defined in the context of a Coupling Element. Tags: atp.Status=candidate

Table D.33: CouplingElement

Class	CouplingPort			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	A CouplingPort is used to connect a CouplingElement with an EcuInstance or two CouplingElements with each other via a CouplingPortConnection. Optionally, the CouplingPort may also have a reference to a macMulticastGroup and a defaultVLAN.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	CouplingElement.couplingPort, EthernetCommunicationController.couplingPort			
Attribute	Type	Mult.	Kind	Note
connection Negotiation Behavior	EthernetConnection NegotiationEnum	0..1	attr	Specifies the connection negotiation of the CouplingPort.
couplingPort Details	CouplingPortDetails	0..1	aggr	Defines more details of a CouplingPort in case a more specific configuration is required.
couplingPort Role	CouplingPortRoleEnum	0..1	attr	Defines the role this CouplingPort takes in the context of the CouplingElement.





Class	CouplingPort			
defaultVlan	EthernetPhysicalChannel	0..1	ref	<p>The vLanIdentifier of the referenced VLAN is the Default-PVID (port VLAN ID). A Port VLAN ID is a default VLAN ID that is assigned to an access CouplingPort to designate the VLAN segment to which this port is connected. Also, if a CouplingPort has not been configured with any VLAN memberships, the virtual switch's Port VLAN ID (pvid) becomes the default VLAN ID for the ports connection.</p> <p>This identifier/tag is added for incoming untagged messages at the port (ingress tagging). For outgoing messages with this identifier, the tag is removed at the port (egress untagging, depending on the Vlan Membership.sendActivity).</p>
macLayerType	EthernetMacLayerTypeEnum	0..1	attr	Specifies the mac layer type of the CouplingPort.
macMulticastAddress	MacMulticastGroup	*	ref	Assigns a set of MAC-Multicast-Addresses which are addressable via this CouplingPort. This is a static pre-configuration and further addresses may be learned during runtime.
macSecProps	MacSecProps	*	aggr	<p>Properties to configure MACsec (Media access control security) and the MKA (MACsec Key Agreement) for the CouplingPort (PHY).</p> <p>Tags:atp.Status=candidate</p>
physicalLayerType	EthernetPhysicalLayerTypeEnum	0..1	attr	Specifies the physical layer type of the CouplingPort.
plcaProps	PlcaProps	0..1	aggr	Optional properties for configuration of PLCA (Physical Layer Collision Avoidance) in case 10-BASE-T1S Ethernet is used and PLCA is enabled on the Coupling Port (PHY).
pncMapping	PncMappingIdent	*	ref	Reference to the partial networks this CouplingPort participates in.
receiveActivity	EthernetSwitchVlanIngressTagEnum	0..1	attr	Defines the handling of frames at the ingress port.
vlanMembership	VlanMembership	*	aggr	Messages of VLANs that are defined here can be communicated via the CouplingPort.
vlanModifier	EthernetPhysicalChannel	0..1	ref	<p>All incoming messages at this CouplingPort shall be tagged with this VLAN Id. This tagging is performed regardless whether the message already has a VLAN tag or is untagged, an existing VLAN tag will be overwritten.</p> <p>This feature is XOR with CoupligPort.defaultVlan.</p>
wakeupSleepOnDatalineConfig	EthernetWakeupSleepOnDatalineConfig	0..1	ref	Optional reference to EthernetWakeupSleepOnDataline Config.

Table D.34: CouplingPort

Class	CouplingPortConnection			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Connection between two CouplingPorts (firstPort and secondPort) or between a collection of Ports that are all referenced by the portCollection reference.			
Base	ARObject			
Aggregated by	EthernetCluster.couplingPortConnection			
Attribute	Type	Mult.	Kind	Note





Class	CouplingPortConnection			
firstPort	CouplingPort	0..1	ref	Reference to the first CouplingPort that is connected via the CouplingPortConnection.
nodePort	CouplingPort	*	ref	Reference to a number of CouplingPorts that are connected via the CouplingPortConnection. This reference shall be used to describe a 10BASE-T1S topology architecture where several CouplingPorts of EthernetCommunicationControllers are connected via one CouplingPortConnection. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=nodePort.couplingPort, nodePort.variationPoint.shortLabel vh.latestBindingTime=postBuild
plcaLocalNodeCount	PositiveInteger	0..1	attr	Defines the number of communication participants in case 10BASE-T1S and the nodePort reference is used.
plcaTransmitOpportunityTimer	PositiveInteger	0..1	attr	Timer for the transmission in bit time to evaluate if a Transmission Opportunity is yield or not.
secondPort	CouplingPort	0..1	ref	Reference to the second CouplingPort that is connected via the CouplingPortConnection.

Table D.35: CouplingPortConnection

Class	DataConstr			
Package	M2::MSR::AsamHdo::Constraints::GlobalConstraints			
Note	This meta-class represents the ability to specify constraints on data. Tags: atp.recommendedPackage=DataConstrs			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataConstrRule	DataConstrRule	*	aggr	This is one particular rule within the data constraints. Tags: xml.roleElement=true xml.roleWrapperElement=true xml.sequenceOffset=30 xml.typeElement=false xml.typeWrapperElement=false

Table D.36: DataConstr

Class	DataConstrRule			
Package	M2::MSR::AsamHdo::Constraints::GlobalConstraints			
Note	This meta-class represents the ability to express one specific data constraint rule.			
Base	ARObject			
Aggregated by	DataConstr.dataConstrRule			
Attribute	Type	Mult.	Kind	Note





Class	DataConstrRule			
constrLevel	Integer	0..1	attr	This attribute describes the category of a constraint. One of its functions is in the area of constraint violation, where it can be used from a certain level, to produce error messages. The lower the level, the more stringent the check. Used to distinguish hard or soft limits. Tags: xml.sequenceOffset=20
internalConstrs	InternalConstrs	0..1	aggr	Describes the limitations applicable on the internal domain (as opposed to the physical domain). Tags: xml.sequenceOffset=40
physConstrs	PhysConstrs	0..1	aggr	Describes the limitations applicable on the physical domain (as opposed to the internal domain). Tags: xml.sequenceOffset=30

Table D.37: DataConstrRule

Class	DataFilter			
Package	M2::AUTOSARTemplates::CommonStructure::Filter			
Note	Base class for data filters. The type of the filter is specified in attribute dataFilterType. Some of the filter types require additional arguments which are specified as attributes of this class.			
Base	ARObject			
Aggregated by	ISignalPort.dataFilter , NonqueuedReceiverComSpec.filter , NonqueuedSenderComSpec.dataFilter , SignalBasedEventElementToSignalTriggeringMapping.filter , SignalBasedFieldToSignalTriggeringMapping.filter , SignalServiceTranslationElementProps.filter , TransmissionModeCondition.dataFilter			
Attribute	Type	Mult.	Kind	Note
dataFilterType	DataFilterTypeEnum	0..1	attr	This attribute specifies the type of the filter.
mask	UnlimitedInteger	0..1	attr	Mask for old and new value.
max	UnlimitedInteger	0..1	attr	Value to specify the upper boundary
min	UnlimitedInteger	0..1	attr	Value to specify the lower boundary
offset	PositiveInteger	0..1	attr	Specifies the initial number of messages to occur before the first message is passed
period	PositiveInteger	0..1	attr	Specifies number of messages to occur before the message is passed again
x	UnlimitedInteger	0..1	attr	Value to compare with

Table D.38: DataFilter

Enumeration	DataFilterTypeEnum
Package	M2::AUTOSARTemplates::CommonStructure::Filter
Note	This enum specifies the supported DataFilterTypes.
Aggregated by	DataFilter.dataFilterType
Literal	Description
always	No filtering is performed so that the message always passes. Tags: atp.EnumerationLiteralIndex=0





Enumeration	DataFilterTypeEnum
maskedNewDiffers MaskedOld	Pass messages where the masked value has changed. $(new_value \& mask) \neq (old_value \& mask)$ new_value: current value of the message old_value: last value of the message (initialized with the initial value of the message, updated with new_value if the new message value is not filtered out) Tags: atp.EnumerationLiteralIndex=1
maskedNewDiffers X	Pass messages whose masked value is not equal to a specific value x $(new_value \& mask) \neq x$ new_value: current value of the message Tags: atp.EnumerationLiteralIndex=2
maskedNewEquals X	Pass messages whose masked value is equal to a specific value x $(new_value \& mask) == x$ new_value: current value of the message Tags: atp.EnumerationLiteralIndex=3
never	The filter removes all messages. Tags: atp.EnumerationLiteralIndex=4
newIsOutside	Pass a message if its value is outside a predefined boundary. $(min > new_value) \text{ OR } (new_value > max)$ Tags: atp.EnumerationLiteralIndex=5
newIsWithin	Pass a message if its value is within a predefined boundary. $min \leq new_value \leq max$ Tags: atp.EnumerationLiteralIndex=6
oneEveryN	Pass a message once every N message occurrences. Algorithm: $occurrence \% period == offset$ Start: $occurrence = 0$. Each time the message is received or transmitted, occurrence is incremented by 1 after filtering. Length of occurrence is 8 bit (minimum). Tags: atp.EnumerationLiteralIndex=7

Table D.39: DataFilterTypeEnum

Class	DataPrototype (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::DataPrototypes			
Note	Base class for prototypical roles of any data type.			
Base	<i>ARObject</i> , <i>AtpFeature</i> , <i>AtpPrototype</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Subclasses	<i>ApplicationCompositeElementDataPrototype</i> , <i>AutosarDataPrototype</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i>			
Attribute	Type	Mult.	Kind	Note
swDataDef Props	SwDataDefProps	0..1	aggr	This property allows to specify data definition properties which apply on data prototype level. Stereotypes: atpSplittable Tags: atp.Splitkey=swDataDefProps

Table D.40: DataPrototype

Class	DataTransformation			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer			
Note	A DataTransformation represents a transformer chain. It is an ordered list of transformers.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	DataTransformationSet.dataTransformation			
Attribute	Type	Mult.	Kind	Note
dataTransformationKind	DataTransformationKind Enum	0..1	attr	This attribute controls the kind of DataTransformation to be applied.
executeDespiteDataUnavailability	Boolean	1	attr	Specifies whether the transformer chain is executed even if no input data are available.
transformerChain (ordered)	Transformation Technology	1..*	ref	This attribute represents the definition of a chain of transformers that are supposed to be executed according to the order of being referenced from DataTransformation.

Table D.41: DataTransformation

Class	DiagnosticAbstractParameter (abstract)			
Package	M2::AUTOSARTemplates::DiagnosticExtract::CommonDiagnostics			
Note	This meta-class represents an abstract base class for modeling a diagnostic parameter.			
Base	ARObject			
Subclasses	DiagnosticParameter , DiagnosticParameterElement			
Attribute	Type	Mult.	Kind	Note
bitOffset	PositiveInteger	0..1	attr	This represents the bitOffset of the DiagnosticParameter. The value of the bitOffset shall always be interpreted as relative to the start of the enclosing DiagnosticData Identifier, DiagnosticParameterIdentifier, or Diagnostic RoutineSubfunction. Stereotypes: atpIdentityContributor Tags: atp.Status=candidate
dataElement	DiagnosticDataElement	0..1	aggr	This represents the related dataElement of the Diagnostic Parameter Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=dataElement.shortName, dataElement.variationPoint.shortLabel vh.latestBindingTime=postBuild
parameterSize	PositiveInteger	0..1	attr	This attribute allows for the specification of the parameter size. This information is relevant if there is a gap between one diagnostic parameter and the following diagnostic parameter (or the tail of the telegram). The unit is bit and the values shall be multiples of 8. Tags: atp.Status=candidate

Table D.42: DiagnosticAbstractParameter

Class	DiagnosticAccessPermission			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm			
Note	<p>This represents the specification of whether a given service can be accessed according to the existence of meta-classes referenced by a particular DiagnosticAccessPermission.</p> <p>In other words, this meta-class acts as a mapping element between several (otherwise unrelated) pieces of information that are put into context for the purpose of checking for access rights.</p> <p>Tags:atp.recommendedPackage=DiagnosticAccessPermissions</p>			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
authentication Role	DiagnosticAuthRole	*	ref	This reference identifies the authenticationRole applicable for the enclosing DiagnosticMemoryDestinationUser Defined.
diagnostic Session	DiagnosticSession	*	ref	This represents the associated DiagnosticSessions
environmental Condition	DiagnosticEnvironmentalCondition	0..1	ref	This represents the environmental conditions associated with the access permission.
securityLevel	DiagnosticSecurityLevel	*	ref	This represents the associated DiagnosticSecurityLevels
sovdLock	DiagnosticSovdLock	0..1	ref	This represents the associated SOVD lock. Tags: atp.Status=draft

Table D.43: DiagnosticAccessPermission

Class	DiagnosticContributionSet			
Package	M2::AUTOSARTemplates::DiagnosticExtract::DiagnosticContribution			
Note	<p>This meta-class represents a root node of a diagnostic extract. It bundles a given set of diagnostic model elements. The granularity of the DiagnosticContributionSet is arbitrary in order to support the aspect of decentralized configuration, i.e. different contributors can come up with an own DiagnosticContribution Set.</p> <p>Tags:atp.recommendedPackage=DiagnosticContributionSets</p>			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
common Properties	DiagnosticCommon Props	0..1	aggr	<p>This attribute represents a collection of diagnostic properties that are shared among the entire DiagnosticContributionSet.</p> <p>Stereotypes: atpSplitable Tags:atp.Splitkey=commonProperties</p>
element	DiagnosticCommon Element	*	ref	<p>This represents a DiagnosticCommonElement considered in the context of the DiagnosticContributionSet</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=element.diagnosticCommonElement, element.variationPoint.shortLabel vh.latestBindingTime=postBuild</p>





Class	DiagnosticContributionSet			
serviceTable	DiagnosticServiceTable	*	ref	This represents the collection of DiagnosticServiceTables to be considered in the scope of this DiagnosticContributionSet. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=serviceTable.diagnosticServiceTable, serviceTable.variationPoint.shortLabel vh.latestBindingTime=postBuild

Table D.44: DiagnosticContributionSet

Class	DiagnosticDataTransfer			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::MemoryByAddress			
Note	This represents an instance of the "Data Transfer" diagnostic service. Tags: atp.recommendedPackage=DiagnosticMemoryByAdresss			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMemoryByAddress , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dataTransferClass	DiagnosticDataTransferClass	0..1	ref	This reference substantiates that abstract reference in the role serviceClass for this specific concrete class. Thereby, the reference represents the ability to access shared attributes among all DiagnosticDataTransfer in the given context.

Table D.45: DiagnosticDataTransfer

Class	DiagnosticIndicator			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dem::DiagnosticIndicator			
Note	Definition of an indicator. Tags: atp.recommendedPackage=DiagnosticIndicators			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
type	DiagnosticIndicatorTypeEnum	0..1	attr	Defines the type of the indicator. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime

Table D.46: DiagnosticIndicator

Class	DiagnosticParameter			
Package	M2::AUTOSARTemplates::DiagnosticExtract::CommonDiagnostics			
Note	This meta-class represents the ability to describe information relevant for the execution of a specific diagnostic service, i.e. it can be taken to parameterize the service.			
Base	ARObject , DiagnosticAbstractParameter			





Class	DiagnosticParameter			
Aggregated by	DiagnosticDataIdentifier.dataElement , DiagnosticExtendedDataRecord.recordElement, DiagnosticInfoType.dataElement, DiagnosticParameterIdentifier.dataElement, DiagnosticRequestRoutineResults.request, DiagnosticRequestRoutineResults.response, DiagnosticStartRoutine.request, DiagnosticStartRoutine.response, DiagnosticStopRoutine.request, DiagnosticStopRoutine.response			
Attribute	Type	Mult.	Kind	Note
ident	DiagnosticParameterIdent	0..1	aggr	The aggregation in the role ident provides the ability to make the DiagnosticAbstractParameter identifiable. From the semantical point of view, the AbstractDiagnosticParameter is considered a first-class Identifiable and therefore the aggregation in the role ident shall always exist (until it may be possible to let AbstractDiagnosticParameter directly inherit from Identifiable). Stereotypes: atpIdentityContributor
supportInfo	DiagnosticParameterSupportInfo	0..1	aggr	This attribute represents the ability to define which bit of the support info byte is representing this part of the PID.

Table D.47: DiagnosticParameter

Class	DiagnosticServiceInstance (abstract)			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::CommonService			
Note	This represents a concrete instance of a diagnostic service.			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	DiagnosticAuthentication , DiagnosticClearDiagnosticInformation, DiagnosticClearResetEmissionRelatedInfo, DiagnosticComControl , DiagnosticControlDTCSetting, DiagnosticCustomServiceInstance , DiagnosticDataByIdentifier , DiagnosticDynamicallyDefineDataIdentifier, DiagnosticEcuReset , DiagnosticIOControl, DiagnosticMemoryByAddress , DiagnosticReadDTCInformation, DiagnosticReadDataByPeriodicID, DiagnosticRequestControlOfOnBoardDevice, DiagnosticRequestCurrentPowertrainData, DiagnosticRequestEmissionRelatedDTC, DiagnosticRequestEmissionRelatedDTCPermanentStatus, DiagnosticRequestFileTransfer , DiagnosticRequestOnBoardMonitoringTestResults, DiagnosticRequestPowertrainFreezeFrameData, DiagnosticRequestVehicleInfo, DiagnosticResponseOnEvent, DiagnosticRoutineControl , DiagnosticSecurityAccess, DiagnosticSessionControl			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
accessPermission	DiagnosticAccessPermission	0..1	ref	This represents the collection of DiagnosticAccessPermissions that allow for the execution of the referencing DiagnosticServiceInstance..
serviceClass	DiagnosticServiceClass	0..1	ref	This represents the corresponding "class", i.e. this meta-class provides properties that are shared among all instances of applicable sub-classes of DiagnosticServiceInstance. The subclasses that affected by this pattern implement references to the applicable "class"-role that substantiate this abstract reference. Stereotypes: atpAbstract

Table D.48: DiagnosticServiceInstance

Class	DiagnosticSovdAuthorizationPortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	<p>This mapping class identifies the PortPrototype in the application software that handles the SOVD authorization.</p> <p>Tags: atp.Status=candidate atp.recommendedPackage=DiagnosticMappings</p>			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
pPortPrototype InExecutable	PPortPrototype	0..1	iref	<p>This aggregation allows for the usage of the Diagnostic SovdAuthorizationPortMapping on the AUTOSAR adaptive platform.</p> <p>Stereotypes: atpUriDef Tags:atp.Status=candidate InstanceRef implemented by:PPortPrototypeInExecutableInstanceRef</p>
process	ProcessDesign	0..1	ref	<p>Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable.</p> <p>Stereotypes: atpSplitable Tags: atp.Splitkey=process atp.Status=candidate</p>

Table D.49: DiagnosticSovdAuthorizationPortMapping

Class	DiagnosticSovdProximityChallengePortMapping			
Package	M2::AUTOSARTemplates::AdaptivePlatform::DiagnosticDesign::DiagnosticMapping			
Note	<p>This mapping class identifies the PortPrototype in the application software that handles the SOVD proximity challenge.</p> <p>Tags: atp.Status=candidate atp.recommendedPackage=DiagnosticMappings</p>			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMapping , DiagnosticSwMapping , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
pPortPrototype InExecutable	PPortPrototype	0..1	iref	<p>This aggregation allows for the usage of the Diagnostic SovdProximityChallengePortMapping on the AUTOSAR adaptive platform.</p> <p>Stereotypes: atpUriDef Tags:atp.Status=candidate InstanceRef implemented by:PPortPrototypeInExecutableInstanceRef</p>
process	ProcessDesign	0..1	ref	<p>Reference to the representation of a Process that is required because the mapping could be different for different Processes referring to a specific Executable.</p> <p>Stereotypes: atpSplitable Tags: atp.Splitkey=process atp.Status=candidate</p>

Table D.50: DiagnosticSovdProximityChallengePortMapping

Class	DiagnosticTransferExit			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dcm::DiagnosticService::MemoryByAddress			
Note	This represents an instance of the "Transfer Exit" diagnostic service. Tags: atp.recommendedPackage=DiagnosticMemoryByAdresss			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticMemoryByAddress , DiagnosticServiceInstance , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
transferExit Class	DiagnosticTransferExit Class	0..1	ref	This reference substantiates that abstract reference in the role serviceClass for this specific concrete class. Thereby, the reference represents the ability to access shared attributes among all DiagnosticTransferExit in the given context.

Table D.51: DiagnosticTransferExit

Class	DiagnosticTroubleCodeUds			
Package	M2::AUTOSARTemplates::DiagnosticExtract::Dem::DiagnosticTroubleCode			
Note	This element is used to describe non OBD-relevant DTCs. Tags: atp.recommendedPackage=DiagnosticTroubleCodes			
Base	ARElement , ARObject , CollectableElement , DiagnosticCommonElement , DiagnosticTroubleCode , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
considerPto Status	Boolean	0..1	attr	This attribute describes the affection of the event by the Dem PTO handling. True: the event is affected by the Dem PTO handling. False: the event is not affected by the Dem PTO handling.
dtcProps	DiagnosticTroubleCode Props	0..1	ref	Defined properties associated with the DemDTC.
eventObd Readiness Group	NameToken	0..1	attr	This attribute specifies the Event OBD Readiness group for PID \$01 and PID \$41 computation. This attribute is only applicable for emission-related ECUs.
functionalUnit	PositiveInteger	0..1	attr	This attribute specifies a 1-byte value which identifies the corresponding basic vehicle / system function which reports the DTC. This parameter is necessary for the report of severity information.
severity	DiagnosticUdsSeverity Enum	0..1	attr	DTC severity according to ISO 14229-1.
udsDtcValue	PositiveInteger	0..1	attr	Unique Diagnostic Trouble Code value for UDS. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime
wwhObdDtc Class	DiagnosticWwhObdDtc ClassEnum	0..1	attr	This attribute is used to identify (if applicable) the corresponding severity class of an WWH-OB DTC. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime

Table D.52: DiagnosticTroubleCodeUds

Class	DltApplication			
Package	M2::AUTOSARTemplates::LogAndTraceExtract			
Note	This meta-class represents the application from which the log and trace message originates.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	DltEcu.application			
Attribute	Type	Mult.	Kind	Note
application Description	String	0..1	attr	This attribute can be used to describe the applicationId that is used in the log and trace message in more detail.
applicationId	String	0..1	attr	This attribute identifies the SW-C/BSW module in the log and trace message.
context	DltContext	*	ref	Definition of ContextIds for the Application. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=context.dltContext, context.variationPoint.shortLabel vh.latestBindingTime=systemDesignTime

Table D.53: DltApplication

Class	DltContext			
Package	M2::AUTOSARTemplates::LogAndTraceExtract			
Note	This meta-class represents the Context that groups Log and Trace Messages that are generated by an application. Tags: atp.recommendedPackage=DltContexts			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
context Description	String	0..1	attr	This attribute can be used to describe the contextId that is used in the log and trace message in more detail.
contextId	String	0..1	attr	This attribute is used to group log and trace messages produced by an application to distinguish functionality.
dltMessage	DltMessage	*	ref	Group of Log and Trace Messages assigned to the Dlt Context Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=dltMessage.dltMessage, dltMessage.variationPoint.shortLabel vh.latestBindingTime=systemDesignTime

Table D.54: DltContext

Class	DltEcu			
Package	M2::AUTOSARTemplates::LogAndTraceExtract			
Note	This element represents an Ecu or Machine that produces logging and tracing information. Tags: atp.recommendedPackage=DltEcus			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	DltEcu			
application	DltApplication	*	aggr	Application on DltEcu that provides log or trace data. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=application.shortName, application.variation Point.shortLabel vh.latestBindingTime=systemDesignTime
eculd	String	0..1	attr	This attribute defines the name of the ECU for use within the Dlt protocol.

Table D.55: DltEcu

Class	DltMessage			
Package	M2::AUTOSARTemplates::LogAndTraceExtract			
Note	This element defines a DltMessage.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Aggregated by	LogAndTraceMessageCollectionSet.dltMessage			
Attribute	Type	Mult.	Kind	Note
dltArgument (ordered)	DltArgument	*	aggr	Ordered collection of DltArguments in the DltMessage.
messageId	PositiveInteger	0..1	attr	This attribute defines the unique Id for the DltMessage.
messageLine Number	PositiveInteger	0..1	attr	This attribute describes the position in the source file in which this log message was called.
messageSource File	String	0..1	attr	This attribute describes the source file in which this log message was called.
messageType Info	String	0..1	attr	This attribute describes the message Type
privacyLevel	PrivacyLevel	0..1	aggr	The Privacy Level helps to identify the Log and Trace content towards the degree of privacy to it.

Table D.56: DltMessage

Enumeration	DolpEidRetrievalEnum			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModule Implementation			
Note	Enumeration with options to retrieve EID.			
Aggregated by	DolpNetworkConfiguration.eidRetrieval			
Literal	Description			
eidUseApi	API DiagnosticDoIPEntityIdentification is used to retrieve eid Tags: atp.EnumerationLiteralIndex=1			
eidUseConfigValue	eid is configured manually by DolpInstantiation.eid Tags: atp.EnumerationLiteralIndex=2			
eidUseMac	MAC of the network interface is used as eid Tags: atp.EnumerationLiteralIndex=0			

Table D.57: DolpEidRetrievalEnum

Class	EcuInstance			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreTopology			
Note	ECUInstances are used to define the ECUs used in the topology. The type of the ECU is defined by a reference to an ECU specified with the ECU resource description. Tags: atp.recommendedPackage=EcuInstances			
Base	<i>ARObject</i> , <i>CollectableElement</i> , <i>FibexElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
associatedConsumedProvidedServiceInstanceGroup	ConsumedProvidedServiceInstanceGroup	*	ref	With this reference it is possible to identify which ConsumedProvidedServiceInstanceGroups are applicable for which EcuInstance. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=associatedConsumedProvidedServiceInstanceGroup.consumedProvidedServiceInstanceGroup, associatedConsumedProvidedServiceInstanceGroup.variationPoint.shortLabel vh.latestBindingTime=postBuild
associatedPdurIPduGroup	PdurIPduGroup	*	ref	With this reference it is possible to identify which PduR IPdu Groups are applicable for which Communication Connector/ ECU.
clientIdRange	ClientIdRange	0..1	aggr	Restriction of the Client Identifier for this Ecu to an allowed range of numerical values. The Client Identifier of the transaction handle is generated by the client RTE for inter-Ecu Client/Server communication.
commController	CommunicationController	1..*	aggr	CommunicationControllers of the ECU. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=commController.shortName, commController.variationPoint.shortLabel vh.latestBindingTime=postBuild
connector	CommunicationConnector	*	aggr	All channels controlled by a single controller. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=connector.shortName, connector.variationPoint.shortLabel vh.latestBindingTime=postBuild
pncNmRequest	Boolean	0..1	attr	Defines if this EcuInstance shall request Nm on all its PhysicalChannels which have Nm variant set to FULL each time a PNC is requested.
pncPrepareSleepTimer	TimeValue	0..1	attr	Time in seconds the PNC state machine shall wait in PNC_PREPARE_SLEEP.
pncSynchronousWakeup	Boolean	0..1	attr	If this parameter is available and set to true then all available PNCs will be woken up as soon as a channel wakeup occurs. This is ensured by adding all PNCs to all channel wakeup sources during upstream mapping.
pnResetTime	TimeValue	0..1	attr	Specifies the runtime of the reset timer in seconds. This reset time is valid for the reset of PN requests in the EIRA and in the ERA.

Table D.58: EcuInstance

Class	EndToEndTransformationDescription
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer
Note	EndToEndTransformationDescription holds these attributes which are profile specific and have the same value for all E2E transformers.





Class	EndToEndTransformationDescription			
Base	<i>ARObject, Describable, TransformationDescription</i>			
Aggregated by	TransformationTechnology.transformationDescription			
Attribute	Type	Mult.	Kind	Note
clearFromValidToInvalid	Boolean	0..1	attr	Clear monitoring window on transition from state Valid to state Invalid.
counterOffset	PositiveInteger	0..1	attr	Offset of the counter in the Data[] array in bits.
crcOffset	PositiveInteger	0..1	attr	Offset of the CRC in the Data[] array in bits.
dataIdMode	DataIdModeEnum	0..1	attr	This attribute describes the inclusion mode that is used to include the implicit two-byte Data ID in the one-byte CRC.
dataIdNibbleOffset	PositiveInteger	0..1	attr	Offset of the Data ID nibble in the Data[] array in bits.
e2eProfileCompatibilityProps	E2EProfileCompatibilityProps	0..1	ref	Reference to additional settings for the E2E state machine.
maxDeltaCounter	PositiveInteger	0..1	attr	Maximum allowed difference between two counter values of two consecutively received valid messages. For example, if the receiver gets data with counter 1 and MaxDeltaCounter is 3, then at the next reception the receiver can accept Counters with values 2, 3 or 4.
maxErrorStateInit	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last WindowSize checks, for the state E2E_SM_INIT.
maxErrorStateInvalid	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last WindowSize checks, for the state E2E_SM_INVALID.
maxErrorStateValid	PositiveInteger	0..1	attr	Maximal number of checks in which ProfileStatus equal to E2E_P_ERROR was determined, within the last WindowSize checks, for the state E2E_SM_VALID.
maxNoNewOrRepeatedData	PositiveInteger	0..1	attr	The maximum allowed amount of consecutive failed counter checks.
minOkStateInit	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_INIT.
minOkStateInvalid	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_INVALID.
minOkStateValid	PositiveInteger	0..1	attr	Minimal number of checks in which ProfileStatus equal to E2E_P_OK was determined, within the last WindowSize checks, for the state E2E_SM_VALID.
offset	PositiveInteger	0..1	attr	Offset of the E2E header in the Data[] array in bits.
profileBehavior	EndToEndProfileBehaviorEnum	0..1	attr	Behavior of the check functionality
profileName	NameToken	1	attr	Definition of the E2E profile.
syncCounterInit	PositiveInteger	0..1	attr	Number of checks required for validating the consistency of the counter that shall be received with a valid counter (i.e. counter within the allowed lock-in range) after the detection of an unexpected behavior of a received counter.





Class	EndToEndTransformationDescription			
upperHeaderBitsToShift	PositiveInteger	0..1	attr	<p>This attribute describes the number of upper-header bits to be shifted.</p> <p>value = 0 or not present: shift of upper header is NOT performed.</p> <p>value > 0: the E2E Transformer on the protect-side, takes the first upperHeaderBitsToShift bits from the upper buffer (e.g. SOME/IP header part generated by SOME/IP transformer) and shifts them towards the lower bytes and bits within the Data[] for the length of the E2E header (e.g. 12 bytes in case of E2E Profile 4). This means the shift distance is fixed - it depends on the E2E header size - what is configured here is the number of bits that are to be shifted. This option is defined because the Some/IP header generated by SOME/IP transformer shall be, due to compatibility between non-protected and E2E-protected communication, at the same position, which is before E2E header.</p>
windowSizeInit	PositiveInteger	0..1	attr	Size of the monitoring window of state Init for the E2E state machine.
windowSizeInvalid	PositiveInteger	0..1	attr	Size of the monitoring window of state Invalid for the E2E state machine.
windowSizeValid	PositiveInteger	0..1	attr	Size of the monitoring window of state Valid for the E2E state machine.

Table D.59: EndToEndTransformationDescription

Class	<<atpVariation>> EthernetCommunicationController			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Ethernet specific communication port attributes.			
Base	ARObject, CommunicationController, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	EcuInstance.commController , MachineDesign.communicationController			
Attribute	Type	Mult.	Kind	Note
canXIConfig	AbstractCanCommunicationController	0..1	ref	If the Ethernet frames handled by this Ethernet CommunicationController are to be tunneled through CAN XL, then this reference shall refer to the Abstract CanCommunicationController that aggregates the CanControllerXIConfiguration of the physical CAN XL channel to be used for tunneling.
couplingPort	CouplingPort	*	aggr	Optional CouplingPort that can be used to connect the ECU to a CouplingElement (e.g. a switch).
macLayerType	EthernetMacLayerTypeEnum	0..1	attr	Specifies the mac layer type of the ethernet controller.
macUnicastAddress	MacAddressString	0..1	attr	Media Access Control address (MAC address) that uniquely identifies each EthernetCommunicationController in the network.
maximumReceiveBufferLength	Integer	0..1	attr	Determines the maximum receive buffer length (frame length) in bytes.
maximumTransmitBufferLength	Integer	0..1	attr	Determines the maximum transmit buffer length (frame length) in bytes.





Class	<<atpVariation>> EthernetCommunicationController			
slaveActAs Passive Communication Slave	Boolean	0..1	attr	This attribute specifies if the EcuInstance is acting as a passive communication slave on the connected Physical Channel. This is used for EthernetCommunication Controllers that use Ethernet hardware which supports wake-up and sleep on the network (e.g. Open Alliance TC10 compliant Ethernet hardware). Tags: atp.Status=draft
slaveQualified UnexpectedLink DownTime	TimeValue	0..1	attr	This attribute specifies time when an unexpected link down is evaluated as link down and indicated to the AUTOSAR communication stack. Tags: atp.Status=draft

Table D.60: EthernetCommunicationController

Class	EthernetPhysicalChannel			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	The EthernetPhysicalChannel represents a VLAN or an untagged channel. An untagged channel is modeled as an EthernetPhysicalChannel without an aggregated VLAN.			
Base	ARObject, Identifiable , MultilanguageReferrable , PhysicalChannel , Referrable			
Aggregated by	CommunicationCluster.physicalChannel			
Attribute	Type	Mult.	Kind	Note
network Endpoint	NetworkEndpoint	*	aggr	Collection of NetworkEndpoints that are used in the VLAN. Stereotypes: atpSplittable Tags: atp.Splitkey=networkEndpoint.shortName
vlan	VlanConfig	0..1	aggr	VLAN Configuration.

Table D.61: EthernetPhysicalChannel

Class	FibexElement (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore			
Note	ASAM FIBEX elements specifying Communication and Topology.			
Base	ARObject, CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	CommunicationCluster , ConsumedProvidedServiceInstanceGroup , CouplingElement , EcuInstance , EthernetWakeupSleepOnDatalineConfigSet , Frame , Gateway , GlobalTimeDomain , ISignal , ISignalGroup , ISignalIPduGroup , MachineDesign , NmConfig , Pdu , PdurIPduGroup , SecureCommunicationPropsSet , ServiceInstanceCollectionSet , SoAdRoutingGroup , SocketConnectionIpdulIdentifierSet , TpConfig			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.62: FibexElement

Class	GlobalTimeDomain			
Package	M2::AUTOSARTemplates::SystemTemplate::GlobalTime			
Note	This represents the ability to define a global time domain. Tags: atp.recommendedPackage=GlobalTimeDomains			





Class	GlobalTimeDomain			
Base	ARObject, CollectableElement, FibexElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
debounceTime	TimeValue	0..1	attr	Defines the minimum amount of time between two time sync messages are transmitted.
domainId	PositiveInteger	1	attr	This represents the ID of the GlobalTimeDomain used in the network messages sent on behalf of global time management.
gateway	GlobalTimeGateway	*	aggr	A GlobalTimeGateway may exist in the context of a GlobalTimeDomain to actively update the global time information as it is routed from one GlobalTimeDomain to another. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=gateway.shortName, gateway.variationPoint.shortLabel vh.latestBindingTime=postBuild
globalTimeCorrectionProps	GlobalTimeCorrectionProps	0..1	aggr	Defintion of attributes for rate and offset correction.
globalTimeDomainProperty	AbstractGlobalTimeDomainProps	0..1	aggr	Additional properties of the GlobalTimeDomain. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=globalTimeDomainProperty, globalTimeDomainProperty.variationPoint.shortLabel vh.latestBindingTime=postBuild
globalTimeMaster	GlobalTimeMaster	0..1	aggr	This represents the single master of a GlobalTimeDomain. A GlobalTimeDomain may have no GlobalTimeDomain.master, e.g. when it gets its time from a GPS receiver. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=globalTimeMaster.shortName, globalTimeMaster.variationPoint.shortLabel vh.latestBindingTime=postBuild
globalTimeSubDomain	GlobalTimeDomain	*	ref	By this means it is possible to create a hierarchy of sub Domains where one global time domain can declare one or more other global time domains as its subDomains. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=globalTimeSubDomain.globalTimeDomain, globalTimeSubDomain.variationPoint.shortLabel vh.latestBindingTime=postBuild
networkSegmentId	NetworkSegmentIdentification	0..1	aggr	Defines the numerical identification of a GlobalTime sub domain.
offsetTimeDomain	GlobalTimeDomain	0..1	ref	Reference to a synchronized time domain this offset time domain is based on. The reference source is the offset time domain. The reference target is the synchronized time domain.





Class	GlobalTimeDomain			
pduTriggering	PduTriggering	0..1	ref	This PduTriggering will be taken to transmit the global time information from a GlobalTimeMaster to a the associated GlobalTimeSlaves. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=pduTriggering.pduTriggering, pduTriggering.variationPoint.shortLabel vh.latestBindingTime=postBuild
slave	GlobalTimeSlave	*	aggr	This represents the collections of slaves of the Global TimeDomain. A GlobalTimeDomain may have no Global TimeDomain.slaves, e.g. when it propagates its time directly to sub domains. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=slave.shortName, slave.variationPoint.shortLabel vh.latestBindingTime=postBuild
syncLoss Timeout	TimeValue	0..1	attr	This attribute describes the timeout for the situation that the time synchronization gets lost in the scope of the time domain.

Table D.63: GlobalTimeDomain

Class	GlobalTimeMaster (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::GlobalTime			
Note	This represents the generic concept of a global time master.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Subclasses	GlobalTimeCanMaster, GlobalTimeEthMaster , GlobalTimeFrMaster, UserDefinedGlobalTimeMaster			
Aggregated by	GlobalTimeDomain.globalTimeMaster			
Attribute	Type	Mult.	Kind	Note
communication Connector	Communication Connector	1	ref	The GlobalTimeMaster is bound to the Communication Connector.
immediate ResumeTime	TimeValue	0..1	attr	Defines the minimum time between an "immediate" message and the next periodic message.
isSystemWide GlobalTime Master	Boolean	1	attr	If set to TRUE, the GlobalTimeMaster is supposed to act as the root of global time information.
syncPeriod	TimeValue	1	attr	This represents the period. Unit: seconds

Table D.64: GlobalTimeMaster

Class	GlobalTimeSlave (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::GlobalTime			
Note	This represents the generic concept of a global time slave.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Subclasses	GlobalTimeCanSlave, GlobalTimeEthSlave , GlobalTimeFrSlave, UserDefinedGlobalTimeSlave			
Aggregated by	GlobalTimeDomain.slave			
Attribute	Type	Mult.	Kind	Note
communication Connector	Communication Connector	1	ref	The GlobalTimeSlave is bound to the Communication Connector.





Class	GlobalTimeSlave (abstract)			
followUpTimeoutValue	TimeValue	0..1	attr	Rx timeout for the follow-up message.
timeLeapFutureThreshold	TimeValue	0..1	attr	Defines the maximum allowed positive difference between the current Local Time Base value and a newly received Global Time Base value.
timeLeapHealingCounter	PositiveInteger	0..1	attr	Defines the required number of updates to the Time Base where the time difference to the previous received value has to remain within the bounds of timeLeapFutureThreshold and timeLeapPastThreshold until that Time Base is considered healed.
timeLeapPastThreshold	TimeValue	0..1	attr	Defines the maximum allowed negative difference between the current Local Time Base value and a newly received Global Time Base value.

Table D.65: GlobalTimeSlave

Enumeration	HandleInvalidEnum
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication
Note	Strategies of handling the reception of invalidValue.
Aggregated by	InvalidationPolicy.handleInvalid, ISignalPort.handleInvalid
Literal	Description
dontInvalidate	Invalidation is switched off. Tags: atp.EnumerationLiteralIndex=0
externalReplacement	Replace a received invalidValue. The replacement value is sourced from the aggregation in the role replaceWith. Tags: atp.EnumerationLiteralIndex=1
keep	The application software is supposed to handle signal invalidation on RTE API level either by DataReceiveErrorEvent or check of error code on read access. Tags: atp.EnumerationLiteralIndex=2
replace	Replace a received invalidValue. The replacement value is specified by the initialValue. Tags: atp.EnumerationLiteralIndex=3

Table D.66: HandleInvalidEnum

Class	IPduPort			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	Connectors reception or send port on the referenced channel referenced by a PduTriggering.			
Base	ARObject , CommConnectorPort , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	CommunicationConnector .ecuCommPortInstance			
Attribute	Type	Mult.	Kind	Note
iPduSignalProcessing	IPduSignalProcessingEnum	0..1	attr	Definition of the two signal processing modes Immediate and Deferred for both Tx and Rx IPdus.
rxSecurityVerification	Boolean	0..1	attr	This attribute defines the bypassing of signature authentication or MAC verification in the receiving ECU. If not defined or set to true the signature authentication or MAC verification shall be performed for the SecuredIPdu. If set to false the signature authentication or MAC verification shall not be performed for the SecuredIPdu.





Class	IPduPort			
timestampRx Acceptance Window	TimeValue	0..1	attr	This attribute is used to define the maximum allowed deviation in seconds from the expected timestamp for which a SecuredIPdu is still deemed authentic. Please note that this attribute is for documentation only to allow the configuration of required freshness value manager and no upstream mapping is defined for it.
useAuthData Freshness	Boolean	0..1	attr	This attribute describes whether a part of AuthenticPdu contained in a SecuredIPdu shall be passed on to the SWC that verifies and generates the Freshness. The part of the Authentic-PDU is defined by the authData FreshnessStartPosition and authDataFreshnessLength.

Table D.67: IPduPort

Class	IPduTiming			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	<p>AUTOSAR COM provides the possibility to define two different TRANSMISSION MODES for each IPdu. The Transmission Mode of an IPdu that is valid at a specific point in time is selected using the values of the signals that are mapped to this IPdu. For each IPdu a Transmission Mode Selector is defined. The Transmission Mode Selector is calculated by evaluating the conditions for a subset of signals (class TransmissionModeCondition in the System Template).</p> <p>The Transmission Mode Selector is defined to be true, if at least one Condition evaluates to true and is defined to be false, if all Conditions evaluate to false.</p>			
Base	ARObject, Describable			
Aggregated by	ISignalIPdu.iPduTimingSpecification			
Attribute	Type	Mult.	Kind	Note
minimumDelay	TimeValue	0..1	attr	Minimum Delay in seconds between successive transmissions of this I-PDU, independent of the Transmission Mode.
transmission Mode Declaration	TransmissionMode Declaration	0..1	aggr	AUTOSAR COM allows configuring statically two different transmission modes for each I-PDU (True and False). The Transmission Mode Selector evaluates the conditions for a subset of signals and decides the transmission mode. It is possible to switch between the transmission modes during runtime.

Table D.68: IPduTiming

Class	ISignal
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication
Note	<p>Signal of the Interaction Layer. The RTE supports a "signal fan-out" where the same System Signal is sent in different SignalIPdus to multiple receivers.</p> <p>To support the RTE "signal fan-out" each SignalIPdu contains ISignals. If the same System Signal is to be mapped into several SignalIPdus there is one ISignal needed for each ISignalToIPduMapping.</p> <p>ISignals describe the Interface between the Precompile configured RTE and the potentially Postbuild configured Com Stack (see ECUC Parameter Mapping).</p> <p>In case of the SystemSignalGroup an ISignal shall be created for each SystemSignal contained in the SystemSignalGroup.</p> <p>Tags:atp.recommendedPackage=ISignals</p>
Base	ARObject, CollectableElement, FibexElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable
Aggregated by	ARPackage.element





Class		ISignal		
Attribute	Type	Mult.	Kind	Note
data Transformation	DataTransformation	0..1	ref	Optional reference to a DataTransformation which represents the transformer chain that is used to transform the data that shall be placed inside this ISignal. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataTransformation.dataTransformation, dataTransformation.variationPoint.shortLabel vh.latestBindingTime=codeGenerationTime
dataTypePolicy	DataTypePolicyEnum	1	attr	With the aggregation of SwDataDefProps an ISignal specifies how it is represented on the network. This representation follows a particular policy. Note that this causes some redundancy which is intended and can be used to support flexible development methodology as well as subsequent integrity checks. If the policy "networkRepresentationFromComSpec" is chosen the network representation from the ComSpec that is aggregated by the PortPrototype shall be used. If the "override" policy is chosen the requirements specified in the PortInterface and in the ComSpec are not fulfilled by the networkRepresentationProps. In case the System Description doesn't use a complete Software Component Description (VFB View) the "legacy" policy can be chosen.
initValue	ValueSpecification	0..1	aggr	Optional definition of a ISignal's initValue in case the System Description doesn't use a complete Software Component Description (VFB View). This supports the inclusion of legacy system signals. This value can be used to configure the Signal's "Init Value". If a full DataMapping exist for the SystemSignal this information may be available from a configured Sender ComSpec and ReceiverComSpec. In this case the initvalues in SenderComSpec and/or ReceiverComSpec override this optional value specification. Further restrictions apply from the RTE specification.
iSignalProps	ISignalProps	0..1	aggr	Additional optional ISignal properties that may be stored in different files. Stereotypes: atpSplitable Tags: atp.Splitkey=iSignalProps
iSignalType	ISignalTypeEnum	0..1	attr	This attribute defines whether this iSignal is an array that results in a UINT8_N / UINT8_DYN ComSignalType in the COM configuration or a primitive type.
length	UnlimitedInteger	1	attr	Size of the signal in bits. The size needs to be derived from the mapped VariableDataPrototype according to the mapping of primitive DataTypes to BaseType as used in the RTE. Indicates maximum size for dynamic length signals. The ISignal length of zero bits is allowed.





Class	ISignal			
network Representation Props	SwDataDefProps	0..1	aggr	<p>Specification of the actual network representation. The usage of SwDataDefProps for this purpose is restricted to the attributes compuMethod and baseType. The optional baseType attributes "memAllignment" and "byteOrder" shall not be used.</p> <p>The attribute "dataTypePolicy" in the SystemTemplate element defines whether this network representation shall be ignored and the information shall be taken over from the network representation of the ComSpec.</p> <p>If "override" is chosen by the system integrator the network representation can violate against the requirements defined in the PortInterface and in the network representation of the ComSpec.</p> <p>In case that the System Description doesn't use a complete Software Component Description (VFB View) this element is used to configure "ComSignalDataInvalid Value" and the Data Semantics.</p> <p>Stereotypes: atpSplitable Tags:atp.Splitkey=networkRepresentationProps</p>
systemSignal	SystemSignal	1	ref	Reference to the System Signal that is supposed to be transmitted in the ISignal.
timeout Substitution Value	ValueSpecification	0..1	aggr	Defines and enables the ComTimeoutSubstitution for this ISignal.
transformation ISignalProps	TransformationISignal Props	*	aggr	<p>A transformer chain consists of an ordered list of transformers. The ISignal specific configuration properties for each transformer are defined in the TransformationISignalProps class. The transformer configuration properties that are common for all ISignals are described in the TransformationTechnology class.</p> <p>Stereotypes: atpSplitable Tags:atp.Splitkey=transformationISignalProps</p>

Table D.69: ISignal

Class	ISignalGroup			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	<p>SignalGroup of the Interaction Layer. The RTE supports a "signal fan-out" where the same System Signal Group is sent in different SignalIPdus to multiple receivers.</p> <p>An ISignalGroup refers to a set of ISignals that shall always be kept together. A ISignalGroup represents a COM Signal Group.</p> <p>Therefore it is recommended to put the ISignalGroup in the same Package as ISignals (see atp.recommendedPackage)</p> <p>Tags:atp.recommendedPackage=ISignalGroup</p>			
Base	ARObject , CollectableElement , FibexElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	ISignalGroup			
comBasedSignalGroupTransformation	DataTransformation	0..1	ref	Optional reference to a DataTransformation which represents the transformer chain that is used to transform the data that shall be placed inside this ISignalGroup based on the COMBasedTransformer approach. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=comBasedSignalGroupTransformation.dataTransformation, comBasedSignalGroupTransformation.variationPoint.shortLabel vh.latestBindingTime=codeGenerationTime
iSignal	ISignal	*	ref	Reference to a set of ISignals that shall always be kept together.
systemSignalGroup	SystemSignalGroup	1	ref	Reference to the SystemSignalGroup that is defined on VFB level and that is supposed to be transmitted in the ISignalGroup.
transformationISignalProps	TransformationISignalProps	*	aggr	A transformer chain consists of an ordered list of transformers. The ISignalGroup specific configuration properties for each transformer are defined in the TransformationISignalProps class. The transformer configuration properties that are common for all ISignalGroups are described in the TransformationTechnology class. Stereotypes: atpSplitable Tags: atp.Splitkey=transformationISignalProps

Table D.70: ISignalGroup

Class	ISignalIPdu			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	Represents the IPdus handled by Com. The ISignalIPdu assembled and disassembled in AUTOSAR COM consists of one or more signals. In case no multiplexing is performed this IPdu is routed to/from the Interface Layer. A maximum of one dynamic length signal per IPdu is allowed. Tags: atp.recommendedPackage=Pdus			
Base	ARObject , CollectableElement , FibexElement , IPdu , Identifiable , MultilanguageReferrable , PackageableElement , Pdu , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
iPduTimingSpecification	IPduTiming	0..1	aggr	Timing specification for Com IPdus (Transmission Modes). This information is mandatory for the sender in a System Extract. This information may be omitted on receivers in a System Extract. atpVariation: The timing of a Pdu can vary. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=iPduTimingSpecification, iPduTimingSpecification.variationPoint.shortLabel vh.latestBindingTime=postBuild





Class	ISignalIPdu			
iSignalToPdu Mapping	ISignalToPduMapping	*	aggr	Definition of SignalToPduMappings included in the Signal IPdu. atpVariation: The content of a PDU can be variable. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=iSignalToPduMapping.shortName, iSignalToPduMapping.variationPoint.shortLabel vh.latestBindingTime=postBuild
unusedBit Pattern	Integer	1	attr	AUTOSAR COM and AUTOSAR IPDUM are filling not used areas of an IPDU with this bit-pattern. This attribute is mandatory to avoid undefined behavior. This byte-pattern will be repeated throughout the IPdu.

Table D.71: ISignalIPdu

Class	ISignalPort			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	Connectors reception or send port on the referenced channel referenced by an ISignalTriggering. If different timeouts or DataFilters for ISignals need to be specified several ISignalPorts may be created.			
Base	ARObject , CommConnectorPort , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	CommunicationConnector .ecuCommPortInstance			
Attribute	Type	Mult.	Kind	Note
dataFilter	DataFilter	0..1	aggr	Optional specification of a signal COM filter at the receiver side in case that the System Description doesn't use a complete Software Component Description (VFB View). This supports the inclusion of legacy system signals. If a full DataMapping exist for the SystemSignal this information may be available from a configured ReceiverComSpec. In this case the ReceiverComSpec overrides this optional specification.
firstTimeout	TimeValue	0..1	attr	<ul style="list-style-type: none"> ISignalPort with communicationDirection = in: Optional first timeout value in seconds for the reception of the ISignal. ISignalPort with communicationDirection = out: Optional first timeout value in seconds for transmission deadline monitoring.
handleInvalid	HandleInvalidEnum	0..1	attr	This attribute defines how invalidation is applied to the ISignals received in the context of this ISignalPort.
timeout	TimeValue	0..1	attr	<ul style="list-style-type: none"> ISignalPort with communicationDirection = in: Optional timeout value in seconds for the reception of the ISignal. The attribute value is used to configure the Com Timeout in the COM module. The RTE ignores this attribute. The timeout can also be specified with the NonqueuedReceiverComSpec.aliveTimeout attribute. If a full DataMapping exists for the SystemSignal and the value is available in the configured ReceiverComSpec, then the timeout value in the ReceiverComSpec overrides this optional timeout specification during the creation of the Base Ecu Configuration of the COM module. ISignalPort with communicationDirection = out: Optional timeout value in seconds for the transmission of the ISignal. The attribute value is used to configure the ComTimeout in the COM module. The RTE ignores this





Class	ISignalPort			
				<p>attribute. The timeout can also be specified with the ender ComSpec.transmissionAcknowledge.timeout attribute. If a full DataMapping exists for the SystemSignal and the value is available in the configured SenderComSpec, then the timeout value in the SenderComSpec overrides this optional timeout specification during the creation of the Base Ecu Configuration of the COM module.</p> <p>This attribute can be used in the following cases:</p> <ul style="list-style-type: none"> legacy signal where the System Description doesn't use a complete Software Component Description (VFB View) and where the Data Mapping is missing. bus monitoring use cases in which the Data Mapping is ignored.

Table D.72: ISignalPort

Class	ISignalToIPduMapping			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	An ISignalToIPduMapping describes the mapping of ISignals to ISignalIPdus and defines the position of the ISignal within an ISignalIPdu.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	ISignalIPdu.iSignalToPduMapping , NmPdu.iSignalToIPduMapping			
Attribute	Type	Mult.	Kind	Note
iSignal	ISignal	0..1	ref	<p>Reference to a ISignal that is mapped into the ISignal IPdu.</p> <p>Each ISignal contained in the ISignalGroup shall be mapped into an IPdu by an own ISignalToIPduMapping. The references to the ISignal and to the ISignalGroup in an ISignalToIPduMapping are mutually exclusive.</p>
iSignalGroup	ISignalGroup	0..1	ref	<p>Reference to an ISignalGroup that is mapped into the SignalIPdu. If an ISignalToIPduMapping for an ISignal Group is defined, only the UpdateIndicationBitPosition and the transferProperty is relevant. The startPosition and the packingByteOrder shall be ignored.</p> <p>Each ISignal contained in the ISignalGroup shall be mapped into an IPdu by an own ISignalToIPduMapping. The references to the ISignal and to the ISignalGroup in an ISignalToIPduMapping are mutually exclusive.</p>
packingByte Order	ByteOrderEnum	0..1	attr	<p>This parameter defines the order of the bytes of the signal and the packing into the SignalIPdu. The byte ordering "Little Endian" (MostSignificantByteLast), "Big Endian" (MostSignificantByteFirst) and "Opaque" can be selected. For opaque data endianness conversion shall be configured to Opaque. The value of this attribute impacts the absolute position of the signal into the SignalIPdu (see the startPosition attribute description).</p> <p>For an ISignalGroup the packingByteOrder is irrelevant and shall be ignored.</p>





Class		ISignalToIPduMapping		
startPosition	UnlimitedInteger	0..1	attr	<p>This parameter is necessary to describe the bitposition of a signal within an SignalIPdu. It denotes the least significant bit for "Little Endian" and the most significant bit for "Big Endian" packed signals within the IPdu (see the description of the packingByteOrder attribute). In AUTOSAR the bit counting is always set to "sawtooth" and the bit order is set to "Decreasing". The bit counting in byte 0 starts with bit 0 (least significant bit). The most significant bit in byte 0 is bit 7.</p> <p>Please note that the way the bytes will be actually sent on the bus does not impact this representation: they will always be seen by the software as a byte array.</p> <p>If a mapping for the ISignalGroup is defined, this attribute is irrelevant and shall be ignored.</p>
transferProperty	TransferPropertyEnum	0..1	attr	<p>Defines how the referenced ISignal contributes to the send triggering of the ISignalIPdu.</p>
updateIndicationBitPosition	UnlimitedInteger	0..1	attr	<p>The UpdateIndicationBit indicates to the receivers that the signal (or the signal group) was updated by the sender. Length is always one bit. The UpdateIndicationBitPosition attribute describes the position of the update bit within the SignalIPdu. For Signals of a ISignalGroup this attribute is irrelevant and shall be ignored.</p> <p>Note that the exact bit position of the updateIndicationBitPosition is linked to the value of the attribute packingByteOrder because the method of finding the bit position is different for the values mostSignificantByteFirst and mostSignificantByteLast. This means that if the value of packingByteOrder is changed while the value of updateIndicationBitPosition remains unchanged the exact bit position of updateIndicationBitPosition within the enclosing ISignalIPdu still undergoes a change.</p> <p>This attribute denotes the least significant bit for "Little Endian" and the most significant bit for "Big Endian" packed signals within the IPdu (see the description of the packingByteOrder attribute). In AUTOSAR the bit counting is always set to "sawtooth" and the bit order is set to "Decreasing". The bit counting in byte 0 starts with bit 0 (least significant bit). The most significant bit in byte 0 is bit 7.</p>

Table D.73: ISignalToIPduMapping

Class		ISignalTriggering		
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	A ISignalTriggering allows an assignment of ISignals to physical channels.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	PhysicalChannel .iSignalTriggering			
Attribute	Type	Mult.	Kind	Note
iSignal	ISignal	0..1	ref	This reference shall be used if an ISignal is transported on the PhysicalChannel. This reference forms an XOR relationship with the ISignalTriggering-ISignalGroup reference.
iSignalGroup	ISignalGroup	0..1	ref	This reference shall be used if an ISignalGroup is transported on the PhysicalChannel. This reference forms an XOR relationship with the ISignalTriggering-ISignal reference.





Class	ISignalTriggering			
iSignalPort	ISignalPort	*	ref	References to the ISignalPort on every ECU of the system which sends and/or receives the ISignal. References for both the sender and the receiver side shall be included when the system is completely defined.

Table D.74: ISignalTriggering

Class	IamModuleInstantiation			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::IdentityAccessManagement			
Note	This meta-class represents the ability to define a definition of an IAM instantiation. Tags: atp.Status=candidate			
Base	<i>ARObject</i> , AdaptiveModuleInstantiation , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , Identifiable , <i>MultilanguageReferrable</i> , <i>NonOsModuleInstantiation</i> , <i>Referrable</i>			
Aggregated by	<i>AtpClassifier</i> .atpFeature, Machine.moduleInstantiation			
Attribute	Type	Mult.	Kind	Note
grant	Grant	*	ref	This reference identifies the applicable Grants for this IamModuleInstantiation. Stereotypes: atpSplittable Tags: atp.Splitkey=grant atp.Status=candidate
localCom AccessControl Enabled	Boolean	0..1	attr	This switch activates the policy enforcement in Communication Management on local applications. Tags: atp.Status=candidate
remoteAccess ControlEnabled	Boolean	0..1	attr	This switch activates the check of the remote subject. Tags: atp.Status=candidate

Table D.75: IamModuleInstantiation

Class	Identifiable (abstract)
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Identifiable
Note	Instances of this class can be referred to by their identifier (within the namespace borders). In addition to this, Identifiables are objects which contribute significantly to the overall structure of an AUTOSAR description. In particular, Identifiables might contain Identifiables.
Base	<i>ARObject</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>
Subclasses	ARPackage , <i>AbstractDolpLogicAddressProps</i> , <i>AbstractEvent</i> , AbstractImplementationDataTypeElement , <i>AbstractSecurityEventFilter</i> , <i>AbstractSecurityIdsmInstanceFilter</i> , AbstractServiceInstance , AbstractSignalBasedToISignalTriggeringMapping , <i>AdaptiveSwcInternalBehavior</i> , <i>ApApplicationEndpoint</i> , <i>ApplicationEndpoint</i> , <i>ApplicationError</i> , <i>ArtifactChecksum</i> , <i>ArtifactLocator</i> , <i>AtpBlueprint</i> , <i>AtpBlueprintable</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AutosarOperationArgumentInstance</i> , <i>AutosarVariableInstance</i> , <i>BuildActionEntity</i> , <i>BuildActionEnvironment</i> , <i>Chapter</i> , CheckpointTransition , <i>ClassContentConditional</i> , <i>ClientIdDefinition</i> , ClientServerOperation , <i>Code</i> , <i>CollectableElement</i> , <i>ComManagementMapping</i> , <i>CommConnectorPort</i> , <i>CommunicationConnector</i> , <i>CommunicationController</i> , <i>Compiler</i> , <i>ConsistencyNeeds</i> , <i>ConsumedEventGroup</i> , CouplingPort , <i>CouplingPortStructuralElement</i> , <i>CryptoCertificate</i> , <i>CryptoKeySlot</i> , <i>CryptoProvider</i> , <i>CryptoServiceMapping</i> , <i>DataPrototypeGroup</i> , <i>DataTransformation</i> , <i>DdsDomainRange</i> , <i>DependencyOnArtifact</i> , DeterministicClientResourceNeeds , <i>DiagEventDebounceAlgorithm</i> , <i>DiagnosticConnectedIndicator</i> , DiagnosticDataElement , <i>DiagnosticDebounceAlgorithmProps</i> , <i>DiagnosticFunctionInhibitSource</i> , <i>DiagnosticParameterElement</i> , <i>DiagnosticRoutineSubfunction</i> , <i>DltApplication</i> , <i>DltArgument</i> , <i>DltMessage</i> , <i>DolpInterface</i> , <i>DolpLogicAddress</i> , <i>DolpRoutingActivation</i> , E2EProfileConfiguration , End2EndEventProtectionProps , End2EndMethodProtectionProps , <i>EndToEndProtection</i> , <i>EthernetWakeUpSleepOnDataLineConfig</i> , <i>EventHandler</i> , EventMapping , <i>ExclusiveArea</i> , <i>ExecutableEntity</i> , <i>ExecutionTime</i> ,





Class	Identifiable (abstract)			
	FMAttributeDef, FMFeatureMapAssertion, FMFeatureMapCondition, FMFeatureMapElement, FMFeatureRelation, FMFeatureRestriction, FMFeatureSelection, FieldMapping , FireAndForgetMethodMapping , FlexrayArTpNode, FlexrayTpPduPool, FrameTriggering , GeneralParameter, GlobalSupervision , GlobalTimeGateway, GlobalTimeMaster , GlobalTimeSlave , HealthChannel , HeapUsage , HwAttributeDef, HwAttributeLiteralDef, HwPin, HwPinGroup, IPSecRule , IPv6ExtHeaderFilterList, ISignalToIPduMapping , ISignalTriggering , IdentCaption , InternalTriggeringPoint, Keyword, LifeCycleState, Linker, MacMulticastGroup, MacSecKeyParticipant , McDataInstance, MemorySection, MemoryUsage , MethodMapping , ModeDeclaration , ModeDeclarationMapping, ModeSwitchPoint, NetworkEndpoint , NmCluster , NmNode , PackageableElement , ParameterAccess, PduActivationRoutingGroup, PduToFrameMapping, PduTriggering , PerInstanceMemory, PersistencyDeploymentElement , PersistencyInterfaceElement , PhmSupervision , PhysicalChannel , PortGroup , PortInterfaceMapping , PossibleErrorReaction, ProcessToMachineMapping , Processor , ProcessorCore , PskIdentityToKeySlotMapping, ResourceConsumption , ResourceGroup, RootSwClusterDesignComponentPrototype , RootSwComponentPrototype , RootSwCompositionPrototype , RptComponent, RptContainer, RptExecutableEntity, RptExecutableEntityEvent, RptExecutionContext, RptProfile, RptServicePoint, RunnableEntityGroup, SdgAttribute , SdgClass , SecOcJobMapping, SecOcJobRequirement , SecureCommunicationAuthenticationProps , SecureCommunicationDeployment , SecureCommunicationFreshnessProps , SecurityEventContextProps, ServiceEventDeployment , ServiceFieldDeployment , ServiceInterfaceElementSecureComConfig , ServiceMethodDeployment , ServiceNeeds , SignalServiceTranslationEventProps, SignalServiceTranslationProps, SocketAddress, SoftwarePackageStep , SomeipEventGroup, SomeipProvidedEventGroup, SomeipTpChannel, SpecElementReference , StackUsage , StateManagementActionItem , StateManagementActionList , StateManagementStateNotification , StateManagementStateRequest , StaticSocketConnection, StructuredReq, SupervisionCheckpoint , SupervisionMode , SupervisionModeCondition , SwGenericAxisParamType, SwServiceArg, SwcServiceDependency , SystemMapping , TimeBaseResource , TimingClock , TimingClockSyncAccuracy, TimingCondition, TimingConstraint , TimingDescription , TimingExtensionResource, TimingModelInstance, TlsCryptoCipherSuite , TlsCryptoCipherSuiteProps, TlsJobMapping, Topic1, TpAddress, TraceableTable, TraceableText, TracedFailure , TransformationProps , TransformationTechnology, Trigger , UcmDescription , UcmRetryStrategy , UcmStep , VariableAccess, VariationPointProxy, VehicleRolloutStep , ViewMap, VlanConfig , WaitPoint			
Attribute	Type	Mult.	Kind	Note
adminData	AdminData	0..1	aggr	This represents the administrative data for the identifiable object. Stereotypes: atpSplitable Tags: atp.Splitkey=adminData xml.sequenceOffset=-40
annotation	Annotation	*	aggr	Possibility to provide additional notes while defining a model element (e.g. the ECU Configuration Parameter Values). These are not intended as documentation but are mere design notes. Tags: xml.sequenceOffset=-25
category	CategoryString	0..1	attr	The category is a keyword that specializes the semantics of the Identifiable. It affects the expected existence of attributes and the applicability of constraints. Tags: xml.sequenceOffset=-50
desc	MultiLanguageOverviewParagraph	0..1	aggr	This represents a general but brief (one paragraph) description what the object in question is about. It is only one paragraph! Desc is intended to be collected into overview tables. This property helps a human reader to identify the object in question. More elaborate documentation, (in particular how the object is built or used) should go to "introduction". Tags: xml.sequenceOffset=-60
introduction	DocumentationBlock	0..1	aggr	This represents more information about how the object in question is built or is used. Therefore it is a DocumentationBlock. Tags: xml.sequenceOffset=-30





Class	Identifiable (abstract)			
uuid	String	0..1	attr	<p>The purpose of this attribute is to provide a globally unique identifier for an instance of a meta-class. The values of this attribute should be globally unique strings prefixed by the type of identifier. For example, to include a DCE UUID as defined by The Open Group, the UUID would be preceded by "DCE:". The values of this attribute may be used to support merging of different AUTOSAR models. The form of the UUID (Universally Unique Identifier) is taken from a standard defined by the Open Group (was Open Software Foundation). This standard is widely used, including by Microsoft for COM (GUIDs) and by many companies for DCE, which is based on CORBA. The method for generating these 128-bit IDs is published in the standard and the effectiveness and uniqueness of the IDs is not in practice disputed. If the id namespace is omitted, DCE is assumed. An example is "DCE:2fac1234-31f8-11b4-a222-08002b34c003". The uuid attribute has no semantic meaning for an AUTOSAR model and there is no requirement for AUTOSAR tools to manage the timestamp.</p> <p>Tags:xml.attribute=true</p>

Table D.76: Identifiable

Class	ImplementationDataType			
Package	M2::AUTOSARTemplates::CommonStructure::ImplementationDataTypes			
Note	Describes a reusable data type on the implementation level. This will typically correspond to a typedef in C-code. Tags: atp.recommendedPackage=ImplementationDataTypes			
Base	ARElement , ARObject , AbstractImplementationDataType , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , AutosarDataType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dynamicArraySizeProfile	String	0..1	attr	Specifies the profile which the array will follow in case this data type is a variable size array.
isStructWithOptionalElement	Boolean	0..1	attr	This attribute is only valid if the attribute category is set to STRUCTURE. If set to true, this attribute indicates that the ImplementationDataType has been created with the intention to define at least one element of the structure as optional.
subElement (ordered)	ImplementationDataTypeElement	*	aggr	Specifies an element of an array, struct, or union data type. The aggregation of ImplementationDataTypeElement is subject to variability with the purpose to support the conditional existence of elements inside a ImplementationDataType representing a structure. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=subElement.shortName, subElement.variationPoint.shortLabel vh.latestBindingTime=preCompileTime





Class	ImplementationDataType			
symbolProps	SymbolProps	0..1	aggr	This represents the SymbolProps for the ImplementationDataType. Stereotypes: atpSplitable Tags: atp.Splitkey=symbolProps.shortName
typeEmitter	NameToken	0..1	attr	This attribute is used to control which part of the AUTOSAR toolchain is supposed to trigger data type definitions.

Table D.77: ImplementationDataType

Class	ImplementationDataTypeElement			
Package	M2::AUTOSARTemplates::CommonStructure::ImplementationDataTypes			
Note	Declares a data object which is locally aggregated. Such an element can only be used within the scope where it is aggregated. This element either consists of further subElements or it is further defined via its swDataDefProps. There are several use cases within the system of ImplementationDataTypes for such a local declaration: <ul style="list-style-type: none"> • It can represent the elements of an array, defining the element type and array size • It can represent an element of a struct, defining its type • It can be the local declaration of a debug element. 			
Base	ARObject , AbstractImplementationDataTypeElement , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	AtpClassifier.atpFeature , ImplementationDataType.subElement , ImplementationDataTypeElement.subElement			
Attribute	Type	Mult.	Kind	Note
arrayImplPolicy	ArrayImplPolicyEnum	0..1	attr	This attribute controls the implementation of the payload of an array. It shall only be used if the enclosing ImplementationDataType constitutes an array.
arraySize	PositiveInteger	0..1	attr	The existence of this attributes (if bigger than 0) defines the size of an array and declares that this ImplementationDataTypeElement represents the type of each single array element. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime
arraySizeHandling	ArraySizeHandlingEnum	0..1	attr	The way how the size of the array is handled in case of a variable size array.
arraySizeSemantics	ArraySizeSemanticsEnum	0..1	attr	This attribute controls the meaning of the value of the array size.
isOptional	Boolean	0..1	attr	This attribute represents the ability to declare the enclosing ImplementationDataTypeElement as optional. This means that, at runtime, the ImplementationDataTypeElement may or may not have a valid value and shall therefore be ignored. The underlying runtime software provides means to set the CppImplementationDataTypeElement as not valid at the sending end of a communication and determine its validity at the receiving end.





Class	ImplementationDataTypeElement			
subElement (ordered)	ImplementationDataTypeElement	*	aggr	Element of an array, struct, or union in case of a nested declaration (i.e. without using "typedefs"). The aggregation of ImplementationDataTypeElement is subject to variability with the purpose to support the conditional existence of elements inside a ImplementationDataType representing a structure. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=subElement.shortName, subElement.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
swDataDef Props	SwDataDefProps	0..1	aggr	The properties of this ImplementationDataTypeElement. Stereotypes: atpSplitable Tags: atp.Splitkey=swDataDefProps

Table D.78: ImplementationDataTypeElement

Class	MacMulticastConfiguration			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	References a per cluster globally defined MAC-Multicast-Group.			
Base	ARObject , NetworkEndpointAddress			
Aggregated by	NetworkEndpoint.networkEndpointAddress			
Attribute	Type	Mult.	Kind	Note
macMulticast Group	MacMulticastGroup	1	ref	Reference to a macMulticastGroup.

Table D.79: MacMulticastConfiguration

Class	ModeSwitchInterface			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	A mode switch interface declares a ModeDeclarationGroupPrototype to be sent and received. Tags: atp.recommendedPackage=PortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
modeGroup	ModeDeclarationGroupPrototype	0..1	aggr	The ModeDeclarationGroupPrototype of this mode interface.

Table D.80: ModeSwitchInterface

Class	MultiplexedIPdu			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	<p>A MultiplexedPdu (i.e. NOT a COM I-PDU) contains a DynamicPart, an optional StaticPart and a selector Field. In case of multiplexing this IPdu is routed between the Pdu Multiplexer and the Interface Layer.</p> <p>A multiplexer is used to define variable parts within an IPdu that may carry different signals. The receivers of such a IPdu can determine which signalPdus are transmitted by evaluating the selector field, which carries a unique selector code for each sub-part.</p> <p>Tags:atp.recommendedPackage=Pdus</p>			
Base	ARObject, CollectableElement, FibexElement, IPdu, Identifiable, MultilanguageReferrable, PackageableElement, Pdu, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dynamicPart	DynamicPart	0..1	aggr	<p>According to the value of the selector field some parts of the IPdu have a different layout. In a complete System Description a MultiplexedIPdu shall contain a Dynamic Part. The following use cases support the multiplicity to be 0..1:</p> <ul style="list-style-type: none"> • If a MultiplexedIPdu is received by a Pdu Gateway and is not delivered to the IPduM but routed directly to a bus interface then the content of the MultiplexedIPdu doesn't need to be described in the System Extract/Ecu Extract. • If a MultiplexedIPdu is received by an ECU which is only interested in the static part of the MultiplexedIPdu then the dynamicPart does not need to be described in the System Extract/Ecu Extract. <p>atpVariation: Content of a multiplexed PDU can vary.</p> <p>Stereotypes: atpSplitable; atpVariation</p> <p>Tags: atp.Splitkey=dynamicPart, dynamicPart.variation Point.shortLabel vh.latestBindingTime=postBuild</p>
selectorField ByteOrder	ByteOrderEnum	0..1	attr	<p>This attribute defines the order of the bytes of the selector Field and the packing into the MultiplexedIPdu. Please consider that [constr_3247] and [constr_3223] are restricting the usage of this attribute.</p> <p>In a complete System Description this attribute is mandatory. If a MultiplexedPdu is received by a Pdu Gateway and is not delivered to the IPduM but routed directly to a bus interface then the content of the MultiplexedPdu doesn't need to be described in the System Extract/Ecu Extract. To support this use case the multiplicity is set to 0..1.</p>
selectorField Length	Integer	0..1	attr	<p>The size in bits of the selector field shall be configurable in a range of 1-16 bits. In a complete System Description this attribute is mandatory. If a MultiplexedPdu is received by a Pdu Gateway and is not delivered to the IPduM but routed directly to a bus interface then the content of the MultiplexedPdu doesn't need to be described in the System Extract/Ecu Extract. To support this use case the multiplicity is set to 0..1.</p>





Class	MultiplexedIPdu			
selectorFieldStartPosition	Integer	0..1	attr	<p>This parameter is necessary to describe the position of the selector field within the IPdu.</p> <p>Note that the absolute position of the selectorField in the MultiplexedIPdu is determined by the definition of the selectorFieldByteOrder attribute of the Multiplexed Pdu. If Big Endian is specified, the start position indicates the bit position of the most significant bit in the IPdu. If Little Endian is specified, the start position indicates the bit position of the least significant bit in the IPdu. In AUTOSAR the bit counting is always set to "sawtooth" and the bit order is set to "Decreasing". The bit counting in byte 0 starts with bit 0 (least significant bit). The most significant bit in byte 0 is bit 7.</p> <p>In a complete System Description this attribute is mandatory. If a MultiplexedPdu is received by a Pdu Gateway and is not delivered to the IPduM but routed directly to a bus interface then the content of the MultiplexedPdu doesn't need to be described in the System Extract/Ecu Extract. To support this use case the multiplicity is set to 0..1.</p>
staticPart	StaticPart	0..1	aggr	<p>The static part of the multiplexed IPdu is the same regardless of the selector field. The static part is optional.</p> <p>atpVariation: Content of a multiplexed PDU can vary.</p> <p>Stereotypes: atpSplitable; atpVariation</p> <p>Tags: atp.Splitkey=staticPart, staticPart.variationPoint.shortLabel vh.latestBindingTime=postBuild</p>
triggerMode	TriggerMode	0..1	attr	<p>IPduM can be configured to send a transmission request for the new multiplexed IPdu to the PDU-Router because of the trigger conditions/ modes that are described in the TriggerMode enumeration.</p> <p>In a complete System Description this attribute is mandatory. If a MultiplexedPdu is received by a Pdu Gateway and is not delivered to the IPduM but routed directly to a bus interface then the content of the MultiplexedPdu doesn't need to be described in the System Extract/Ecu Extract. To support this use case the multiplicity is set to 0..1.</p>
unusedBitPattern	Integer	0..1	attr	<p>AUTOSAR COM and AUTOSAR IPDUM are filling not used areas of an IPdu with this bit-pattern. This attribute is mandatory to avoid undefined behavior. This byte-pattern will be repeated throughout the IPdu.</p> <p>In a complete System Description this attribute is mandatory. If a MultiplexedPdu is received by a Pdu Gateway and is not delivered to the IPduM but routed directly to a bus interface then the content of the MultiplexedPdu doesn't need to be described in the System Extract/Ecu Extract. To support this use case the multiplicity is set to 0..1.</p>

Table D.81: MultiplexedIPdu

Primitive	NameToken
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::PrimitiveTypes
Note	<p>This is an identifier as used in xml, e.g. xml-names. Typical usages are, for example, the names of type emitters, protocols, or profiles. For details see NMTOKEN definition on the W3C website (https://www.w3.org/TR/xml/#NT-Nmtoken).</p> <p>Note: Although NameToken supports a wide range of characters, the actually allowed patterns for a certain attribute typed by NameToken may be further restricted by the specification of that attribute.</p> <p>Tags: xml.xsd.customType=NMTOKEN-STRING xml.xsd.type=NMTOKEN</p>

Table D.82: NameToken

Class	NotAvailableValueSpecification			
Package	M2::AUTOSARTemplates::CommonStructure::Constants			
Note	<p>This meta-class provides the ability to specify a ValueSpecification to state that the respective element is not available. This ability is needed to support the existence of ApplicationRecordElements where attribute isOptional ist set to the value true.</p> <p>Tags:atp.Status=draft</p>			
Base	<i>ARObject</i> , <i>ValueSpecification</i>			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , CalibrationParameterValue.applInitValue , CalibrationParameterValue.implInitValue , ConstantSpecification.valueSpec , CryptoServiceKey.developmentValue , DiagnosticEnvDataCondition.compareValue , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , ISignal.initValue , ISignal.timeoutSubstitutionValue , NonqueuedReceiverComSpec.initValue , NonqueuedReceiverComSpec.timeoutSubstitutionValue , NonqueuedSenderComSpec.initValue , NvProvideComSpec.ramBlockInitValue , NvProvideComSpec.romBlockInitValue , NvRequireComSpec.initValue , ParameterDataPrototype.initValue , ParameterProvideComSpec.initValue , ParameterRequireComSpec.initValue , PersistencyDataRequiredComSpec.initValue , PersistencyKeyValuePair.initValue , PortDefinedArgumentValue.value , PortPrototypeBlueprintInitValue.value , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , SwDataDefProps.invalidValue , VariableDataPrototype.initValue			
Attribute	Type	Mult.	Kind	Note
defaultPattern	PositiveInteger	0..1	attr	The content of this attribute shall be used to initialize gaps in the memory occupied by a structured data type in the case that an NotAvailableValueSpecification is used. Note that this pattern is only applied during initialization!

Table D.83: NotAvailableValueSpecification

Class	NumericalValueSpecification			
Package	M2::AUTOSARTemplates::CommonStructure::Constants			
Note	A numerical ValueSpecification which is intended to be assigned to a Primitive data element. Note that the numerical value is a variant, it can be computed by a formula.			
Base	<i>ARObject</i> , <i>ValueSpecification</i>			





Class	NumericalValueSpecification			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , CalibrationParameterValue.appInitValue , CalibrationParameterValue.implInitValue , ConstantSpecification.valueSpec , CryptoServiceKey.developmentValue , DiagnosticEnvDataCondition.compareValue , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , ISignal.initValue , ISignal.timeoutSubstitutionValue , NonqueuedReceiverComSpec.initValue , NonqueuedReceiverComSpec.timeoutSubstitutionValue , NonqueuedSenderComSpec.initValue , NvProvideComSpec.ramBlockInitValue , NvProvideComSpec.romBlockInitValue , NvRequireComSpec.initValue , ParameterDataPrototype.initValue , ParameterProvideComSpec.initValue , ParameterRequireComSpec.initValue , PersistencyDataRequiredComSpec.initValue , PersistencyKeyValuePair.initValue , PortDefinedArgumentValue.value , PortPrototypeBlueprintInitValue.value , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , SwDataDefProps.invalidValue , VariableDataPrototype.initValue			
Attribute	Type	Mult.	Kind	Note
value	Numerical	0..1	attr	This is the value itself. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime

Table D.84: NumericalValueSpecification

Class	PPortComSpec (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Communication attributes of a provided PortPrototype. This class will contain attributes that are valid for all kinds of provide ports, independent of client-server or sender-receiver communication patterns.			
Base	ARObject			
Subclasses	ModeSwitchSenderComSpec , NvProvideComSpec , ParameterProvideComSpec , SenderComSpec , ServerComSpec			
Aggregated by	AbstractProvidedPortPrototype.providedComSpec , PortPrototypeBlueprint.providedComSpec			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.85: PPortComSpec

Class	PPortPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	Component port providing a certain port interface.			
Base	ARObject , AbstractProvidedPortPrototype , AtpBlueprintable , AtpFeature , AtpPrototype , Identifiable , MultilanguageReferrable , PortPrototype , Referrable			
Aggregated by	AtpClassifier.atpFeature , SwComponentType.port			
Attribute	Type	Mult.	Kind	Note
provided Interface	PortInterface	0..1	tref	The interface that this port provides. Stereotypes: isOfType

Table D.86: PPortPrototype

Class	PRPortPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	This kind of PortPrototype can take the role of both a required and a provided PortPrototype.			
Base	ARObject, AbstractProvidedPortPrototype , AbstractRequiredPortPrototype , AtpBlueprintable , AtpFeature , AtpPrototype , Identifiable , MultilanguageReferrable , PortPrototype , Referrable			
Aggregated by	AtpClassifier.atpFeature , SwComponentType.port			
Attribute	Type	Mult.	Kind	Note
provided Required Interface	PortInterface	0..1	tref	This represents the PortInterface used to type the PRPort Prototype Stereotypes: isOfType

Table D.87: PRPortPrototype

Class	PackageableElement (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::ARPackage			
Note	This meta-class specifies the ability to be a member of an AUTOSAR package.			
Base	ARObject, CollectableElement , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	ARElement , EnumerationMappingTable , FibexElement			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.88: PackageableElement

Class	Pdu (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	Collection of all Pdus that can be routed through a bus interface.			
Base	ARObject, CollectableElement , FibexElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Subclasses	GeneralPurposePdu, IPdu , NmPdu , UserDefinedPdu			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
hasDynamic Length	Boolean	0..1	attr	This attribute defines whether the Pdu has dynamic length (true) or not (false). Please note that the usage of this attribute is restricted by [constr_3448].
length	UnlimitedInteger	0..1	attr	Pdu length in bytes. In case of dynamic length IPdus (containing a dynamical length signal), this value indicates the maximum data length. It should be noted that in former AUTOSAR releases (Rel 2.1, Rel 3.0, Rel 3.1, Rel 4.0 Rev. 1) this parameter was defined in bits. The Pdu length of zero bytes is allowed.

Table D.89: Pdu

Class	PduTriggering			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	<p>The PduTriggering describes on which channel the IPdu is transmitted. The Pdu routing by the PduR is only allowed for subclasses of IPdu.</p> <p>Depending on its relation to entities such channels and clusters it can be unambiguously deduced whether a fan-out is handled by the Pdu router or the Bus Interface.</p> <p>If the fan-out is specified between different clusters it shall be handled by the Pdu Router. If the fan-out is specified between different channels of the same cluster it shall be handled by the Bus Interface.</p>			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	PhysicalChannel.pduTriggering			
Attribute	Type	Mult.	Kind	Note
iPdu	Pdu	1	ref	<p>Reference to the Pdu for which the PduTriggering is defined. One I-Pdu can be triggered on different channels (PduR fan-out). The Pdu routing by the PduR is only allowed for subclasses of IPdu.</p> <p>Nevertheless is the reference to the Pdu element necessary since the PduTriggering element is also used to specify the sending and receiving connections to Ecu Ports.</p>
iPduPort	IPduPort	*	ref	<p>References to the IPduPort on every ECU of the system which sends and/or receives the I-PDU.</p> <p>References for both the sender and the receiver side shall be included when the system is completely defined.</p>
iSignal Triggering	ISignalTriggering	*	ref	<p>This reference provides the relationship to the ISignal Triggerings that are implemented by the PduTriggering. The reference is optional since no ISignalTriggering can be defined for DCM and Multiplexed Pdus.</p> <p>Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=iSignalTriggering.iSignalTriggering, iSignalTriggering.variationPoint.shortLabel vh.latestBindingTime=postBuild</p>
secOcCrypto Mapping	SecOcCryptoService Mapping	0..1	ref	<p>This reference identifies the crypto profile applicable to the usage (send, receive) of the also referenced Secured IPdu.</p> <p>Obviously, this reference is only applicable if the PduTriggering also references a SecuredIPdu in the role i Pdu.</p>
triggerIPduSend Condition	TriggerIPduSend Condition	*	aggr	<p>Defines the trigger for the Com_TriggerIPDUSend API call. Only if all defined TriggerIPduSendConditions evaluate to true (AND associated) the Com_Trigger IPDUSend API shall be called.</p>

Table D.90: PduTriggering

Class	PhmStateReference (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Definition of state dependency.			
Base	ARObject			
Subclasses	FunctionGroupPhmStateReference			
Aggregated by	SupervisionModeCondition.stateReference			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.91: PhmStateReference

Class	<i>PhmSupervision</i> (abstract)			
Package	M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::PlatformHealthManagement			
Note	Defines explicitly that NO supervision shall be applied for a set of SupervisionCheckpoints.			
Base	<i>ARObject</i> , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	AliveSupervision , DeadlineSupervision , LogicalSupervision , NoCheckpointSupervision , NoSupervision			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.92: PhmSupervision

Class	PortGroup			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	<p>Group of ports which share a common functionality , e.g. need specific network resources. This information shall be available on the VFB level in order to delegate it properly via compositions. When propagated into the ECU extract, this information is used as input for the configuration of Services like the Communication Manager.</p> <p>A PortGroup is defined locally in a component (which can be a composition) and refers to the "outer" ports belonging to the group as well as to the "inner" groups which propagate this group into the components which are part of a composition. A PortGroup within an atomic SWC cannot be linked to inner groups.</p>			
Base	<i>ARObject</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	<i>AtpClassifier.atpFeature</i> , SwComponentType.portGroup			
Attribute	Type	Mult.	Kind	Note
innerGroup	PortGroup	*	iref	<p>Links a PortGroup in a composition to another PortGroup, that is defined in a component which is part of this CompositionSwComponentType.</p> <p>InstanceRef implemented by: InnerPortGroupInCompositionInstanceRef</p>
outerPort	PortPrototype	*	ref	<p>Outer PortPrototype of this AtomicSwComponentType which belongs to the group. A port can belong to several groups or to no group at all.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=outerPort.portPrototype, outerPort.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>

Table D.93: PortGroup

Class	<i>PortPrototype</i> (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	<p>Base class for the ports of an AUTOSAR software component.</p> <p>The aggregation of PortPrototypes is subject to variability with the purpose to support the conditional existence of ports.</p>			
Base	<i>ARObject</i> , <i>AtpBlueprintable</i> , <i>AtpFeature</i> , <i>AtpPrototype</i> , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	AbstractProvidedPortPrototype , AbstractRequiredPortPrototype			
Aggregated by	<i>AtpClassifier.atpFeature</i> , SwComponentType.port			
Attribute	Type	Mult.	Kind	Note
clientServerAnnotation	ClientServerAnnotation	*	aggr	Annotation of this PortPrototype with respect to client/server communication.





Class	PortPrototype (abstract)			
delegatedPort Annotation	DelegatedPort Annotation	0..1	aggr	Annotations on this delegated port.
ioHwAbstractionServer Annotation	IoHwAbstractionServer Annotation	*	aggr	Annotations on this IO Hardware Abstraction port.
modePort Annotation	ModePortAnnotation	*	aggr	Annotations on this mode port.
nvDataPort Annotation	NvDataPortAnnotation	*	aggr	Annotations on this non volatile data port.
parameterPort Annotation	ParameterPort Annotation	*	aggr	Annotations on this parameter port.
portPrototype Props	PortPrototypeProps	0..1	aggr	This attribute allows for the definition of further qualification of the semantics of a PortPrototype. Tags: atp.Status=draft
senderReceiver Annotation	SenderReceiver Annotation	*	aggr	Collection of annotations of this ports sender/receiver communication.
triggerPort Annotation	TriggerPortAnnotation	*	aggr	Annotations on this trigger port.

Table D.94: PortPrototype

Class	ProvidedServiceInstance			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ServiceInstances			
Note	Service instances that are provided by the ECU that is connected via the ApplicationEndpoint to a CommunicationConnector.			
Base	ARObject , AbstractServiceInstance , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	ApplicationEndpoint.providedServiceInstance, ServiceInstanceCollectionSet.serviceInstance			
Attribute	Type	Mult.	Kind	Note
autoAvailable	Boolean	0..1	attr	Defines that this ProvidedServiceInstance shall be offered by the service discovery at ECU start.
eventHandler	EventHandler	*	aggr	Collection of event groups provided by the Provided ServiceInstance Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=eventHandler.shortName, eventHandler.variationPoint.shortLabel vh.latestBindingTime=postBuild
instance Identifier	PositiveInteger	0..1	attr	Instance identifier. Can be used for e.g. service discovery to identify the instance of the service.
loadBalancing Priority	PositiveInteger	0..1	attr	Defines the value to be used for load balancing priority in the service offer. Lower value means higher priority.
loadBalancing Weight	PositiveInteger	0..1	attr	Defines the value to be used for load balancing weight in the service offer. Higher value means higher probability to be chosen.
localUnicast Address	ApplicationEndpoint	0..2	ref	The local address over which the PSI is provided (udp, tcp or both). Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=localUnicastAddress.applicationEndpoint, localUnicastAddress.variationPoint.shortLabel vh.latestBindingTime=postBuild
minorVersion	PositiveInteger	0..1	attr	Minor Version of the Service that is provided by this ProvidedServiceInstance.





Class	ProvidedServiceInstance			
priority	PositiveInteger	0..1	attr	Defines the frame priority where values from 0 (best effort) to 7 (highest) are allowed.
remoteMulticastSubscriptionAddress	ApplicationEndpoint	*	ref	This reference defines the remote multicast subscribed addresses of service consumers. This reference shall ONLY be used if the remote address of the clients is determined from the configuration and not at runtime. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=remoteMulticastSubscriptionAddress.applicationEndpoint, remoteMulticastSubscriptionAddress.variationPoint.shortLabel vh.latestBindingTime=postBuild
remoteUnicastAddress	ApplicationEndpoint	*	ref	This reference defines the remote addresses of service consumers. This reference shall ONLY be used if the remote address of the clients is determined from the configuration and not at runtime. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=remoteUnicastAddress.applicationEndpoint, remoteUnicastAddress.variationPoint.shortLabel vh.latestBindingTime=postBuild
sdServerConfig	SdServerConfig	0..1	aggr	Service Discovery Server configuration. Tags: atp.Status=obsolete
sdServerTimerConfig	SomeipSdServerServiceInstanceConfig	0..1	ref	Server specific configuration settings relevant for the SOME/IP service discovery. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=sdServerTimerConfig.someipSdServerServiceInstanceConfig, sdServerTimerConfig.variationPoint.shortLabel vh.latestBindingTime=postBuild
serviceIdentifier	PositiveInteger	0..1	attr	This attribute represents the ability to describe the SOME/IP service ID that is offered.

Table D.95: ProvidedServiceInstance

Class	RPortComSpec (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Communication attributes of a required PortPrototype. This class will contain attributes that are valid for all kinds of require-ports, independent of client-server or sender-receiver communication patterns.			
Base	ARObject			
Subclasses	ClientComSpec , ModeSwitchReceiverComSpec , NvRequireComSpec , ParameterRequireComSpec , PersistencyDataRequiredComSpec , ReceiverComSpec			
Aggregated by	AbstractRequiredPortPrototype.requiredComSpec , PortPrototypeBlueprint.requiredComSpec			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.96: RPortComSpec

Class	RPortPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	Component port requiring a certain port interface.			
Base	<i>AObject</i> , AbstractRequiredPortPrototype , <i>AtpBlueprintable</i> , <i>AtpFeature</i> , <i>AtpPrototype</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PortPrototype</i> , <i>Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature</i> , SwComponentType.port			
Attribute	Type	Mult.	Kind	Note
required Interface	PortInterface	0..1	tref	The interface that this port requires. Stereotypes: isOfType

Table D.97: RPortPrototype

Class	RecordValueSpecification			
Package	M2::AUTOSARTemplates::CommonStructure::Constants			
Note	Specifies the values for a record.			
Base	<i>AObject</i> , <i>CompositeValueSpecification</i> , <i>ValueSpecification</i>			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , <i>CalibrationParameterValue.applInitValue</i> , <i>CalibrationParameterValue.implInitValue</i> , <i>CompositeRuleBasedValueSpecification.argument</i> , <i>ConstantSpecification.valueSpec</i> , CryptoServiceKey.developmentValue , <i>DiagnosticEnvDataCondition.compareValue</i> , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , <i>ISignal.initValue</i> , <i>ISignal.timeoutSubstitutionValue</i> , <i>NonqueuedReceiverComSpec.initValue</i> , <i>NonqueuedReceiverComSpec.timeoutSubstitutionValue</i> , <i>NonqueuedSenderComSpec.initValue</i> , <i>NvProvideComSpec.ramBlockInitValue</i> , <i>NvProvideComSpec.romBlockInitValue</i> , <i>NvRequireComSpec.initValue</i> , <i>ParameterDataPrototype.initValue</i> , <i>ParameterProvideComSpec.initValue</i> , <i>ParameterRequireComSpec.initValue</i> , PersistencyDataRequiredComSpec.initValue , PersistencyKeyValuePair.initValue , <i>PortDefinedArgumentValue.value</i> , <i>PortPrototypeBlueprintInitValue.value</i> , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , <i>SwDataDefProps.invalidValue</i> , <i>VariableDataPrototype.initValue</i>			
Attribute	Type	Mult.	Kind	Note
field (ordered)	ValueSpecification	*	aggr	The value for a single record field. This could also be mapped explicitly to a record element of the data type using the shortName of the ValueSpecification. But this would introduce a relationship to the data type that is too strong. As of now, it is only important that the structure of the data type matches the structure of the ValueSpecification independently of the shortNames. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=field, field.variationPoint.shortLabel vh.latestBindingTime=preCompileTime

Table D.98: RecordValueSpecification

Primitive	Ref			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::PrimitiveTypes			
Note	This primitive denotes a name based reference. For detailed syntax see the xsd.pattern. <ul style="list-style-type: none"> • first slash (relative or absolute reference) [optional] • Identifier [required] • a sequence of slashes and Identifiers [optional] This primitive is used by the meta-model tools to create the references. Tags: xml.xsd.customType=REF xml.xsd.pattern=/?[a-zA-Z][a-zA-Z0-9_]{0,127}/([a-zA-Z][a-zA-Z0-9_]{0,127})* xml.xsd.type=string			
Attribute	Type	Mult.	Kind	Note
base	Identifier	0..1	attr	This attribute reflects the base to be used for this reference. Tags: xml.attribute=true
blueprintValue	String	0..1	attr	This represents a description that documents how the value shall be defined when deriving objects from the blueprint. Tags: atp.Status=draft xml.attribute=true
index	PositiveInteger	0..1	attr	This attribute supports the use case to point on specific elements in an array. This is in particular required if arrays are used to implement particular data objects. The counting of array indices starts with the value 0, i.e. the index of the first array element is 0. Tags: xml.attribute=true

Table D.99: Ref

Class	ReferenceValueSpecification			
Package	M2::AUTOSARTemplates::CommonStructure::Constants			
Note	Specifies a reference to a data prototype to be used as an initial value for a pointer in the software.			
Base	<i>AObject</i> , <i>ValueSpecification</i>			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , CalibrationParameterValue.applInitValue , CalibrationParameterValue.implInitValue , ConstantSpecification.valueSpec , CryptoServiceKey.developmentValue , DiagnosticEnvDataCondition.compareValue , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , ISignal.initValue , ISignal.timeoutSubstitutionValue , NonqueuedReceiverComSpec.initValue , NonqueuedReceiverComSpec.timeoutSubstitutionValue , NonqueuedSenderComSpec.initValue , NvProvideComSpec.ramBlockInitValue , NvProvideComSpec.romBlockInitValue , NvRequireComSpec.initValue , ParameterDataPrototype.initValue , ParameterProvideComSpec.initValue , ParameterRequireComSpec.initValue , PersistencyDataRequiredComSpec.initValue , PersistencyKeyValuePair.initValue , PortDefinedArgumentValue.value , PortPrototypeBlueprintInitValue.value , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , SwDataDefProps.invalidValue , VariableDataPrototype.initValue			
Attribute	Type	Mult.	Kind	Note
referenceValue	DataPrototype	0..1	ref	The referenced data prototype.

Table D.100: ReferenceValueSpecification

Class	Referrable (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Identifiable			
Note	Instances of this class can be referred to by their identifier (while adhering to namespace borders).			
Base	ARObject			
Subclasses	<i>AtpDefinition</i> , <i>BswDistinguishedPartition</i> , <i>BswModuleCallPoint</i> , <i>BswModuleClientServerEntry</i> , <i>BswVariableAccess</i> , <i>CouplingPortTrafficClassAssignment</i> , CpplImplementationData TypeContextTarget , <i>DiagnosticEnvModeElement</i> , <i>EthernetPriorityRegeneration</i> , <i>ExclusiveAreaNestingOrder</i> , <i>HwDescriptionEntity</i> , <i>ImplementationProps</i> , <i>ModeTransition</i> , <i>MultilanguageReferrable</i> , <i>NmNetworkHandle</i> , <i>PncMappingIdent</i> , <i>SingleLanguageReferrable</i> , <i>SoConIPdulIdentifier</i> , <i>SocketConnectionBundle</i> , SomeipRequiredEventGroup , <i>TimeSyncServerConfiguration</i> , <i>TpConnectionIdent</i>			
Attribute	Type	Mult.	Kind	Note
shortName	Identifier	1	attr	This specifies an identifying shortName for the object. It needs to be unique within its context and is intended for humans but even more for technical reference. Stereotypes: atpIdentityContributor Tags: xml.enforceMinMultiplicity=true xml.sequenceOffset=-100
shortName Fragment	ShortNameFragment	*	aggr	This specifies how the Referrable.shortName is composed of several shortNameFragments. Tags: xml.sequenceOffset=-90

Table D.101: Referrable

Class	RoleBasedPortAssignment			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::ServiceMapping			
Note	This class specifies an assignment of a role to a particular service port (RPortPrototype or PPort Prototype) of an AtomicSwComponentType. With this assignment, the role of the service port can be mapped to a specific ServiceNeeds element, so that a tool is able to create the correct connector.			
Base	ARObject			
Aggregated by	NvBlockDescriptor.clientServerPort, SwcServiceDependency.assignedPort			
Attribute	Type	Mult.	Kind	Note
portPrototype	PortPrototype	0..1	ref	Service PortPrototype used in the assigned role. This PortPrototype shall either belong to the same AtomicSw ComponentType as the SwcInternalBehavior which owns the ServiceDependency or to the same NvBlockSw ComponentType as the NvBlockDescriptor.
role	Identifier	0..1	attr	This is the role of the assigned Port in the given context. The value shall be a shortName of the Blueprint of a Port Interface as standardized in the Software Specification of the related AUTOSAR Service.

Table D.102: RoleBasedPortAssignment

Class	Sd			
Package	M2::MSR::AsamHdo::SpecialData			
Note	This class represents a primitive element in a special data group.			
Base	ARObject			
Aggregated by	SdgContents.sd			
Attribute	Type	Mult.	Kind	Note





Class	Sd			
gid	NameToken	1	attr	This attributes specifies an identifier. Gid comes from the SGML/XML-Term "Generic Identifier" which is the element name in XML. The role of this attribute is the same as the name of an XML - element. Tags: xml.attribute=true
value	VerbatimStringPlain	1	attr	This is the value of the special data. Tags: xml.roleElement=false xml.roleWrapperElement=false xml.typeElement=false xml.typeWrapperElement=false
xmlSpace	XmlSpaceEnum	0..1	attr	This attribute is used to signal an intention that in that element, white space should be preserved by applications. It is defined according to xml:space as declared by W3C. Tags: xml.attribute=true xml.attributeRef=true xml.enforceMinMultiplicity=true xml.name=space xml.nsPrefix=xml

Table D.103: Sd

Class	SdClientConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ObsoleteModel			
Note	Client configuration for Service-Discovery. Tags: atp.Status=obsolete atp.recommendedPackage=SdConfigs			
Base	ARObject			
Aggregated by	ConsumedEventGroup.sdClientConfig, ConsumedServiceInstance.sdClientConfig			
Attribute	Type	Mult.	Kind	Note
capability Record	TagWithOptionalValue	*	aggr	A sequence of records to store arbitrary name/value pairs conveying additional information about the named service. Capability records shall only be existing if the respective SdClientConfig is composed by a Consumed ServiceInstance (see constr_3260). Tags: atp.Status=obsolete
clientService MajorVersion	PositiveInteger	0..1	attr	Major version number of the Service.
clientService MinorVersion	PositiveInteger	0..1	attr	Minor version number of the Service.
initialFind Behavior	InitialSdDelayConfig	0..1	aggr	Controls initial find behavior of clients. Tags: atp.Status=obsolete
request ResponseDelay	RequestResponseDelay	0..1	aggr	Maximum/Minimum allowable response delay to entries received by multicast in seconds. Tags: atp.Status=obsolete
tll	PositiveInteger	1	attr	TTL for Request and Subscribe messages.

Table D.104: SdClientConfig

Class	SdServerConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ObsoleteModel			
Note	Server configuration for Service-Discovery. Tags: atp.Status=obsolete atp.recommendedPackage=SdConfigs			
Base	ARObject			
Aggregated by	EventHandler.sdServerConfig, ProvidedServiceInstance.sdServerConfig			
Attribute	Type	Mult.	Kind	Note
capability Record	TagWithOptionalValue	*	aggr	A sequence of records to store arbitrary name/value pairs conveying additional information about the named service. Capability records shall only be existing if the respective SdServerConfig is composed by a Provided ServiceInstance (see constr_3259). Tags: atp.Status=obsolete
initialOffer Behavior	InitialSdDelayConfig	0..1	aggr	Controls offer behavior of the server. Tags: atp.Status=obsolete
offerCyclicDelay	TimeValue	0..1	attr	Optional attribute to define cyclic offers. Cyclic offer is active, if the delay is set (in seconds).
request ResponseDelay	RequestResponseDelay	0..1	aggr	Maximum/Minimum allowable response delay to entries received by multicast in seconds. Tags: atp.Status=obsolete
serverService MajorVersion	PositiveInteger	0..1	attr	Major version number of the Service.
serverService MinorVersion	PositiveInteger	0..1	attr	Minor version number of the Service.
ttl	PositiveInteger	1	attr	Time to live. Shall be a positive value (slnt32).

Table D.105: SdServerConfig

Class	SecOcCryptoServiceMapping			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class has the ability to represent a crypto service mapping for the Pdu-based communication via SecOC.			
Base	ARObject, CryptoServiceMapping , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	SystemMapping.cryptoServiceMapping			
Attribute	Type	Mult.	Kind	Note
authentication	CryptoServicePrimitive	0..1	ref	This reference identifies the applicable crypto primitive for the authentication.
cryptoService Key	CryptoServiceKey	0..1	ref	This reference identifies the applicable crypto key.
cryptoService Queue	CryptoServiceQueue	0..1	ref	This reference identifies the CryptoServiceQueue the processing of this SecOcCryptoServiceMapping shall be performed in.

Table D.106: SecOcCryptoServiceMapping

Class	SecureCommunicationAuthenticationProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	Authentication properties used to configure SecuredIPdus.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			





Class	SecureCommunicationAuthenticationProps			
Aggregated by	SecureCommunicationPropsSet.authenticationProps			
Attribute	Type	Mult.	Kind	Note
authInfoTx Length	PositiveInteger	0..1	attr	This attribute defines the length in bits of the authentication code to be included in the payload of the authenticated Pdu.

Table D.107: SecureCommunicationAuthenticationProps

Class	SecureCommunicationFreshnessProps			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	Freshness properties used to configure SecuredIPdus.			
Base	ARObject, Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	SecureCommunicationPropsSet.freshnessProps			
Attribute	Type	Mult.	Kind	Note
freshness CounterSync Attempts	PositiveInteger	0..1	attr	This attribute defines the number of Freshness Counter re-synchronization attempts when a verification failed for a Secured I-PDU. If the value is zero, there will be no additional verification attempt to synchronize with a potentially better fitting Freshness Counter value. This attribute is only applicable if useFreshnessTimestamp is FALSE.
freshness TimestampTime PeriodFactor	PositiveInteger	0..1	attr	This attribute defines a factor that specifies the time period for the Freshness Timestamp. It holds a multiplication factor that specifies the concrete meaning of a Freshness Timestamp increment by one on basis of microseconds.
freshnessValue Length	PositiveInteger	0..1	attr	This attribute defines the complete length in bits of the Freshness Value. As long as the key doesn't change the counter shall not overflow. The length of the counter shall be determined based on the expected life time of the corresponding key and frequency of usage of the counter.
freshnessValue TxLength	PositiveInteger	0..1	attr	This attribute defines the length in bits of the Freshness Value to be included in the payload of the Secured I-PDU. This length is specific to the least significant bits of the complete Freshness Counter. If the attribute is 0 no Freshness Value is included in the Secured I-PDU.
useFreshness Timestamp	Boolean	0..1	attr	This attribute specifies whether the Freshness Value is generated through individual Freshness Counters or by a Timestamps. The value is set to TRUE when Timestamps are used.

Table D.108: SecureCommunicationFreshnessProps

Class	SecuredIPdu
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication
Note	<p>If useAsCryptographicPdu is not set or set to false this IPdu contains the payload of an Authentic IPdu supplemented by additional Authentication Information (Freshness Counter and an Authenticator).</p> <p>If useAsCryptographicPdu is set to true this IPdu contains the Authenticator for a payload that is transported in a separate message. The separate Authentic IPdu is described by the Pdu that is referenced with the payload reference from this SecuredIPdu.</p> <p>Tags:atp.recommendedPackage=Pdus</p>





Class	SecuredIPdu			
Base	<i>ARObject</i> , <i>CollectableElement</i> , <i>FibexElement</i> , <i>IPdu</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Pdu</i> , <i>Referrable</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
authentication Props	SecureCommunicationAuthenticationProps	0..1	ref	Reference to authentication properties that are valid for this SecuredIPdu.
dynamic RuntimeLength Handling	Boolean	0..1	attr	Defines whether the length information for handling this SecuredIPdu with SecuredIPdu.useSecuredPduHeader=noHeader is taken from the configuration or from the actually provided length information during runtime. true: SecuredIPdu length information is taken from the actually provided length information during runtime. false: SecuredIPdu length information is taken from the configuration.
freshnessProps	SecureCommunicationFreshnessProps	0..1	ref	Reference to freshness properties that are valid for this SecuredIPdu.
payload	PduTriggering	1	ref	Reference to a Pdu that will be protected against unauthorized manipulation and replay attacks.
secure Communication Props	SecureCommunication Props	1	aggr	Specific configuration properties for this SecuredIPdu.
useAs Cryptographic IPdu	Boolean	0..1	attr	If this attribute is set to true the SecuredIPdu contains the Authentication Information for an AuthenticIPdu that is transmitted in a separate message. The AuthenticIPdu contains the original payload, i.e. the secured data. If this attribute is set to false this SecuredIPdu contains the payload of an Authentic IPdu supplemented by additional Authentication Information.
useSecuredPdu Header	SecuredPduHeader Enum	0..1	attr	This attribute defines the size of the header which is inserted into the SecuredIPdu. If this attribute is set to anything but noHeader, the SecuredIPdu contains the Secured I-PDU Header to indicate the length of the AuthenticIPdu. The AuthenticIPdu contains the original payload, i.e. the secured data.

Table D.109: SecuredIPdu

Class	SenderReceiverInterface			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	A sender/receiver interface declares a number of data elements to be sent and received. Tags: atp.recommendedPackage=PortInterfaces			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>AtpBlueprint</i> , <i>AtpBlueprintable</i> , <i>AtpClassifier</i> , <i>AtpType</i> , <i>CollectableElement</i> , <i>DataInterface</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>PortInterface</i> , <i>Referrable</i>			
Aggregated by	<i>ARPackage.element</i>			
Attribute	Type	Mult.	Kind	Note
dataElement	VariableDataPrototype	*	aggr	The data elements of this SenderReceiverInterface.
invalidation Policy	InvalidationPolicy	*	aggr	InvalidationPolicy for a particular dataElement
metaDataItem Set	MetaDataItemSet	*	aggr	This aggregation defines fixed sets of meta-data items associated with dataElements of the enclosing Sender ReceiverInterface

Table D.110: SenderReceiverInterface

Class	ServiceNeeds (abstract)			
Package	M2::AUTOSARTemplates::CommonStructure::ServiceNeeds			
Note	This expresses the abstract needs that a Software Component or Basic Software Module has on the configuration of an AUTOSAR Service to which it will be connected. "Abstract needs" means that the model abstracts from the Configuration Parameters of the underlying Basic Software.			
Base	<i>ARObject</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>Referrable</i>			
Subclasses	BswMgrNeeds, ComMgrUserNeeds, CryptoKeyManagementNeeds, <i>CryptoNeeds</i> , CryptoServiceJobNeeds, CryptoServiceNeeds, <i>DiagnosticCapabilityElement</i> , DltUserNeeds, <i>DolpServiceNeeds</i> , EcuStateMgrUserNeeds, ErrorTracerNeeds, FunctionInhibitionAvailabilityNeeds, FunctionInhibitionNeeds, GlobalSupervisionNeeds, HardwareTestNeeds, IdsMgrCustomTimestampNeeds, IdsMgrNeeds, IndicatorStatusNeeds, J1939DcmDm19Support, J1939RmIncomingRequestServiceNeeds, J1939RmOutgoingRequestServiceNeeds, NvBlockNeeds, SecureOnBoardCommunicationNeeds, SupervisedEntityCheckpointNeeds, SupervisedEntityNeeds, SyncTimeBaseMgrUserNeeds, V2xDataManagerNeeds, V2xFacUserNeeds, V2xMUserNeeds, VendorSpecificServiceNeeds			
Aggregated by	BswServiceDependency.serviceNeeds, SwcServiceDependency.serviceNeeds			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.111: ServiceNeeds

Class	ServiceSwComponentType			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	ServiceSwComponentType is used for configuring services for a given ECU. Instances of this class are only to be created in ECU Configuration phase for the specific purpose of the service configuration. Tags: atp.recommendedPackage=SwComponentTypes			
Base	<i>ARElement</i> , <i>ARObject</i> , <i>AtomicSwComponentType</i> , <i>AtpBlueprint</i> , <i>AtpBlueprintable</i> , <i>AtpClassifier</i> , <i>AtpType</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>Referrable</i> , <i>SwComponentType</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.112: ServiceSwComponentType

Class	SocketConnection			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ObsoleteModel			
Note	The SoAd serves as a (De)Multiplexer between different PDU sources and the TCP/IP stack. Tags: atp.Status=obsolete			
Base	<i>ARObject</i> , <i>Describable</i>			
Aggregated by	SoAdConfig.connection, SocketConnectionBundle.bundledConnection			
Attribute	Type	Mult.	Kind	Note
clientIpAddrFromConnectionRequest	Boolean	0..1	attr	If set to true the Server "learns" the client IP address on connection request. This means that the statically configured IP Address of the related client shall be ignored. If set to false the Server only accepts statically configured IP address, e.g. 192.168.1.2. This means that the statically configured IP Address of the Client shall be used.
clientPort	SocketAddress	0..1	ref	Client Port for TCP/UDP connection in an abstract communication sense. The client is the major requester of the communication. Please note that the client may also produce data. Tags: atp.Status=obsolete





Class	SocketConnection			
clientPortFromConnectionRequest	Boolean	0..1	attr	If set to true the Server "learns" the client Port on connection request. This means that the statically configured Port of the related client shall be ignored. If set to false the Server only accepts statically configured Port. This means that the statically configured Port of the Client shall be used.
pdu	SocketConnectionIpduIdentifier	*	aggr	PDUs handed over by the PDU Router (Transmission over the Ethernet) or PDUs handed over by SoAd (Reception over Ethernet). Multiple IPdus can be transmitted over one socket connection. Tags: atp.Status=obsolete
pduCollectionMaxBufferSize	PositiveInteger	0..1	attr	Defines the maximum buffer size in Byte which shall be filled before a socket with Pdu collection enabled shall be transmitted to the lower layer.
pduCollectionTimeout	TimeValue	0..1	attr	Defines the time in seconds which shall pass before a socket with Pdu collection enabled shall be transmitted to the lower layer after the first Pdu has been put into the socket buffer.
runtimeIpAddressConfiguration	RuntimeAddressConfigurationEnum	0..1	attr	This attribute determines which protocol is used by the client to obtain the IP Address information. If this attribute is not set to none the value determines the service used by the client to obtain the IP Address information for the SocketConnection. If this attribute is set to none the client used the statically configured IP Address information.
runtimePortConfiguration	RuntimeAddressConfigurationEnum	0..1	attr	This attribute determines which protocol is used by the client to obtain the Port information. If this attribute is not set to none the value determines the service used by the client to obtain the Port information for the Socket Connection. If this attribute is set to none the client uses the statically configured Port information.
shortLabel	Identifier	0..1	attr	This attribute specifies an identifying shortName for the SocketConnection. It shall be unique within its context.

Table D.113: SocketConnection

Class	SocketConnectionIpduIdentifier			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::ObsoleteModel			
Note	An Identifier is required in case of one port per ECU communication where multiple Pdus are transmitted over the same connection. If only one IPdu is transmitted over the connection this attribute can be ignored. Tags: atp.Status=obsolete			
Base	ARObject			
Aggregated by	SocketConnection.pdu , SocketConnectionBundle.pdu			
Attribute	Type	Mult.	Kind	Note
headerId	PositiveInteger	0..1	attr	If multiple Pdus are transmitted over the same connection this headerId can be used to distinguish between the different Pdus.
pduCollectionPduTimeout	TimeValue	0..1	attr	Defines the timeout in seconds the PDU collection shall be transmitted at the latest after this PDU has been put into the buffer.
pduCollectionSemantics	PduCollectionSemanticsEnum	0..1	attr	Specifies if the referenced PduTriggering shall be collected using a queued (i.e. all PDU instances) or last-is-best (i.e. only the last PDU instance) semantics. If this attribute is not present the behavior of "queued" is assumed.





Class	SocketConnectionIpduIdentifier			
pduCollectionTrigger	PduCollectionTriggerEnum	0..1	attr	Defines whether the referenced Pdu contributes to the triggering of the socket transmission if Pdu collection is enabled for this socket.
pduTriggering	PduTriggering	0..1	ref	Reference to a Pdu that is mapped to a socket connection. Tags: atp.Status=obsolete
routingGroup	SoAdRoutingGroup	*	ref	Reference to RoutingGroups that can be enabled or disabled. Tags: atp.Status=obsolete

Table D.114: SocketConnectionIpduIdentifier

Class	SwComponentPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Composition			
Note	Role of a software component within a composition.			
Base	<i>ARObject</i> , <i>AtpFeature</i> , <i>AtpPrototype</i> , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	<i>AtpClassifier.atpFeature</i> , CompositionSwComponentType.component			
Attribute	Type	Mult.	Kind	Note
type	SwComponentType	0..1	tref	Type of the instance. Stereotypes: isOfType

Table D.115: SwComponentPrototype

Class	SwConnector (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Composition			
Note	The base class for connectors between ports. Connectors have to be identifiable to allow references from the system constraint template.			
Base	<i>ARObject</i> , <i>AtpClassifier</i> , <i>AtpFeature</i> , <i>AtpStructureElement</i> , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	AssemblySwConnector , DelegationSwConnector , PassThroughSwConnector			
Aggregated by	<i>AtpClassifier.atpFeature</i> , CompositionSwComponentType.connector			
Attribute	Type	Mult.	Kind	Note
mapping	PortInterfaceMapping	0..1	ref	Reference to a PortInterfaceMapping specifying the mapping of unequal named PortInterface elements of the two different PortInterfaces typing the two PortPrototypes which are referenced by the ConnectorPrototype.

Table D.116: SwConnector

Class	<<atpVariation>> SwDataDefProps			
Package	M2::MSR::DataDictionary::DataDefProperties			
Note	<p>This class is a collection of properties relevant for data objects under various aspects. One could consider this class as a "pattern of inheritance by aggregation". The properties can be applied to all objects of all classes in which SwDataDefProps is aggregated.</p> <p>Note that not all of the attributes or associated elements are useful all of the time. Hence, the process definition (e.g. expressed with an OCL or a Document Control Instance MSR-DCI) has the task of implementing limitations.</p> <p>SwDataDefProps covers various aspects:</p> <ul style="list-style-type: none"> • Structure of the data element for calibration use cases: is it a single value, a curve, or a map, but also the recordLayouts which specify how such elements are mapped/converted to the Data Types in the programming language (or in AUTOSAR). This is mainly expressed by properties like swRecordLayout and swCalprmAxisSet • Implementation aspects, mainly expressed by swImplPolicy, swVariableAccessImplPolicy, swAddrMethod, swPointerTargetProps, baseType, implementationDataType and additionalNativeTypeQualifier • Access policy for the MCD system, mainly expressed by swCalibrationAccess • Semantics of the data element, mainly expressed by compuMethod and/or unit, dataConstr, invalidValue • Code generation policy provided by swRecordLayout <p>Tags:vh.latestBindingTime=codeGenerationTime</p>			
Base	ARObject			
Aggregated by	AutosarDataType.swDataDefProps , CompositeNetworkRepresentation.networkRepresentation, DataPrototype.swDataDefProps , DataPrototypeTransformationProps.networkRepresentationProps, DiagnosticDataElement.swDataDefProps , DiagnosticEnvDataElementCondition.swDataDefProps , DltArgument.networkRepresentation, FlatInstanceDescriptor.swDataDefProps, ImplementationDataTypeElement.swDataDefProps , InstantiationDataDefProps.swDataDefProps, ISignal.networkRepresentationProps , McDataInstance.resultingProperties, ParameterAccess.swDataDefProps, PerInstanceMemory.swDataDefProps, ReceiverComSpec.networkRepresentation , SenderComSpec.networkRepresentation , SomeipDataPrototypeTransformationProps.networkRepresentation , SwPointerTargetProps.swDataDefProps , SwServiceArg.swDataDefProps, SwSystemconst.swDataDefProps, SystemSignal.physicalProps			
Attribute	Type	Mult.	Kind	Note
additionalNativeTypeQualifier	NativeDeclarationString	0..1	attr	<p>This attribute is used to declare native qualifiers of the programming language which can neither be deduced from the baseType (e.g. because the data object describes a pointer) nor from other more abstract attributes. Examples are qualifiers like "volatile", "strict" or "enum" of the C-language. All such declarations have to be put into one string.</p> <p>Tags:xml.sequenceOffset=235</p>
annotation	Annotation	*	aggr	<p>This aggregation allows to add annotations (yellow pads ...) related to the current data object.</p> <p>Tags: xml.roleElement=true xml.roleWrapperElement=true xml.sequenceOffset=20 xml.typeElement=false xml.typeWrapperElement=false</p>
baseType	SwBaseType	0..1	ref	<p>Base type associated with the containing data object.</p> <p>Tags:xml.sequenceOffset=50</p>
compuMethod	CompuMethod	0..1	ref	<p>Computation method associated with the semantics of this data object.</p> <p>Tags:xml.sequenceOffset=180</p>
dataConstr	DataConstr	0..1	ref	<p>Data constraint for this data object.</p> <p>Tags:xml.sequenceOffset=190</p>





Class	<<atpVariation>> SwDataDefProps			
displayFormat	DisplayFormatString	0..1	attr	This property describes how a number is to be rendered e.g. in documents or in a measurement and calibration system. Tags: xml.sequenceOffset=210
displayPresentation	DisplayPresentationEnum	0..1	attr	This attribute controls the presentation of the related data for measurement and calibration tools.
implementationDataType	AbstractImplementationDataType	0..1	ref	This association denotes the ImplementationDataType of a data declaration via its aggregated SwDataDefProps. It is used whenever a data declaration is not directly referring to a base type. Especially <ul style="list-style-type: none"> • redefinition of an ImplementationDataType via a "typedef" to another ImplementationDatatype • the target type of a pointer (see SwPointerTarget Props), if it does not refer to a base type directly • the data type of an array or record element within an ImplementationDataType, if it does not refer to a base type directly • the data type of an SwServiceArg, if it does not refer to a base type directly Tags: xml.sequenceOffset=215
invalidValue	ValueSpecification	0..1	aggr	Optional value to express invalidity of the actual data element. Tags: xml.sequenceOffset=255
stepSize	Float	0..1	attr	This attribute can be used to define a value which is added to or subtracted from the value of a DataPrototype when using up/down keys while calibrating.
swAddrMethod	SwAddrMethod	0..1	ref	Addressing method related to this data object. Via an association to the same SwAddrMethod it can be specified that several DataPrototypes shall be located in the same memory without already specifying the memory section itself. Tags: xml.sequenceOffset=30
swAlignment	AlignmentType	0..1	attr	The attribute describes the intended typical alignment of the DataPrototype. If the attribute is not defined the alignment is determined by the swBaseType size and the memoryAllocationKeywordPolicy of the referenced Sw AddrMethod. Tags: xml.sequenceOffset=33
swBitRepresentation	SwBitRepresentation	0..1	aggr	Description of the binary representation in case of a bit variable. Tags: xml.sequenceOffset=60
swCalibrationAccess	SwCalibrationAccessEnum	0..1	attr	Specifies the read or write access by MCD tools for this data object. Tags: xml.sequenceOffset=70
swCalprmAxisSet	SwCalprmAxisSet	0..1	aggr	This specifies the properties of the axes in case of a curve or map etc. This is mainly applicable to calibration parameters. Tags: xml.sequenceOffset=90
swComparisonVariable	SwVariableRefProxy	*	aggr	Variables used for comparison in an MCD process. Tags: xml.sequenceOffset=170 xml.typeElement=false





Class	<<atpVariation>> SwDataDefProps			
swData Dependency	SwDataDependency	0..1	aggr	Describes how the value of the data object has to be calculated from the value of another data object (by the MCD system). Tags: xml.sequenceOffset=200
swHostVariable	SwVariableRefProxy	0..1	aggr	Contains a reference to a variable which serves as a host-variable for a bit variable. Only applicable to bit objects. Tags: xml.sequenceOffset=220 xml.typeElement=false
swImplPolicy	SwImplPolicyEnum	0..1	attr	Implementation policy for this data object. Tags: xml.sequenceOffset=230
swIntended Resolution	Numerical	0..1	attr	The purpose of this element is to describe the requested quantization of data objects early on in the design process. The resolution ultimately occurs via the conversion formula present (compuMethod), which specifies the transition from the physical world to the standardized world (and vice-versa) (here, "the slope per bit" is present implicitly in the conversion formula). In the case of a development phase without a fixed conversion formula, a pre-specification can occur through swIntendedResolution. The resolution is specified in the physical domain according to the property "unit". Tags: xml.sequenceOffset=240
swInterpolation Method	Identifier	0..1	attr	This is a keyword identifying the mathematical method to be applied for interpolation. The keyword needs to be related to the interpolation routine which needs to be invoked. Tags: xml.sequenceOffset=250
swIsVirtual	Boolean	0..1	attr	This element distinguishes virtual objects. Virtual objects do not appear in the memory, their derivation is much more dependent on other objects and hence they shall have a swDataDependency . Tags: xml.sequenceOffset=260
swPointerTarget Props	SwPointerTargetProps	0..1	aggr	Specifies that the containing data object is a pointer to another data object. Tags: xml.sequenceOffset=280
swRecord Layout	SwRecordLayout	0..1	ref	Record layout for this data object. Tags: xml.sequenceOffset=290
swRefresh Timing	MultidimensionalTime	0..1	aggr	This element specifies the frequency in which the object involved shall be or is called or calculated. This timing can be collected from the task in which write access processes to the variable run. But this cannot be done by the MCD system. So this attribute can be used in an early phase to express the desired refresh timing and later on to specify the real refresh timing. Tags: xml.sequenceOffset=300
swTextProps	SwTextProps	0..1	aggr	the specific properties if the data object is a text object. Tags: xml.sequenceOffset=120





Class	<<atpVariation>> SwDataDefProps			
swValueBlock Size	Numerical	0..1	attr	This represents the size of a Value Block Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime xml.sequenceOffset=80
swValueBlock SizeMult (ordered)	Numerical	*	attr	This attribute is used to specify the dimensions of a value block (VAL_BLK) for the case that that value block has more than one dimension. The dimensions given in this attribute are ordered such that the first entry represents the first dimension, the second entry represents the second dimension, and so on. For one-dimensional value blocks the attribute swValueBlockSize shall be used and this attribute shall not exist. Stereotypes: atpVariation Tags: vh.latestBindingTime=preCompileTime
unit	Unit	0..1	ref	Physical unit associated with the semantics of this data object. This attribute applies if no compuMethod is specified. If both units (this as well as via compuMethod) are specified the units shall be compatible. Tags: xml.sequenceOffset=350
valueAxisDataType	ApplicationPrimitive DataType	0..1	ref	The referenced ApplicationPrimitiveDataType represents the primitive data type of the value axis within a compound primitive (e.g. curve, map). It supersedes CompuMethod, Unit, and BaseType. Tags: xml.sequenceOffset=355

Table D.117: SwDataDefProps

Class	SwPointerTargetProps			
Package	M2::MSR::DataDictionary::DataDefProperties			
Note	This element defines, that the data object (which is specified by the aggregating element) contains a reference to another data object or to a function in the CPU code. This corresponds to a pointer in the C-language. The attributes of this element describe the category and the detailed properties of the target which is either a data description or a function signature.			
Base	ARObject			
Aggregated by	SwDataDefProps.swPointerTargetProps			
Attribute	Type	Mult.	Kind	Note
swDataDef Props	SwDataDefProps	0..1	aggr	The properties of the target data type. Stereotypes: atpSplitable Tags: atp.Splitkey=swDataDefProps xml.sequenceOffset=30
targetCategory	Identifier	0..1	attr	This specifies the category of the target: <ul style="list-style-type: none"> In case of a data pointer, it shall specify the category of the referenced data. In case of a function pointer, it could be used to denote the category of the referenced Bsw ModuleEntry. Tags: xml.sequenceOffset=5

Table D.118: SwPointerTargetProps

Class	SwRecordLayout			
Package	M2::MSR::DataDictionary::RecordLayout			
Note	Defines how the data objects (variables, calibration parameters etc.) are to be stored in the ECU memory. As an example, this definition specifies the sequence of axis points in the ECU memory. Iterations through axis values are stored within the sub-elements swRecordLayoutGroup. Tags: atp.recommendedPackage=SwRecordLayouts			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
swRecordLayoutGroup	SwRecordLayoutGroup	0..1	aggr	This is the top level record layout group. Tags: xml.roleElement=true xml.roleWrapperElement=false xml.sequenceOffset=20 xml.typeElement=false xml.typeWrapperElement=false

Table D.119: SwRecordLayout

Class	SwcServiceDependency			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::ServiceMapping			
Note	Specialization of ServiceDependency in the context of an SwcInternalBehavior. It allows to associate ports, port groups and (in special cases) data defined for an atomic software component to a given ServiceNeeds element.			
Base	ARObject , AtpClassifier , AtpFeature , AtpStructureElement , Identifiable , MultilanguageReferrable , Referrable , ServiceDependency			
Aggregated by	AdaptiveSwcInternalBehavior.serviceDependency , AtpClassifier.atpFeature , SwcInternalBehavior.serviceDependency			
Attribute	Type	Mult.	Kind	Note
assignedData	RoleBasedDataAssignment	*	aggr	Defines the role of an associated data object of the same component. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=assignedData, assignedData.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
assignedPort	RoleBasedPortAssignment	*	aggr	Defines the role of an associated port of the same component. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=assignedPort, assignedPort.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
representedPortGroup	PortGroup	0..1	ref	This reference specifies an association between the ServiceNeeds and a PortGroup, for example to request a communication mode which applies for communication via these ports. The referred PortGroup shall be local to this atomic SWC, but via the links between the Port Groups, a tool can evaluate this information such that all the ports linked via this port group on the same ECU can be found.
serviceNeeds	ServiceNeeds	0..1	aggr	The associated ServiceNeeds.

Table D.120: SwcServiceDependency

Class	SystemSignal			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::FibexCore::CoreCommunication			
Note	The system signal represents the communication system's view of data exchanged between SW components which reside on different ECUs. The system signals allow to represent this communication in a flattened structure, with exactly one system signal defined for each data element prototype sent and received by connected SW component instances. Tags: atp.recommendedPackage=SystemSignals			
Base	ARElement , ARObject , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
dynamicLength	Boolean	1	attr	The length of dynamic length signals is variable in run-time. Only a maximum length of such a signal is specified in the configuration (attribute length in ISignal element).
physicalProps	SwDataDefProps	0..1	aggr	Specification of the physical representation. Stereotypes: atpSplitable Tags: atp.Splitkey=physicalProps

Table D.121: SystemSignal

Class	TlsCryptoServiceMapping			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This meta-class has the ability to represent a crypto service mapping for the socket-based configuration of Transport Layer Security (TLS).			
Base	ARObject , CryptoServiceMapping , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	SystemMapping.cryptoServiceMapping			
Attribute	Type	Mult.	Kind	Note
keyExchange	CryptoServicePrimitive	*	ref	This reference identifies the shared (i.e. applicable for each of the aggregated cipher suites) crypto service primitive for the execution of key exchange during the handshake phase.
tlsCipherSuite	TlsCryptoCipherSuite	*	aggr	This aggregation represents the collection of supported cipher suites.
useClientAuthenticationRequest	Boolean	0..1	attr	Defines if client authentication shall be applied for this TLS connection.
useSecurityExtensionRecordSizeLimit	Boolean	0..1	attr	Defines if the security extension for max_fragment_length shall be supported as defined in IETF RFC 8449, chapter 4.1.

Table D.122: TlsCryptoServiceMapping

Class	TlsPskIdentity			
Package	M2::AUTOSARTemplates::SystemTemplate::SecureCommunication			
Note	This element is used to describe the pre-shared key shared during the handshake among the communication parties, to establish a TLS connection if the handshake is based on the existence of a pre-shared key.			
Base	ARObject			
Aggregated by	TlsCryptoCipherSuite.pskIdentity			
Attribute	Type	Mult.	Kind	Note





Class	TlsPskIdentity			
preSharedKey	CryptoServiceKey	1	ref	This reference identifies the applicable cryptographic key.
pskIdentity	String	1	attr	This attribute provides the key identification.
pskIdentityHint	String	0..1	attr	This attribute provides the identity hint for a pre-shared key.

Table D.123: TlsPskIdentity

Class	TransformationProps (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::Transformer			
Note	This meta-class represents a abstract base class for transformation settings.			
Base	ARObject , Identifiable , MultilanguageReferrable , Referrable			
Subclasses	ApSomeipTransformationProps , SOMEIPTransformationProps , UserDefinedTransformationProps			
Aggregated by	TransformationPropsSet.transformationProps			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table D.124: TransformationProps

Enumeration	TransportLayerProtocolEnum			
Package	M2::AUTOSARTemplates::AdaptivePlatform::ServiceInstanceManifest::ServiceInstanceDeployment			
Note	This enumeration allows to choose a TCP/IP transport layer protocol.			
Aggregated by	SomeipEventDeployment.transportProtocol , SomeipMethodDeployment.transportProtocol			
Literal	Description			
tcp	Transmission control protocol Tags: atp.EnumerationLiteralIndex=1			
udp	User datagram protocol Tags: atp.EnumerationLiteralIndex=0			

Table D.125: TransportLayerProtocolEnum

Class	TriggerInterface			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	A trigger interface declares a number of triggers that can be sent by an trigger source. Tags: atp.recommendedPackage=PortInterfaces			
Base	ARElement , ARObject , AtpBlueprint , AtpBlueprintable , AtpClassifier , AtpType , CollectableElement , Identifiable , MultilanguageReferrable , PackageableElement , PortInterface , Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
trigger	Trigger	*	aggr	The Trigger of this trigger interface.

Table D.126: TriggerInterface

Class	ValueSpecification (abstract)			
Package	M2::AUTOSARTemplates::CommonStructure::Constants			
Note	Base class for expressions leading to a value which can be used to initialize a data object.			
Base	<i>ARObject</i>			
Subclasses	AbstractRuleBasedValueSpecification , ApplicationValueSpecification , CompositeValueSpecification , ConstantReference , NotAvailableValueSpecification , NumericalValueSpecification , ReferenceValueSpecification , TextValueSpecification			
Aggregated by	ApplicationAssocMapElementValueSpecification.key , ApplicationAssocMapElementValueSpecification.value , ArrayValueSpecification.element , CalibrationParameterValue.applInitValue , CalibrationParameterValue.implInitValue , ConstantSpecification.valueSpec , CryptoServiceKey.developmentValue , DiagnosticEnvDataCondition.compareValue , DiagnosticEnvDataElementCondition.compareValue , FieldSenderComSpec.initValue , ISignal.initValue , ISignal.timeoutSubstitutionValue , NonqueuedReceiverComSpec.initValue , NonqueuedReceiverComSpec.timeoutSubstitutionValue , NonqueuedSenderComSpec.initValue , NvProvideComSpec.ramBlockInitValue , NvProvideComSpec.romBlockInitValue , NvRequireComSpec.initValue , ParameterDataPrototype.initValue , ParameterProvideComSpec.initValue , ParameterRequireComSpec.initValue , PersistenceDataRequiredComSpec.initValue , PersistenceKeyValuePair.initValue , PortDefinedArgumentValue.value , PortPrototypeBlueprintInitValue.value , RecordValueSpecification.field , StateManagementCompareCondition.compareValue , SwDataDefProps.invalidValue , VariableDataPrototype.initValue			
Attribute	Type	Mult.	Kind	Note
shortLabel	Identifier	0..1	attr	This can be used to identify particular value specifications for human readers, for example elements of a record type.

Table D.127: ValueSpecification

Class	VlanConfig			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	VLAN Configuration attributes			
Base	<i>ARObject</i> , Identifiable , MultilanguageReferrable , Referrable			
Aggregated by	EthernetPhysicalChannel.vlan			
Attribute	Type	Mult.	Kind	Note
vlanIdentifier	PositiveInteger	1	attr	A VLAN is identified by this attribute according to IEEE 802.1Q. The allowed values range is from 0..4095.

Table D.128: VlanConfig

Class	VlanMembership			
Package	M2::AUTOSARTemplates::SystemTemplate::Fibex::Fibex4Ethernet::EthernetTopology			
Note	Static logical channel or VLAN binding to a switch-port. The reference to an EthernetPhysicalChannel without a VLAN defined represents the handling of untagged frames.			
Base	<i>ARObject</i>			
Aggregated by	CouplingPort.vlanMembership			
Attribute	Type	Mult.	Kind	Note
defaultPriority	PositiveInteger	1	attr	Standard output-priority outgoing Frames will be tagged with. Defines the priority that received frames are assigned together with the VLAN Id (defaultVlan). The values from 0 (best effort) to 7 (highest) are allowed. In case modifyVlan and an already tagged received frame, the actual priority of the received frame is not modified.





Class	VlanMembership			
dhcpAddress Assignment	DhcpServer Configuration	0..1	aggr	Specifies the IP Address which will be assigned to a DHCP Client at this SwitchPort. If no dhcpAddress Assignment is provided all DHCP-Discover messages received at this Port will be discarded by the DHCP Server.
sendActivity	EthernetSwitchVlan EgressTaggingEnum	0..1	attr	Attribute denotes whether a VLAN tagged ethernet frame will be <ol style="list-style-type: none"> 1. sent with its VLAN tag (sentTagged) 2. sent without a VLAN tag (sentUntagged) 3. will be dropped at this port (notSent or VLAN not member of this list)
vlan	EthernetPhysical Channel	1	ref	References a channel that represents a VLAN or an untagged channel.

Table D.129: VlanMembership

E History of Constraints and Specification Items

Please note that the lists in this chapter also include constraints and specification items that have been removed from the specification in a later version. These constraints and specification items do not appear as hyperlinks in the document.

E.1 Constraint and Specification Item History of this document according to AUTOSAR Release R17-03 (original version)

E.1.1 Created Constraints in R17-03

Number	Heading
[constr_1473]	No support for <code>PRPortPrototype</code>
[constr_1474]	<code>SwDataDefProps</code> applicable to <code>ImplementationDataTypes</code> exclusive to the <i>AUTOSAR adaptive platform</i>
[constr_1475]	<code>ImplementationDataType</code> of category <code>STRING</code> is limited
[constr_1476]	<code>ImplementationDataType</code> of category <code>VECTOR</code> is limited
[constr_1477]	<code>ImplementationDataType</code> of category <code>ASSOCIATIVE_MAP</code> is limited
[constr_1478]	<code>SwDataDefProps</code> applicable to <code>ApplicationDataTypes</code> exclusive to the <i>AUTOSAR adaptive platform</i>
[constr_1479]	No support for certain values of <code>ImplementationDataType.category</code>
[constr_1480]	Mutual existence of <code>CompositionDataPrototypeRef.elementInImplDatatype</code> vs. attributes of <code>CompositionDataPrototypeRef.dataPrototype</code>
[constr_1481]	Usage of <code>CompositionDataPrototypeRef</code> in the <i>AUTOSAR adaptive platform</i>
[constr_1482]	Mapping of service interfaces vs. mapping of service interface elements
[constr_1483]	Applicability of a <code>ServiceInterface</code>
[constr_1484]	Applicability of <code>ModeDependentStartupConfig.executionDependency</code>
[constr_1485]	No <code>subElement</code> for <code>ImplementationDataType</code> of category <code>STRING</code>
[constr_1486]	<code>ImplementationDataType</code> of category <code>STRING</code> and <code>SwBaseType</code>
[constr_1487]	Number of <code>subElements</code> of an <code>ImplementationDataType</code> of category <code>ASSOCIATIVE_MAP</code>
[constr_1488]	Initialization of a <code>DataPrototype</code> typed by an <code>ApplicationAssocMapDataType</code>
[constr_1489]	Uniqueness of <code>ApplicationAssocMapValueSpecification.mapElement-Tuple.key</code>
[constr_1490]	Allowed value of category for reference <code>AdaptiveModuleInstantiation.process.executable</code>
[constr_1491]	Reference to <code>ApplicationError</code>
[constr_1492]	<code>SwComponentType</code> referenced as <code>Executable.rootSwComponentPrototype.applicationType</code>
[constr_1493]	<code>ArgumentDataPrototype</code> referenced in the role <code>Application-Error.errorContext</code>





Number	Heading
[constr_1494]	Initial value for <code>event</code>
[constr_1495]	Initial value for <code>field</code>
[constr_1496]	<code>DiagnosticServiceDataMapping.mappedApDataElement</code> shall only refer to specific sub-classes of <code>DataPrototype</code>
[constr_1497]	Attribute <code>optionKind</code> set to <code>commandLineSimpleForm</code>
[constr_1498]	Attribute <code>optionKind</code> set to <code>commandLineShortForm</code> or <code>commandLineLongForm</code>
[constr_1499]	Target <code>SwcServiceDependency</code> of <code>DiagnosticServiceSwMapping.mappedSwcServiceDependencyInExecutable</code>
[constr_1500]	Target <code>SwcServiceDependency</code> of <code>DiagnosticEventPortMapping.swcServiceDependencyInExecutable</code>
[constr_1501]	Target <code>SwcServiceDependency</code> of <code>DiagnosticOperationCyclePortMapping.swcServiceDependencyInExecutable</code>
[constr_1502]	Target <code>SwcServiceDependency</code> of <code>DiagnosticEnableConditionPortMapping.swcServiceDependencyInExecutable</code>
[constr_1503]	Target <code>SwcServiceDependency</code> of <code>DiagnosticStorageConditionPortMapping.swcServiceDependencyInExecutable</code>
[constr_1504]	Number of <code>Process.modeDependentStartupConfig</code> that refer to the same <code>ModeDeclaration</code>
[constr_1505]	Number of <code>Process.modeDependentStartupConfig</code> that do not refer to a <code>ModeDeclaration</code>
[constr_1507]	<code>PortInterfaceToDataTypeMapping</code> is only applicable to <code>ServiceInterface</code>
[constr_1508]	<code>BaseTypeDirectDefinition.nativeDeclaration</code> shall not be set to the value <code>enum</code>
[constr_3320]	Aggregation of <code>CommunicationConnector</code> by <code>Machine</code>
[constr_3287]	Mandatory information of a <code>ProvidedSomeipServiceInstance</code>
[constr_3288]	IP configuration restriction for <code>unicastNetworkEndpoints</code>
[constr_3290]	Usage of <code>ServiceInstancePortConfig</code> defined for a <code>ProvidedSomeipServiceInstance</code>
[constr_3291]	<code>SomeipServiceInstanceToMachineMapping.portConfig</code> aggregation restriction
[constr_3293]	Mandatory information of a <code>RequiredSomeipServiceInstance</code>
[constr_3296]	Usage of <code>ServiceInstancePortConfig</code> defined for a <code>RequiredSomeipServiceInstance</code>
[constr_5155]	<code>SomeipServiceInstanceToMachineMapping</code> only supports a single <code>AddressFamily</code>
[constr_3300]	Allowed <code>ServiceMethodDeployment.method</code> references
[constr_3301]	Allowed <code>ServiceEventDeployment.event</code> references
[constr_3302]	Allowed <code>ServiceFieldDeployment.field</code> references
[constr_3303]	ANY not allowed for <code>SomeipServiceInterface.serviceInterfaceVersion</code>
[constr_3304]	Value of attribute <code>SomeipEventGroup.eventGroupId</code> shall be unique
[constr_3305]	Value of attribute <code>SomeipEvent.eventId</code> shall be unique
[constr_3306]	Value of attribute <code>SomeipMethod.methodId</code> shall be unique
[constr_5156]	<code>SomeipEvent.transportProtocol</code> setting to <code>udp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>





Number	Heading
[constr_3308]	SomeipEvent.transportProtocol setting to <code>tcp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_3309]	SomeipMethod.transportProtocol setting to <code>udp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_3310]	SomeipMethod.transportProtocol setting to <code>tcp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_3320]	Aggregation of <code>CommunicationConnector</code> by <code>Machine</code>
[constr_3349]	Usage of <code>ApplicationAssocMapDataType</code> is limited
[constr_3350]	Consistent value of <code>category</code> for <code>AdaptiveAutosarApplications</code> referencing an <code>Executable</code>
[constr_3351]	SOME/IP segmentation allowed for <code>udp</code> <code>SomeipEvents</code>
[constr_3352]	SOME/IP segmentation allowed for <code>udp</code> <code>SomeipMethods</code>
[constr_3353]	Restriction in usage of <code>ApSomeipTransformationProps.sizeOfArrayLengthField</code>
[constr_3354]	Restriction in usage of <code>ApSomeipTransformationProps.sizeOfStructLengthField</code>
[constr_3355]	Restriction in usage of <code>ApSomeipTransformationProps.sizeOfUnionLengthField</code>
[constr_3356]	Restriction in usage of <code>ApSomeipTransformationProps.alignment</code>
[constr_3357]	Restriction in usage of <code>ApSomeipTransformationProps.sizeOfUnionTypeSelectorField</code>
[constr_3358]	Usage of <code>PortPrototype</code> and <code>TransportLayerIndependentInstanceId</code> to define the same Service Instance is not allowed.
[constr_3359]	<code>RPortPrototypeProps</code> are related only to <code>RPortPrototypes</code> .
[constr_3360]	<code>RPortPrototypeProps</code> are related only to <code>TransportLayerIndependentInstanceIds</code> representing a consumer Service Instance.
[constr_3361]	Selective definition of serialization settings.
[constr_3362]	<code>SomeipEvents</code> aggregated by a <code>SomeipField</code>
[constr_3363]	<code>SomeipMethods</code> aggregated by a <code>SomeipField</code>

Table E.1: Added Constraints in original version

E.1.2 Created Specification Items in R17-03

Number	Heading
[TPS_MANI_01000]	Definition of the term <code>Manifest</code>
[TPS_MANI_01001]	Meaning of <code>ServiceInterface</code>
[TPS_MANI_01002]	Semantics of a <code>ServiceInterfaceMapping</code>
[TPS_MANI_01003]	Limitations of the applicability of <code>ServiceInterfaceMapping</code>
[TPS_MANI_01004]	Semantics of <code>ServiceInterface.namespace</code>





Number	Heading
[TPS_MANI_01005]	The definition of the namespace of a ServiceInterface may follow a hierarchical pattern
[TPS_MANI_01006]	Ordered definition of ServiceInterface.namespace
[TPS_MANI_01007]	Service-oriented communication and service discovery
[TPS_MANI_01008]	Semantics of AdaptiveAutosarApplication
[TPS_MANI_01009]	Standardized values of AdaptiveAutosarApplication.category
[TPS_MANI_01010]	Root element for a hierarchical software-component
[TPS_MANI_01011]	Connection between application design and application deployment
[TPS_MANI_01012]	Formal modeling of application startup behavior
[TPS_MANI_01013]	Semantics of meta-class ModeDependentStartupConfig
[TPS_MANI_01014]	Semantics of meta-class StartupConfigSet
[TPS_MANI_01015]	Semantics of meta-class StartupOption
[TPS_MANI_01016]	Category of ApplicationAssocMapDataType
[TPS_MANI_01017]	Relation of startup configuration to resource groups
[TPS_MANI_01018]	ImplementationDataType of category VECTOR
[TPS_MANI_01019]	Manifest content may apply to different aspects of the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01020]	Serialization format of the <i>Manifest</i> in AUTOSAR
[TPS_MANI_01021]	Serialization format of <i>Manifest</i> content on a machine
[TPS_MANI_01022]	Concept behind ServiceInterfaceMapping
[TPS_MANI_01024]	Semantics of ServiceInterfaceEventMapping
[TPS_MANI_01025]	Semantics of ServiceInterfaceFieldMapping
[TPS_MANI_01026]	Semantics of ServiceInterfaceMethodMapping
[TPS_MANI_01027]	Semantics of ApplicationAssocMapDataType
[TPS_MANI_01028]	ImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_01029]	Usage of ImplementationDataType
[TPS_MANI_01030]	ImplementationDataType of category STRING
[TPS_MANI_01031]	Semantics of CompositionDataPrototypeRef
[TPS_MANI_01032]	Usage of ServiceInterfaceMapping
[TPS_MANI_01033]	Semantics of ServiceInterface.event
[TPS_MANI_01034]	Semantics of ServiceInterface.field
[TPS_MANI_01035]	Semantics of ServiceInterface.method
[TPS_MANI_01037]	Diagnostic data mapping on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01038]	Diagnostic software mapping on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01039]	Representation of provided service
[TPS_MANI_01040]	Representation of required service
[TPS_MANI_01041]	Startup configuration supports the definition of a launch dependency
[TPS_MANI_01042]	Definition of a linear ImplementationDataType of category VECTOR
[TPS_MANI_01043]	Definition of a rectangular ImplementationDataType of category VECTOR





Number	Heading
[TPS_MANI_01044]	Structure of an ImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_01045]	Process.modeDependentStartupConfig that does not refer to a ModeDeclaration
[TPS_MANI_01046]	Semantics of ModeDependentStartupConfig.machineMode
[TPS_MANI_01047]	Existence of SwRecordLayout for an ApplicationPrimitiveDataType of category STRING
[TPS_MANI_01048]	Mapping of DiagnosticEvent to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01049]	Mapping of DiagnosticOperationCycle to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01050]	Mapping of DiagnosticEnableCondition to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01051]	Mapping of DiagnosticStorageCondition to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01052]	Semantics of RPortPrototypeProps.portInstantiationBehavior
[TPS_MANI_01053]	Usage of ComSpecs on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01054]	Definition of the queue length of an event
[TPS_MANI_01055]	Semantics of ServiceInterface.possibleError
[TPS_MANI_01056]	Semantics of ApplicationError.errorContext
[TPS_MANI_01057]	Semantics of RPortPrototypeProps.searchIntention
[TPS_MANI_01058]	Ability to create a mapping of ApplicationErrors aggregated in the role possibleError
[TPS_MANI_01059]	Different values of optionKind within a StartupConfig.startupOption
[TPS_MANI_01060]	Use cases for the application of DiagnosticServiceDataMapping
[TPS_MANI_01061]	Requirements on scheduling
[TPS_MANI_01062]	ImplementationDataType to generate a C++ enum
[TPS_MANI_01063]	Sharing of ImplementationDataType with enumeration semantics
[TPS_MANI_03000]	Mapping of AdaptivePlatformServiceInstance to PortPrototypes
[TPS_MANI_03001]	Mapping of AdaptivePlatformServiceInstance to a Machine
[TPS_MANI_03002]	IP configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03003]	ProvidedSomeipServiceInstance Fanout
[TPS_MANI_03004]	IPv4 Multicast event destination address
[TPS_MANI_03005]	IPv4 Multicast address range
[TPS_MANI_03006]	IPv6 Multicast address range
[TPS_MANI_03007]	Udp Transport Protocol Configuration for ProvidedSomeipServiceInstance
[TPS_MANI_03008]	Tcp Transport Protocol Configuration for ProvidedSomeipServiceInstance
[TPS_MANI_03009]	Tcp and Udp Transport Protocol Configuration for ProvidedSomeipServiceInstance
[TPS_MANI_03010]	Udp Transport Protocol Configuration in case of IP-Multicast





Number	Heading
[TPS_MANI_03011]	Server Timing configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03012]	Initial Wait Phase configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03013]	Repetition Wait Phase configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03014]	Main Phase configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03015]	TTL for Offer Service Entries
[TPS_MANI_03016]	Servers RequestResponseDelay for received <code>FindService</code> entries
[TPS_MANI_03017]	Server Capability Records
[TPS_MANI_03018]	Usage of SomeipProvidedEventGroup.multicastThreshold
[TPS_MANI_03019]	TTL for <code>SubscribeEventGroupAck</code> Entries
[TPS_MANI_03020]	Servers RequestResponseDelay for received <code>SubscribeEventGroup</code> entries
[TPS_MANI_03021]	Requirements on the service version from the client's point of view
[TPS_MANI_03022]	Context of RequiredSomeipServiceInstance
[TPS_MANI_03023]	Udp Transport Protocol Configuration for RequiredSomeipServiceInstance
[TPS_MANI_03024]	Tcp Transport Protocol Configuration for RequiredSomeipServiceInstance
[TPS_MANI_03025]	Client Timing configuration for a RequiredSomeipServiceInstance
[TPS_MANI_03026]	Initial Wait Phase configuration for a RequiredSomeipServiceInstance
[TPS_MANI_03027]	Repetition Wait Phase configuration for a RequiredSomeipServiceInstance
[TPS_MANI_03028]	TTL for Find Service Entries
[TPS_MANI_03029]	Client Capability Records
[TPS_MANI_03030]	SomeipSdClientEventGroupTimingConfig.timeToLive for <code>SubscribeEventGroup</code> Entries
[TPS_MANI_03031]	Clients RequestResponseDelay for received <code>ServiceOffer</code> entries
[TPS_MANI_03032]	Description of middleware technologies not standardized by AUTOSAR
[TPS_MANI_03035]	Content of the Machine configuration
[TPS_MANI_03036]	ServiceInterface deployment to a middleware transport layer
[TPS_MANI_03037]	Purpose of ServiceMethodDeployment
[TPS_MANI_03038]	Purpose of ServiceEventDeployment
[TPS_MANI_03039]	Purpose of ServiceFieldDeployment
[TPS_MANI_03040]	SOME/IP ServiceInterface binding
[TPS_MANI_03041]	Definition of SOME/IP EventGroups
[TPS_MANI_03042]	Definition of SOME/IP Service Version
[TPS_MANI_03043]	SOME/IP VariableDataPrototype binding
[TPS_MANI_03044]	SOME/IP ClientServerOperation binding
[TPS_MANI_03045]	UserDefined ServiceInterface binding
[TPS_MANI_03046]	User defined VariableDataPrototype binding





Number	Heading
[TPS_MANI_03047]	User defined <code>ClientServerOperation</code> binding
[TPS_MANI_03048]	User defined <code>Field</code> binding
[TPS_MANI_03049]	Tcp and Udp Transport Protocol Configuration for <code>RequiredSomeipServiceInstance</code>
[TPS_MANI_03050]	Tcp and Udp Transport Protocol Configuration for <code>RequiredSomeipServiceInstance</code>
[TPS_MANI_03051]	Usage of <code>SomeipMethod.transportProtocol</code>
[TPS_MANI_03052]	Static IPv4 configuration
[TPS_MANI_03053]	Static IPv6 configuration
[TPS_MANI_03056]	Usage of <code>SomeipEvent.transportProtocol</code>
[TPS_MANI_03057]	SOME/IP <code>Field</code> binding
[TPS_MANI_03059]	<code>RequiredSomeipServiceInstance.requiredServiceInstanceId</code>
[TPS_MANI_03061]	IPv6 Multicast event destination address
[TPS_MANI_03064]	SOME/IP Service Discovery message exchange configuration
[TPS_MANI_03065]	Hardware resources of the machine
[TPS_MANI_03066]	Description of machine states
[TPS_MANI_03067]	SOME/IP segmentation of udp <code>SomeipEvents</code>
[TPS_MANI_03068]	SOME/IP segmentation of <code>SomeipMethod</code> Calls
[TPS_MANI_03069]	SOME/IP segmentation of <code>SomeipMethod</code> Responses
[TPS_MANI_03070]	Size of a length field for a chosen array
[TPS_MANI_03071]	Size of a length field for a chosen structure
[TPS_MANI_03072]	Size of a length field for a chosen union
[TPS_MANI_03073]	Alignment of a dynamic <code>DataPrototype</code>
[TPS_MANI_03074]	Size of a type selector field for a chosen union
[TPS_MANI_03075]	Byte Order of chosen <code>DataPrototype</code> in the serialized data stream
[TPS_MANI_03094]	<code>Machine</code> -specific platform configuration settings
[TPS_MANI_03095]	Implementation-specific platform configuration settings
[TPS_MANI_03096]	<code>Machine</code> -specific configuration settings for a generic module
[TPS_MANI_03097]	Implementation-specific configuration settings for a generic module
[TPS_MANI_03098]	<code>Machine</code> -specific configuration settings for the OS module
[TPS_MANI_03099]	Implementation-specific configuration settings for the OS module
[TPS_MANI_03100]	Transport layer independent <code>TransportLayerIndependentInstanceIds</code>
[TPS_MANI_03101]	SOME/IP serialization
[TPS_MANI_03102]	UserDefined serialization
[TPS_MANI_03103]	Default size for all array length fields
[TPS_MANI_03104]	Default size for all structure length fields
[TPS_MANI_03105]	Default size for all union length fields
[TPS_MANI_03106]	Default size for all union type selector fields
[TPS_MANI_03107]	Default alignment for all dynamic <code>DataPrototypes</code>





Number	Heading
[TPS_MANI_03108]	Default Byte Order for all DataPrototypes
[TPS_MANI_03109]	TransformationProps on the level of DataPrototypes overwrites TransformationProps settings on the level of a ServiceInterface

Table E.2: Added Specification Items in original Version

E.2 Constraint and Specification Item History of this document according to AUTOSAR Release R17-10

E.2.1 Added Traceables in R17-10

Number	Heading
[TPS_MANI_01064]	Semantics of attribute method.fireAndForget
[TPS_MANI_01065]	Purpose of PersistencyKeyValueDatabaseInterface
[TPS_MANI_01067]	Purpose of PersistencyFileProxyInterface
[TPS_MANI_01068]	Semantics of PersistencyFileProxyInterface.maxNumberOfFiles
[TPS_MANI_01069]	Further qualification of properties of PortPrototypes typed by PersistencyKeyValueDatabaseInterfaces
[TPS_MANI_01073]	Semantics of PortPrototype typed by PersistencyKeyValueDatabaseInterface
[TPS_MANI_01074]	Specification of encryption of persistent data
[TPS_MANI_01075]	Specification of redundancy of persistent data
[TPS_MANI_01077]	Specification of file encryption
[TPS_MANI_01078]	Semantics of PersistencyPortPrototypeToKeyValueDatabaseMapping
[TPS_MANI_01079]	Semantics of PersistencyKeyValueDatabase
[TPS_MANI_01080]	Semantics of PersistencyFileProxyToFileMapping
[TPS_MANI_01081]	Semantics of PortPrototype typed by PersistencyFileProxyInterface
[TPS_MANI_01082]	Eligibility of DataPrototypes for the definition of optionality
[TPS_MANI_01083]	Optionality is supported for ApplicationDataType as well as ImplementationDataType
[TPS_MANI_01084]	Optionality for a DataPrototype typed by an ApplicationDataType
[TPS_MANI_01085]	Definition of optionality for a DataPrototype typed by an ImplementationDataType
[TPS_MANI_01087]	Interaction with crypto software
[TPS_MANI_01088]	Semantics of CryptoNeed
[TPS_MANI_01089]	Relation between CryptoNeed and PortPrototype
[TPS_MANI_01090]	Modeling of crypto software as a platform module





Number	Heading
[TPS_MANI_01091]	Semantics of <code>CryptoJob</code>
[TPS_MANI_01092]	Mapping between <code>CryptoNeed</code> and <code>CryptoJob</code>
[TPS_MANI_01093]	Semantics of <code>CryptoDriver</code>
[TPS_MANI_01094]	Scope of <code>CryptoDriver</code>
[TPS_MANI_01095]	Semantics of <code>CryptoKeySlot</code>
[TPS_MANI_01096]	Semantics of the <code>CryptoPrimitive</code>
[TPS_MANI_01097]	Assignment of TLV data ids for data structures with optional members
[TPS_MANI_01098]	Constraints on the definition of an <code>ImplementationDataType</code> of <code>category VECTOR</code>
[TPS_MANI_01099]	Semantics of <code>ImplementationDataTypeElementExtension</code>
[TPS_MANI_01100]	Semantics of <code>Allocator</code>
[TPS_MANI_01101]	Size-constrained allocation of memory
[TPS_MANI_01102]	Specification of a namespace for an <code>ImplementationDataType</code> of <code>category VECTOR</code>
[TPS_MANI_01103]	Three-level approach to REST modeling
[TPS_MANI_01105]	Semantics of <code>RestServiceInterface</code>
[TPS_MANI_01106]	Specification of capabilities for the receiver of <code>events</code> or <code>field</code> notifiers
[TPS_MANI_01107]	Specification of capabilities for the sender of <code>events</code> or <code>field</code> notifiers
[TPS_MANI_01108]	Specification of capabilities for the caller of a <code>methods</code> or <code>field</code> setter/getter
[TPS_MANI_01109]	Semantics of <code>UploadablePackageElement</code>
[TPS_MANI_01110]	Semantics of <code>SoftwareCluster</code>
[TPS_MANI_01111]	Diagnostic Address of a <code>SoftwareCluster</code>
[TPS_MANI_01112]	Semantics of <code>SoftwareClusterDesign</code>
[TPS_MANI_01113]	Semantics of <code>SoftwareClusterDesign.diagnosticAddress</code>
[TPS_MANI_01114]	Relation of <code>DiagnosticContributionSet</code> to <code>SoftwareCluster</code>
[TPS_MANI_01115]	Specification of executable software within <code>SoftwareCluster</code>
[TPS_MANI_01116]	Reference to model elements included in an uploadable software package
[TPS_MANI_01117]	Semantics of <code>SoftwareClusterDesign.intendedTargetMachine</code>
[TPS_MANI_01118]	Relation between <code>SoftwareClusterDesign</code> and <code>DiagnosticContributionSet</code>
[TPS_MANI_01119]	Reference to model elements from <code>SoftwareClusterDesign</code>
[TPS_MANI_01120]	Recursive definition of <code>RestResourceDef</code>
[TPS_MANI_01121]	Semantics of <code>RestResourceDef.endpoint</code>
[TPS_MANI_01122]	Arguments to endpoints
[TPS_MANI_01123]	System Triggered Event
[TPS_MANI_01124]	Semantics of <code>RestElementDef</code>
[TPS_MANI_01125]	Properties of REST elements can either be primitive or have array semantics
[TPS_MANI_01126]	Definition of string properties





Number	Heading
[TPS_MANI_01127]	Limited support for data semantics in <code>RestAbstractNumericalPropertyDef</code>
[TPS_MANI_01128]	Difference between <code>RestIntegerPropertyDef</code> and <code>RestNumberPropertyDef</code>
[TPS_MANI_01129]	<code>RestObjectRef</code> is only needed for specific implementations of REST-based communication
[TPS_MANI_01130]	Structure of a typical URI for a REST service
[TPS_MANI_01131]	Impact of nested REST resources on the structure of REST URI
[TPS_MANI_01132]	Semantics of <code>CompositionDataPrototypeRef</code>
[TPS_MANI_01133]	Optional element of an event
[TPS_MANI_01134]	Optional element in the context of a method
[TPS_MANI_03110]	Allowed components in system description with category <code>category SOFTWARE_COMPONENT_SYSTEM_DESIGN_DESCRIPTION</code> .
[TPS_MANI_03111]	Mapping between method and <code>operation</code>
[TPS_MANI_03112]	Mapping between an event and a <code>dataElement</code>
[TPS_MANI_03113]	Mapping between a field and elements of Classic Platform <code>PortInterfaces</code>
[TPS_MANI_03114]	Usage of <code>AssemblySwConnectors</code> in the System Design model
[TPS_MANI_03115]	Mapping between a fire and forget method and elements of Classic Platform <code>PortInterfaces</code>
[TPS_MANI_03116]	Size of a length field for a chosen string
[TPS_MANI_03117]	Default size for all string length fields
[TPS_MANI_03118]	Semantics of <code>ServiceInterface.method</code> with <code>fireAndForget</code> set to true
[TPS_MANI_03119]	Default value for the attribute <code>fireAndForget</code> of meta-class <code>ClientServerOperation</code>
[TPS_MANI_03120]	Signal-based <code>ServiceInterface</code> binding
[TPS_MANI_03121]	Signal-based <code>VariableDataPrototype</code> binding
[TPS_MANI_03122]	Signal-based <code>Field</code> binding
[TPS_MANI_03123]	Signal-based <code>ClientServerOperation</code> binding
[TPS_MANI_03124]	<code>SignalBasedEventDeployment</code> to <code>ISignalTriggering</code> mapping
[TPS_MANI_03125]	<code>SignalBasedMethodDeployment</code> to <code>ISignalTriggerings</code> mapping
[TPS_MANI_03126]	<code>SignalBasedFieldDeployment</code> to <code>ISignalTriggerings</code> mapping
[TPS_MANI_03127]	Usage of <code>End2EndEventProtectionProps</code>
[TPS_MANI_03128]	Usage of same <code>dataId</code> in case of Multi-Binding
[TPS_MANI_03129]	E2E profile
[TPS_MANI_03130]	Standardized <code>E2EProfileConfiguration.profileName</code> values
[TPS_MANI_03131]	Non-Standardized <code>E2EProfileConfiguration.profileName</code> values
[TPS_MANI_03132]	Semantics of E2E attributes in <code>ReceiverComSpec</code>
[TPS_MANI_03133]	Usage of <code>ServiceInterfaceElementSecureComConfig</code>
[TPS_MANI_03134]	Configuration of supported TLS ciphersuites





Number	Heading
[TPS_MANI_03135]	Configuration of TLS PSK Identity
[TPS_MANI_03136]	Configuration of requirements for the TLS cryptographic job
[TPS_MANI_03137]	<code>ServiceInterfaceElementSecureComConfig.dataId</code> and <code>ServiceInterfaceElementSecureComConfig.freshnessValueId</code> are not relevant in case of TLS communication
[TPS_MANI_03138]	SecOC Security Profile
[TPS_MANI_03139]	Standardized SecOC Security Profiles
[TPS_MANI_03140]	Non-Standardized SecOC Security Profiles
[TPS_MANI_03141]	Mapping between <code>SecOcJobRequirement</code> and <code>CryptoJob</code>
[TPS_MANI_03142]	Mapping between <code>TlsJobRequirement</code> and <code>CryptoJob</code>
[TPS_MANI_03143]	Mapping between <code>PresharedKeyIdentity</code> and <code>CryptoKeySlot</code>
[TPS_MANI_03144]	C++ language binding of <code>ImplementationDataTypes</code> of category <code>STRING</code>
[TPS_MANI_03145]	Description of a function group
[TPS_MANI_03146]	Configuration of timeouts for a selected machine state or function group state
[TPS_MANI_03147]	Mapping of a <code>Process</code> to a <code>Machine</code>
[TPS_MANI_03148]	Description of Core affinity
[TPS_MANI_03149]	Definition of a start-up timeout for a <code>Process</code>
[TPS_MANI_03150]	Definition of a termination timeout for a <code>Process</code>
[TPS_MANI_03151]	Default value for termination timeout
[TPS_MANI_03152]	Assignment of a <code>StateDependentStartupConfig</code> to a function group state
[TPS_MANI_03153]	Semantics of <code>ModeDependentStartupConfig.functionGroupMode</code>
[TPS_MANI_03500]	Definition of platform health management checkpoints
[TPS_MANI_03501]	Definition of platform health management supervised entities
[TPS_MANI_03502]	Enabling of <code>PlatformHealthManagementContribution</code> on a <code>Machine</code>
[TPS_MANI_03503]	Applicability of supervision to a specific <code>Process</code>
[TPS_MANI_03504]	Existence of <code>SupervisionEntity</code>
[TPS_MANI_03505]	Existence of <code>PhmCheckpoint</code>
[TPS_MANI_03506]	Optionality of <code>SupervisionEntity</code> and <code>PhmCheckpoint</code>
[TPS_MANI_03508]	Definition of an <code>AliveSupervision</code> for a <code>PhmCheckpoint</code>
[TPS_MANI_03509]	Definition of a <code>CheckpointTransition</code>
[TPS_MANI_03510]	Definition of <code>LogicalSupervision</code>
[TPS_MANI_03511]	Definition of <code>DeadlineSupervision</code>
[TPS_MANI_03512]	Applicability of global supervision to a specific <code>Process</code>
[TPS_MANI_03513]	Collection of <code>SupervisionEntity</code> s into a global supervision
[TPS_MANI_03514]	Expiration tolerance for <code>GlobalSupervisionEntity</code>
[TPS_MANI_03515]	Expiration tolerance for <code>SupervisionEntity</code>
[TPS_MANI_03516]	Condition evaluation for <code>HealthChannelSupervision</code>
[TPS_MANI_03517]	Condition evaluation for <code>HealthChannelExternalMode</code>





Number	Heading
[TPS_MANI_03518]	LogicalExpression definition
[TPS_MANI_03519]	Rule definition
[TPS_MANI_03520]	Execution of PhmActionList with actionListExecution=triggeredOnEvaluation
[TPS_MANI_03521]	Execution of PhmActionList with actionListExecution=triggeredOnChange
[TPS_MANI_03522]	Definition of actions for application software
[TPS_MANI_03523]	Definition of actions for Platform Instance
[TPS_MANI_03524]	Definition of actions for Watchdog

Table E.3: Added Traceables in R17-10

E.2.2 Changed Traceables in R17-10

Number	Heading
[TPS_MANI_01004]	Semantics of ServiceInterface.namespace
[TPS_MANI_01006]	Ordered definition of ServiceInterface.namespace
[TPS_MANI_01017]	Relation of startup configuration to resource group
[TPS_MANI_01018]	ImplementationDataType of category VECTOR
[TPS_MANI_01030]	ImplementationDataType of category STRING
[TPS_MANI_03000]	Mapping of AdaptivePlatformServiceInstance to PortPrototypes
[TPS_MANI_03007]	Udp Transport Protocol Configuration for ProvidedSomeipServiceInstance
[TPS_MANI_03008]	Tcp Transport Protocol Configuration for ProvidedSomeipServiceInstance
[TPS_MANI_03009]	Tcp and Udp Transport Protocol Configuration for ProvidedSomeipServiceInstance
[TPS_MANI_03010]	Udp Transport Protocol Configuration in case of IP-Multicast
[TPS_MANI_03018]	Usage of SomeipProvidedEventGroup.multicastThreshold
[TPS_MANI_03023]	Udp Transport Protocol Configuration for RequiredSomeipServiceInstance
[TPS_MANI_03024]	Tcp Transport Protocol Configuration for RequiredSomeipServiceInstance
[TPS_MANI_03049]	Tcp and Udp Transport Protocol Configuration for RequiredSomeipServiceInstance
[TPS_MANI_03101]	SOME/IP serialization
[TPS_MANI_03102]	UserDefined serialization
[TPS_MANI_03103]	Default size for all array length fields
[TPS_MANI_03104]	Default size for all structure length fields
[TPS_MANI_03105]	Default size for all union length fields





Number	Heading
[TPS_MANI_03106]	Default size for all union type selector fields
[TPS_MANI_03107]	Default alignment for all dynamic DataPrototypes
[TPS_MANI_03108]	Default Byte Order for all DataPrototypes
[TPS_MANI_03109]	TransformationProps on the level of DataPrototypes overwrites TransformationProps settings on the level of a ServiceInterface

Table E.4: Changed Traceables in R17-10

E.2.3 Deleted Traceables in R17-10

Number	Heading
[TPS_MANI_03100]	Transport layer independent TransportLayerIndependentInstanceIds

Table E.5: Deleted Traceables in R17-10

E.2.4 Added Constraints in R17-10

Number	Heading
[constr_1522]	Semantics of ClientServerOperation.possibleError
[constr_1524]	Standardized values of PersistencyFileProxyInterface.category
[constr_1525]	Standardized values of PersistencyFile.category
[constr_1526]	Values of PersistencyFileArray.file.category
[constr_1527]	ImplementationDataTypeElement finally referenced as the target element in the context of an ImplementationDataTypeElementInAutosarDataPrototypeRef
[constr_1528]	Definition of optionality for multiple DataPrototypes typed by the same AutosarDataType
[constr_1529]	Standardized values of CryptoNeed.category
[constr_1530]	Standardized values of CryptoPrimitive.algorithmFamily and CryptoKeySlot.algorithmFamily
[constr_1531]	Standardized values of CryptoPrimitive.algorithmMode
[constr_1532]	Consistent assignment of TLV data ids to data structures with optional members
[constr_1533]	Applicability of ImplementationDataTypeElementExtension
[constr_1534]	Existence of DiagnosticSoftwareClusterProps
[constr_1535]	Existence of DiagnosticSoftwareClusterProps in the context of a DiagnosticContributionSet
[constr_1536]	Definition of SoftwareCluster applies for a single Machine



△

Number	Heading
[constr_1537]	Consistent assignment of TLV data ids to arguments of a given <code>ClientServerOperation</code>
[constr_1542]	No nested definition of <code>SoftwareCluster</code>
[constr_1543]	Only one physical address per <code>SoftwareCluster</code>
[constr_3366]	System <code>category</code> for a system description with Adaptive Platform components
[constr_3367]	<code>FieldMapping.notifierDataElement</code> reference
[constr_3368]	<code>FieldMapping.getterOperation</code> reference
[constr_3369]	<code>FieldMapping.setterOperation</code> reference
[constr_3370]	<code>InterfaceMapping</code> shall map all elements of a single <code>ServiceInterface</code>
[constr_3371]	Mutually exclusive existence of <code>FireAndForgetMapping.dataElement</code> reference and <code>FireAndForgetMapping.trigger</code> reference
[constr_3372]	Restriction in usage of <code>ApSomeipTransformationProps.sizeOfStringLengthField</code>
[constr_3374]	method with attribute <code>fireAndForget</code> set to true shall not have any inout or out arguments
[constr_3375]	method with attribute <code>fireAndForget</code> set to true shall not reference an <code>ApplicationError</code>
[constr_3376]	<code>FireAndForgetMapping</code> shall reference only fire and forget methods
[constr_3377]	Restriction of <code>ISignalTriggering</code> references in <code>SignalBasedFieldToISignalTriggeringMapping</code>
[constr_3380]	<code>End2EndEventProtectionProps</code> shall not reference an event and a notifier at the same time
[constr_3387]	Compatibility of <code>PortPrototypes</code> of different <code>ServiceInterfaces</code>
[constr_3388]	Compatibility of events
[constr_3389]	Compatibility of methods
[constr_3390]	Compatibility of fields
[constr_3391]	<code>ServiceInterfaceElementSecureComConfig</code> references to <code>ServiceInterfaceDeployment</code> elements
[constr_3392]	<code>ServiceInterfaceElementSecureComConfig.dataId</code> and <code>ServiceInterfaceElementSecureComConfig.freshnessValueId</code> are mandatory in case of SecOC communication
[constr_3393]	Usage of <code>shallRunOn</code> and <code>shallNotRunOn</code> references
[constr_3394]	Default value for start-up timeout on the <code>Machine</code> is not configurable
[constr_3395]	<code>TransformationPropsToServiceInterfaceElementMapping</code> is restricted to one single <code>ServiceInterface</code>
[constr_3396]	Number of <code>Process.modeDependentStartupConfig</code> that refer to the same <code>functionGroupMode</code>
[constr_3397]	<code>ModeDependentStartupConfig</code> that refers to a <code>functionGroupMode</code> and to a <code>machineMode</code>
[constr_3398]	<code>ModeDependentStartupConfig</code> that refers to function group modes of different function groups
[constr_3527]	<code>LogicalExpression</code> referenced by one <code>PhmRule</code>

Table E.6: Added Constraints in R17-10

E.2.5 Changed Constraints in R17-10

Number	Heading
[constr_1486]	<code>ImplementationDataType</code> of <code>category</code> <code>STRING</code> and <code>SwBaseType</code>
[constr_1490]	Allowed value of <code>category</code> for reference <code>ProcessToMachineMapping.process.executable</code>
[constr_3290]	Transport Protocol attributes defined for a <code>ProvidedSomeipServiceInstance</code>
[constr_3296]	Transport Protocol attributes defined for a <code>RequiredSomeipServiceInstance</code>
[constr_3307]	<code>SomeipEventDeployment.transportProtocol</code> setting to <code>udp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_3308]	<code>SomeipEventDeployment.transportProtocol</code> setting to <code>tcp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_3309]	<code>SomeipMethodDeployment.transportProtocol</code> setting to <code>udp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_3310]	<code>SomeipMethodDeployment.transportProtocol</code> setting to <code>tcp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_3361]	Selective definition of serialization settings

Table E.7: Changed Constraints in R17-10

E.2.6 Deleted Constraints in R17-10

Number	Heading
[constr_3291]	<code>SomeipServiceInstanceToMachineMapping.portConfig</code> aggregation restriction
[constr_3358]	Usage of <code>PortPrototype</code> and <code>TransportLayerIndependentInstanceId</code> to define the same Service Instance is not allowed
[constr_3360]	<code>RPortPrototypeProps</code> are related only to <code>TransportLayerIndependentInstanceIds</code> representing a consumer Service Instance

Table E.8: Deleted Constraints in R17-10

E.3 Constraint and Specification Item History of this document according to AUTOSAR Release R18-03

E.3.1 Added Traceables in R18-03

Number	Heading
[TPS_MANI_01135]	Semantics of <code>PersistencyKeyValueDatabaseInterface.dataTypeForSerialization</code>
[TPS_MANI_01136]	<code>AutosarDataPrototype</code> is the target of the <code>CompositionDataPrototypeRef</code>
[TPS_MANI_01137]	Applicable use cases for <code>CompositionDataPrototypeRef</code>
[TPS_MANI_01138]	Semantics of <code>PersistencyKeyValueDatabaseInterface.dataElement</code>
[TPS_MANI_01139]	Semantics of <code>PersistencyKeyValueDatabaseInterface.updateStrategy</code>
[TPS_MANI_01140]	Semantics of <code>PersistencyDataElement.updateStrategy</code>
[TPS_MANI_01141]	Semantics of <code>PersistencyFileProxyInterface.updateStrategy</code>
[TPS_MANI_01142]	Semantics of <code>PersistencyFileProxy</code>
[TPS_MANI_01143]	Semantics of <code>PersistencyFileProxy.updateStrategy</code>
[TPS_MANI_01144]	Semantics of <code>PersistencyKeyValuePair</code>
[TPS_MANI_01146]	Initial value for <code>PersistencyKeyValuePair</code>
[TPS_MANI_01147]	Semantics of <code>PersistencyKeyValueDatabase.updateStrategy</code>
[TPS_MANI_01148]	Semantics of <code>PersistencyKeyValuePair.updateStrategy</code>
[TPS_MANI_01149]	Semantics of <code>PersistencyFileArray.file</code>
[TPS_MANI_01150]	Semantics of <code>PersistencyFileArray</code>
[TPS_MANI_01151]	Semantics of <code>PersistencyFileArray.updateStrategy</code>
[TPS_MANI_01152]	Semantics of <code>PersistencyFile.updateStrategy</code>
[TPS_MANI_01154]	<code>PersistencyFileArray.updateStrategy</code> overrides <code>PersistencyFileProxyInterface.updateStrategy</code>
[TPS_MANI_01155]	<code>PersistencyKeyValueDatabase.updateStrategy</code> overrides <code>PersistencyKeyValueDatabaseInterface.updateStrategy</code>
[TPS_MANI_01156]	<code>PersistencyKeyValuePair.updateStrategy</code> overrides <code>PersistencyKeyValueDatabase.updateStrategy</code>
[TPS_MANI_01157]	Semantics of <code>updateStrategy</code> on collection level
[TPS_MANI_01158]	<code>PersistencyFile.updateStrategy</code> overrides <code>PersistencyFileArray.updateStrategy</code>
[TPS_MANI_01159]	Semantics of <code>updateStrategy</code> on element level
[TPS_MANI_01160]	Definition of initial value for <code>PersistencyDataElement</code>
[TPS_MANI_01161]	Impact of values of <code>category</code> on the semantics of <code>SoftwareClusterDesign</code>
[TPS_MANI_01162]	Semantics of <code>SoftwareClusterDesign.dependsOn</code>





Number	Heading
[TPS_MANI_01163]	Impact of values of <code>category</code> on the semantics of <code>SoftwareCluster</code>
[TPS_MANI_01164]	Semantics of <code>SoftwareCluster.dependsOn</code>
[TPS_MANI_01165]	Standardized value of <code>UserDefinedServiceInterfaceDeployment.category</code>
[TPS_MANI_01166]	Semantics of <code>CppImplementationDataType</code>
[TPS_MANI_01167]	<code>AbstractImplementationDataType</code>
[TPS_MANI_01168]	Specification of a namespace for a <code>CppImplementationDataType</code>
[TPS_MANI_01169]	Support for template data types
[TPS_MANI_01170]	Semantics of <code>CppTemplateArgument.isVariadicTemplate</code>
[TPS_MANI_01171]	Modeling of structured data types
[TPS_MANI_01172]	Description of type references in the scope of <code>CppImplementation-DataType</code>
[TPS_MANI_01173]	Description of type references in the scope of <code>CppImplementation-DataTypeElement</code>
[TPS_MANI_01174]	Semantics of reference in the role <code>CppTemplateArgument.templateType</code>
[TPS_MANI_01175]	Semantics of reference in the role <code>CppTemplateArgument allocator</code>
[TPS_MANI_01176]	Standardized value for attribute <code>CppImplementationDataType.typeEmitter</code>
[TPS_MANI_01177]	Semantics of <code>CppImplementationDataType.typeEmitter</code>
[TPS_MANI_01178]	Semantics of <code>RestHttpPortPrototypeMapping.acceptsEncoding</code>
[TPS_MANI_01179]	Semantics of <code>PersistencyFileProxy.contentUri/PersistencyFile.contentUri</code> vs. <code>PersistencyFileArray.uri</code> and <code>PersistencyFileProxy.fileName/PersistencyFile.fileName</code>
[TPS_MANI_01180]	Collection of data types that requires serialization support
[TPS_MANI_01181]	Use cases for the application of <code>DiagnosticServiceSwMapping</code>
[TPS_MANI_01182]	<code>PersistencyKeyValuePair.updateStrategy</code> overrides <code>PersistencyDataElement.updateStrategy</code>
[TPS_MANI_01183]	<code>PersistencyFile.updateStrategy</code> overrides <code>PersistencyFileProxy.updateStrategy</code>
[TPS_MANI_03154]	<code>ProvidedSomeipServiceInstance</code> related configuration settings for events
[TPS_MANI_03155]	<code>ProvidedSomeipServiceInstance</code> related configuration settings for methods
[TPS_MANI_03156]	<code>RequiredSomeipServiceInstance</code> related configuration settings for methods
[TPS_MANI_03157]	Enabling of data accumulation for upd data transmission
[TPS_MANI_03158]	Configuration of a data accumulation on a <code>ProvidedServiceInstance</code> for transmission over udp
[TPS_MANI_03159]	Configuration of a data accumulation on a <code>RequiredSomeipServiceInstance</code> for transmission over udp
[TPS_MANI_03160]	Log and Trace configuration options in the Application Manifest
[TPS_MANI_03161]	Log and Trace configuration options in the Service Instance Manifest





Number	Heading
[TPS_MANI_03162]	Machine-specific configuration settings for the Log and Trace functional cluster
[TPS_MANI_03163]	Network configuration for Log and Trace messages
[TPS_MANI_03164]	Machine-specific configuration settings for DoIP
[TPS_MANI_03165]	Network configuration for DoIP
[TPS_MANI_03166]	Machine-specific configuration settings for NM module
[TPS_MANI_03167]	Network configuration for Nm
[TPS_MANI_03168]	Configuration of the SOME/IP load balancing option
[TPS_MANI_03169]	CppImplementationDataType with fixed size array semantics
[TPS_MANI_03170]	CppImplementationDataType of category ARRAY
[TPS_MANI_03171]	Value type of a CppImplementationDataType of category ARRAY
[TPS_MANI_03172]	Size of a CppImplementationDataType of category ARRAY
[TPS_MANI_03173]	multidimensional Array
[TPS_MANI_03174]	CppImplementationDataType with variable size array semantics
[TPS_MANI_03175]	CppImplementationDataType of category VECTOR
[TPS_MANI_03176]	Value type of a CppImplementationDataType of category VECTOR
[TPS_MANI_03177]	multidimensional Vector
[TPS_MANI_03178]	CppImplementationDataType of category STRING
[TPS_MANI_03179]	C++ language binding of CppImplementationDataTypes of category STRING
[TPS_MANI_03180]	Definition of Structures
[TPS_MANI_03181]	Definition of members in CppImplementationDataType of category STRUCTURE
[TPS_MANI_03182]	Definition of members in CppImplementationDataTypeElement of category STRUCTURE
[TPS_MANI_03183]	CppImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_03184]	CppImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_03185]	Structure of an CppImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_03186]	Usage of arraySize in case of a Vector
[TPS_MANI_03187]	Definition of enumeration types
[TPS_MANI_03188]	Usage of an Allocator for a CppImplementationDataType of category STRING
[TPS_MANI_03189]	Definition of CppImplementationDataType of category VARIANT
[TPS_MANI_03190]	CppImplementationDataType of category VARIANT
[TPS_MANI_03191]	Definition of type alternatives stored in a VARIANT
[TPS_MANI_03192]	CppImplementationDataType of category VALUE
[TPS_MANI_03193]	CppImplementationDataType or CppImplementationDataTypeElement of category TYPE_REFERENCE
[TPS_MANI_03194]	Function Group State
[TPS_MANI_03195]	Off state in Function Group





Number	Heading
[TPS_MANI_03196]	Semantics of <code>CppImplementationDataTypeElementQualifier.anonymous</code> attribute
[TPS_MANI_03525]	DDS <code>ServiceInterface</code> binding
[TPS_MANI_03526]	DDS <code>VariableDataPrototype</code> binding
[TPS_MANI_03527]	Definition of <code>ProvidedDdsServiceInstance</code>
[TPS_MANI_03528]	Definition of <code>ProvidedDdsEventQosProps</code>
[TPS_MANI_03529]	Definition of <code>RequiredDdsServiceInstance</code>
[TPS_MANI_03530]	Definition of <code>RequiredDdsEventQosProps</code>
[TPS_MANI_03531]	<code>qosProfile</code> of <code>ProvidedDdsEventQosProps</code> is optional
[TPS_MANI_03532]	<code>qosProfile</code> of <code>RequiredDdsEventQosProps</code> is optional
[TPS_MANI_03533]	<code>DdsServiceInstanceToMachineMapping</code>
[TPS_MANI_03534]	Definition of Platform Health Management Health Channel
[TPS_MANI_03535]	Definition of Time Synchronization interaction
[TPS_MANI_03536]	Time Synchronization interaction in a master role
[TPS_MANI_03537]	Time Synchronization interaction in a slave role
[TPS_MANI_03538]	Time Synchronization interaction with a local Time Base
[TPS_MANI_03539]	Definition of Time Bases
[TPS_MANI_03540]	Definition of <code>PureLocalTimeBase</code>
[TPS_MANI_03541]	Definition of <code>SynchronizedSlaveTimeBase</code>
[TPS_MANI_03542]	Definition of <code>SynchronizedMasterTimeBase</code>
[TPS_MANI_03543]	Definition of time sync correction attributes
[TPS_MANI_03544]	Definition of <code>PlatformHealthManagementContribution</code>
[TPS_MANI_03545]	Existence of <code>HealthChannelExternalStatus</code>
[TPS_MANI_03546]	Definition of reported health status <code>RPortPrototype</code>
[TPS_MANI_03547]	Definition of <i>offset</i> time domains
[TPS_MANI_03548]	Definition of <code>TimeSyncPortPrototypeToTimeBaseMapping</code>
[TPS_MANI_03549]	Usage of <code>RPortPrototype</code> for the interaction with Time Synchronization
[TPS_MANI_03550]	Usage of <code>RPortPrototype</code> for the interaction with Platform Health Management
[TPS_MANI_03551]	Definition of Time Base kind
[TPS_MANI_03552]	Supervision cycle for <code>GlobalSupervision</code>

Table E.9: Added Traceables in R18-03

E.3.2 Changed Traceables in R18-03

Number	Heading
[TPS_MANI_01006]	Ordered definition of ServiceInterface.namespace
[TPS_MANI_01008]	Semantics of ExecutableGroup
[TPS_MANI_01009]	Standardized values of ExecutableGroup.category
[TPS_MANI_01013]	Semantics of meta-class ModeDependentStartupConfig
[TPS_MANI_01017]	Relation of startup configuration to resource group
[TPS_MANI_01041]	Startup configuration supports the definition of a launch sequence dependency
[TPS_MANI_01042]	Definition of a linear ImplementationDataType of category VECTOR
[TPS_MANI_01044]	Structure of an ImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_01060]	Use cases for the application of DiagnosticServiceDataMapping
[TPS_MANI_01068]	Semantics of PersistencyFileProxyInterface.maxNumberOfFiles
[TPS_MANI_01069]	Further qualification of properties of PortPrototypes typed by PersistencyKeyValueDatabaseInterfaces
[TPS_MANI_01075]	Specification of redundancy of persistent data
[TPS_MANI_01078]	Semantics of PersistencyPortPrototypeToKeyValueDatabaseMapping
[TPS_MANI_01080]	Semantics of PersistencyPortPrototypeToFileArrayMapping
[TPS_MANI_01097]	Assignment of TLV data ids for data structures with optional members
[TPS_MANI_01100]	Semantics of Allocator
[TPS_MANI_01109]	Semantics of UploadablePackageElement
[TPS_MANI_01112]	Semantics of SoftwareClusterDesign
[TPS_MANI_01113]	Semantics of SoftwareClusterDesign.diagnosticAddress
[TPS_MANI_01116]	Reference to model elements included in an uploadable software package
[TPS_MANI_01117]	Semantics of SoftwareClusterDesign.intendedTargetMachine
[TPS_MANI_01118]	Relation between SoftwareClusterDesign and DiagnosticContributionSet
[TPS_MANI_01119]	Reference to model elements from SoftwareClusterDesign
[TPS_MANI_01133]	Optional element of an event
[TPS_MANI_01134]	Optional element in the context of a method
[TPS_MANI_03001]	Mapping of AdaptivePlatformServiceInstance to a MachineDesign
[TPS_MANI_03002]	IP configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03003]	ProvidedSomeipServiceInstance Fanout
[TPS_MANI_03022]	Context of RequiredSomeipServiceInstance
[TPS_MANI_03110]	Allowed components in system description with category SYSTEM_DESIGN_DESCRIPTION .
[TPS_MANI_03114]	Usage of AssemblySwConnectors in the System Design model
[TPS_MANI_03145]	Description of a function group



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Number	Heading
[TPS_MANI_03152]	Assignment of a <code>ModeDependentStartupConfig</code> to a function group state
[TPS_MANI_03153]	Semantics of <code>ModeDependentStartupConfig.functionGroupMode</code>
[TPS_MANI_03500]	Definition of Platform Health Management Supervision and Checkpoints
[TPS_MANI_03503]	Applicability of supervision to a specific <code>Process</code>
[TPS_MANI_03505]	Existence of <code>SupervisionCheckpoint</code>
[TPS_MANI_03506]	Optionality of <code>SupervisionCheckpoint</code>
[TPS_MANI_03508]	Definition of an <code>AliveSupervision</code> for a <code>SupervisionCheckpoint</code>
[TPS_MANI_03509]	Definition of a <code>CheckpointTransition</code>
[TPS_MANI_03510]	Definition of <code>LogicalSupervision</code>
[TPS_MANI_03512]	Applicability of global supervision to a specific <code>Process</code>
[TPS_MANI_03513]	Collection of <code>LocalSupervisions</code> into a global supervision
[TPS_MANI_03514]	Expiration tolerance for <code>GlobalSupervision</code>
[TPS_MANI_03515]	Expiration tolerance for <code>LocalSupervision</code>
[TPS_MANI_03516]	Condition evaluation for <code>HealthChannelSupervision</code>
[TPS_MANI_03517]	Condition evaluation for <code>HealthChannelExternalStatus</code>

Table E.10: Changed Traceables in R18-03

E.3.3 Deleted Traceables in R18-03

Number	Heading
[TPS_MANI_01031]	Semantics of <code>CompositionDataPrototypeRef</code>
[TPS_MANI_01045]	<code>Process.modeDependentStartupConfig</code> that does not refer to a <code>ModeDeclaration</code>
[TPS_MANI_01132]	Semantics of <code>CompositionDataPrototypeRef</code>
[TPS_MANI_03019]	TTL for <code>SubscribeEventGroupAck</code> Entries
[TPS_MANI_03501]	Definition of platform health management supervised entities
[TPS_MANI_03504]	Existence of <code>SupervisionEntity</code>

Table E.11: Deleted Traceables in R18-03

E.3.4 Added Constraints in R18-03

Number	Heading
[constr_1546]	Existence of attributes of <code>ServiceInterfaceSubElement</code>
[constr_1547]	Reference from <code>ImplementationDataTypeExtension</code> to <code>ImplementationDataType</code>
[constr_1548]	Reference from <code>ImplementationDataTypeElementExtension</code> to <code>ImplementationDataTypeElement</code>
[constr_1549]	Value of <code>ProcessorCore.coreId</code>
[constr_1550]	Reference from <code>Process</code> to <code>ProcessDesign</code>
[constr_1551]	Existence of <code>CompositionDataPrototypeRef.dataPrototype</code> vs. <code>CompositionDataPrototypeRef.elementInImplDatatype</code>
[constr_1553]	Restriction for <code>ProcessToMachineMapping</code>
[constr_1554]	Restriction regarding <code>PersistencyKeyValuePair.initValue</code>
[constr_1555]	Restriction applicable for <code>PersistencyPortPrototypeToKeyValueDatabaseMapping.portPrototype</code>
[constr_1556]	Restriction applicable for <code>PersistencyPortPrototypeToFileArrayMapping.portPrototype</code>
[constr_1557]	Standardized values of <code>SoftwareClusterDesign.category</code> and <code>SoftwareCluster.category</code>
[constr_1558]	Existence of <code>SoftwareClusterDesign.diagnosticAddress</code>
[constr_1559]	Existence of <code>SoftwareClusterDesign.subSoftwareCluster</code>
[constr_1560]	Usage of <code>SoftwareClusterDesign.requiredARElement</code>
[constr_1561]	Existence of <code>SoftwareClusterDesign.subSoftwareCluster</code> and <code>SoftwareClusterDesign.dependsOn.dependentSoftwareClusterDesign</code>
[constr_1562]	Existence of <code>SoftwareClusterDesign.diagnosticContribution</code>
[constr_1563]	Standardized values of <code>SoftwareClusterDesign.category</code> and <code>SoftwareCluster.category</code>
[constr_1564]	Existence of <code>SoftwareCluster.diagnosticAddress</code>
[constr_1565]	Existence of <code>SoftwareCluster.subSoftwareCluster</code>
[constr_1566]	Usage of <code>SoftwareCluster.containedARElement</code>
[constr_1567]	Existence of <code>SoftwareCluster.subSoftwareCluster</code> and <code>SoftwareCluster.dependsOn.dependentSoftwareCluster</code>
[constr_1568]	Existence of <code>SoftwareCluster.diagnosticExtract</code>
[constr_1569]	Restriction for the scope of <code>RestHttpPortPrototypeMapping.acceptsEncoding</code>
[constr_1570]	Restriction for <code>UserDefinedServiceInterfaceDeployment</code> of category <code>SERVICE_INTERFACE_DEPLOYMENT_IPC</code>
[constr_1571]	<code>CppImplementationDataType</code> is limited
[constr_1572]	Usage of <code>SwDataDefProps.implementationDataType</code> within a <code>CppImplementationDataType</code>
[constr_1573]	<code>CppTemplateArgument.isVariadicTemplate</code> is set to True





Number	Heading
[constr_1574]	Number of <code>CppTemplateArguments</code> with <code>isVariadicTemplate</code> set to True
[constr_1575]	Position of <code>CppTemplateArgument</code> with <code>isVariadicTemplate</code> set to True
[constr_1576]	Existence of <code>CppTemplateArgument.templateType</code> vs. <code>CppTemplateArgument allocator</code>
[constr_1577]	Specification of a <code>nativeDeclaration</code> for a <code>CppImplementationDataType</code>
[constr_1578]	applicable data categories
[constr_1579]	<code>SwDataDefProps</code> applicable to <code>CppImplementationDataTypes</code> exclusive to the <i>AUTOSAR adaptive platform</i>
[constr_1580]	Restriction for the usage of <code>RestHttpPortPrototypeMapping.acceptsEncoding</code>
[constr_1581]	Value of <code>fileProxy.fileName</code>
[constr_1582]	<code>PersistencyKeyValuePair.valueDataType</code> shall match to <code>ImplementationDataType</code> for the corresponding <code>PersistencyDataElement</code>
[constr_1585]	Standardized values of attribute <code>DiagnosticServiceSwMapping.category</code>
[constr_1586]	<code>DiagnosticServiceSwMapping.category</code> set to <code>DATA_ELEMENT</code>
[constr_1587]	<code>DiagnosticServiceSwMapping.category</code> set to <code>DATA_IDENTIFIER</code>
[constr_1588]	<code>DiagnosticServiceSwMapping.category</code> set to <code>GENERIC_UDS_SERVICE</code>
[constr_1589]	Value of <code>file.fileName</code>
[constr_3408]	Value range of <code>SomeipEventDeployment.eventId</code>
[constr_3409]	Value range of <code>SomeipMethodDeployment.methodId</code>
[constr_3410]	Value range of <code>SomeipServiceInterfaceDeployment.serviceInterfaceId</code>
[constr_3411]	<code>eventMulticastUdpPort</code> , <code>ipv4MulticastIpAddress</code> and <code>ipv6MulticastIpAddress</code> not relevant for <code>RequiredSomeipServiceInstances</code>
[constr_3412]	<code>OsModuleInstantiation</code> shall have at least one <code>ResourceGroup</code>
[constr_3413]	<code>ModeDependentStartupConfig</code> of a <code>Process</code> is mapped to exactly one <code>ResourceGroup</code>
[constr_3414]	Allowed usage of <code>EthernetNetworkConfiguration</code> attributes
[constr_3415]	Value range of <code>loadBalancingPriority</code>
[constr_3416]	Value range of <code>loadBalancingWeight</code>
[constr_3417]	<code>UserDefinedEventDeployments</code> aggregated by a <code>UserDefinedFieldDeployment</code>
[constr_3418]	<code>UserDefinedMethodDeployments</code> aggregated by a <code>UserDefinedFieldDeployment</code>
[constr_3419]	Allowed usage of <code>EthernetNetworkConfiguration</code> attributes
[constr_3420]	System <code>category</code> for a design description that has one single Adaptive <code>Machine</code> in scope
[constr_3421]	Fibex elements applicable for a <code>MACHINE_DESIGN_EXTRACT</code>
[constr_3422]	<code>CppImplementationDataType</code> of <code>category STRING</code> and <code>SwBaseType</code>
[constr_3423]	<code>ModeDependentStartupConfig</code> of a <code>Process</code> shall reference a <code>functionGroupMode</code> or <code>machineMode</code>
[constr_3424]	<code>ModeDependentStartupConfig</code> shall never reference the <code>functionGroupMode Off</code>





Number	Heading
[constr_3425]	Restriction of DoIpInstantiations on a Machine
[constr_3426]	The logTraceFilePath is mandatory in case that logTraceLogMode is set to file
[constr_3427]	The logTraceFilePath is only relevant if logTraceLogMode is set to file
[constr_3428]	Structure shall own at least one element
[constr_3429]	No allocator usage for CppImplementationDataTypes of category VARIANT
[constr_3432]	Allowed subElements for Structures
[constr_3433]	Aggregation of templateArguments for a ARRAY
[constr_3434]	Aggregation of templateArguments for a VECTOR
[constr_3528]	Value range of domainId
[constr_3529]	Value range of serviceInstanceId
[constr_3530]	Mandatory definition of checkpointId
[constr_3531]	Mandatory definition of healthChannelId
[constr_3532]	Mandatory definition of statusId
[constr_3536]	Mandatory definition of supervisedEntityId

Table E.12: Added Constraints in R18-03

E.3.5 Changed Constraints in R18-03

Number	Heading
[constr_1484]	Applicability of ModeDependentStartupConfig.executionDependency
[constr_1507]	PortInterfaceToDataTypeMapping is only applicable to ServiceInterface
[constr_1532]	Consistent assignment of TLV data ids to data structures with optional members
[constr_1537]	Consistent assignment of TLV data ids to arguments of a given ClientServerOperation
[constr_3307]	SomeipEventDeployment.transportProtocol setting to udp and the impact on ProvidedSomeipServiceInstances
[constr_3308]	SomeipEventDeployment.transportProtocol setting to tcp and the impact on ProvidedSomeipServiceInstances
[constr_3309]	SomeipMethodDeployment.transportProtocol setting to udp and the impact on ProvidedSomeipServiceInstances
[constr_3310]	SomeipMethodDeployment.transportProtocol setting to tcp and the impact on ProvidedSomeipServiceInstances
[constr_3320]	Aggregation of CommunicationConnector by MachineDesign
[constr_3350]	Consistent value of category for ExecutableGroups referencing an Executable
[constr_3366]	System category for a system design description with Adaptive Platform and Classic Platform content

Table E.13: Changed Constraints in R18-03

E.3.6 Deleted Constraints in R18-03

Number	Heading
[constr_1480]	Mutual existence of <code>CompositionDataPrototypeRef.elementInImplDatatype</code> vs. attributes of <code>CompositionDataPrototypeRef.dataPrototype</code>
[constr_1505]	Number of <code>Process.modeDependentStartupConfig</code> that do not refer to a <code>ModeDeclaration</code>
[constr_1525]	Standardized values of <code>PersistencyFile.category</code>
[constr_1526]	Values of <code>PersistencyFileArray.file.category</code>
[constr_1533]	Applicability of <code>ImplementationDataTypeElementExtension</code>

Table E.14: Deleted Constraints in R18-03

E.4 Constraint and Specification Item History of this document according to AUTOSAR Release R18-10

E.4.1 Added Traceables in R18-10

Number	Heading
[TPS_MANI_01184]	Definition of optional elements on the level of <code>ApplicationDataType</code>
[TPS_MANI_01185]	Definition of optional elements on the level of <code>CppImplementationDataType</code>
[TPS_MANI_01186]	Definition of the applicable <code>wire type</code>
[TPS_MANI_01187]	Matching pairs of <code>PersistencyFileProxy</code> and <code>PersistencyFile</code>
[TPS_MANI_01188]	Semantics of attribute <code>schedulingPriority</code>
[TPS_MANI_01189]	Software Cluster and <code>DiagnosticContributionSet.category</code>
[TPS_MANI_01190]	Semantics of <code>ApApplicationError</code>
[TPS_MANI_01191]	Modeling of possible errors
[TPS_MANI_01192]	Semantics of <code>ApApplicationErrorDomain</code>
[TPS_MANI_01193]	Combination of <code>ModeDependentStartupConfig.machineMode</code> and <code>ModeDependentStartupConfig.functionGroupMode</code>
[TPS_MANI_01194]	Semantics of <code>PersistencyKeyValueDatabaseInterface.minimumSustainedSize</code>
[TPS_MANI_01195]	Semantics of <code>PersistencyFileProxyInterface.minimumSustainedSize</code>
[TPS_MANI_01196]	Semantics of <code>PersistencyKeyValueDatabase.minimumSustainedSize</code>
[TPS_MANI_01197]	Semantics of <code>PersistencyKeyValueDatabase.maximumAllowedSize</code>
[TPS_MANI_01198]	Semantics of <code>ApApplicationErrorSet</code>
[TPS_MANI_01199]	Semantics of <code>DeterministicClientResourceNeeds</code>
[TPS_MANI_01200]	Semantics of meta-class <code>DeterministicClientResource</code>
[TPS_MANI_01201]	Standardized values for attribute <code>CppTemplateArgument.category</code>





Number	Heading
[TPS_MANI_01202]	Semantics of reference <code>SoftwareCluster.moduleInstantiation</code>
[TPS_MANI_01203]	Semantics of <code>DeterministicClient</code>
[TPS_MANI_01204]	Specification of redundancy of persistent data
[TPS_MANI_01205]	Semantics of meta-class <code>PersistencyDeployment</code>
[TPS_MANI_01206]	Modeling of redundancy in the context of <code>PersistencyDeployment</code>
[TPS_MANI_01207]	Standardized values of attribute <code>PersistencyRedundancy-Crc.algorithmFamily</code>
[TPS_MANI_01208]	Definition of environment variables in the scope of a <code>Machine</code>
[TPS_MANI_01209]	Definition of environment variables in process scope
[TPS_MANI_01210]	Default encoding for all <code>DataPrototypes</code> typed by <code>CppImplementation-DataType</code> of category <code>STRING</code>
[TPS_MANI_03197]	Semantics of <code>StdCppImplementationDataType</code>
[TPS_MANI_03198]	Semantics of <code>CustomCppImplementationDataType</code>
[TPS_MANI_03199]	Endpoint protection by <code>SecureComProps</code>
[TPS_MANI_03200]	<code>SecureComProps</code> for udp, tcp and multicast communication
[TPS_MANI_03201]	Semantics of <code>CppTemplateArgument.inplace</code> attribute
[TPS_MANI_03202]	Definition of bitfield types
[TPS_MANI_03203]	Configuration of IPsec
[TPS_MANI_03204]	Definition of <code>IPSecRules</code>
[TPS_MANI_03205]	IPsec connection type
[TPS_MANI_03206]	IPsec AH and ESP protocol configuration
[TPS_MANI_03207]	IPsec Internet Key Exchange protocol configuration
[TPS_MANI_03208]	Protection of <code>AdaptivePlatformServiceInstance</code> by IPsec
[TPS_MANI_03209]	The meaning of <code>MachineDesign.accessControl</code>
[TPS_MANI_03210]	Specification of <code>event</code> specific communication attributes
[TPS_MANI_03211]	Specification of <code>field</code> specific communication attributes
[TPS_MANI_03212]	Specification of initial value for a <code>field</code>
[TPS_MANI_03213]	Semantics of meta-class <code>TlsSecureComProps</code>
[TPS_MANI_03214]	Existence of <code>TlsCryptoCipherSuite.keyExchange</code> vs. <code>TlsSecureComProps.keyExchange</code>
[TPS_MANI_03215]	Semantics of <code>CryptoServiceCertificate</code>
[TPS_MANI_03216]	Existence of <code>TlsCryptoCipherSuite.certificate</code> in the <code>client</code> role
[TPS_MANI_03217]	On-the-wire encoding for a chosen string
[TPS_MANI_03218]	Default value for the attribute <code>tcpInitialInactivityTime</code> of meta-class <code>DoIpNetworkConfiguration</code>
[TPS_MANI_03219]	Default value for the attribute <code>tcpGeneralInactivityTime</code> of meta-class <code>DoIpNetworkConfiguration</code>
[TPS_MANI_03220]	Default value for the attribute <code>vehicleAnnouncementCount</code> of meta-class <code>DoIpNetworkConfiguration</code>
[TPS_MANI_03221]	Default value for the attribute <code>vehicleAnnouncementInterval</code> of meta-class <code>DoIpNetworkConfiguration</code>





Number	Heading
[TPS_MANI_03222]	Default value for the attribute <code>tcpAliveCheckResponseTimeout</code> of meta-class <code>DoIpNetworkConfiguration</code>
[TPS_MANI_03553]	Applicability of health channel to a specific <code>Process</code>
[TPS_MANI_03554]	Several <code>SomeipServiceInstanceToMachineMappings</code> with equal settings
[TPS_MANI_03555]	Mix of <code>SomeipServiceInstanceToMachineMapping</code> and signal-based communication
[TPS_MANI_03556]	DDS-RPC Service Binding
[TPS_MANI_03557]	DDS <code>ClientServerOperation</code> Binding
[TPS_MANI_03558]	DDS <code>Field</code> Binding
[TPS_MANI_03559]	Definition of <code>DdsProvidedServiceInstance.methodQosProps</code>
[TPS_MANI_03560]	<code>qosProfile</code> of <code>DdsProvidedServiceInstance.methodQosProps</code> is optional
[TPS_MANI_03561]	Definition of <code>DdsProvidedServiceInstance.fieldNotifierQosProps</code>
[TPS_MANI_03562]	<code>qosProfile</code> of <code>DdsProvidedServiceInstance.fieldNotifierQosProps</code> is optional
[TPS_MANI_03563]	Definition of <code>DdsProvidedServiceInstance.fieldGetSetQosProps</code>
[TPS_MANI_03564]	<code>qosProfile</code> of <code>DdsProvidedServiceInstance.fieldGetSetQosProps</code> is optional
[TPS_MANI_03565]	Definition of <code>DdsRequiredServiceInstance.methodQosProps</code>
[TPS_MANI_03566]	<code>qosProfile</code> of <code>DdsRequiredServiceInstance.methodQosProps</code> is optional
[TPS_MANI_03567]	Definition of <code>DdsRequiredServiceInstance.fieldNotifierQosProps</code>
[TPS_MANI_03568]	<code>qosProfile</code> of <code>DdsRequiredServiceInstance.fieldNotifierQosProps</code> is optional
[TPS_MANI_03569]	Definition of <code>DdsRequiredServiceInstance.fieldGetSetQosProps</code>
[TPS_MANI_03570]	<code>qosProfile</code> of <code>DdsRequiredServiceInstance.fieldGetSetQosProps</code> is optional
[TPS_MANI_03571]	<code>transportPlugin</code> for <code>DdsProvidedServiceInstance</code>
[TPS_MANI_03572]	<code>transportPlugin</code> for <code>DdsRequiredServiceInstance</code>

Table E.15: Added Traceables in R18-10

E.4.2 Changed Traceables in R18-10

Number	Heading
[TPS_MANI_01001]	Meaning of ServiceInterface
[TPS_MANI_01041]	Startup configuration supports the definition of a launch sequence dependency
[TPS_MANI_01097]	Assignment of TLV data ids
[TPS_MANI_01100]	Semantics of Allocator
[TPS_MANI_01147]	Semantics of PersistencyKeyValueDatabase.updateStrategy
[TPS_MANI_01151]	Semantics of PersistencyFileArray.updateStrategy
[TPS_MANI_01166]	Semantics of CppImplementationDataType
[TPS_MANI_01176]	Standardized value for attribute CppImplementationDataType.typeEmitter
[TPS_MANI_01177]	Semantics of CppImplementationDataType.typeEmitter
[TPS_MANI_01180]	Collection of data types that requires serialization support
[TPS_MANI_03001]	Mapping of AdaptivePlatformServiceInstance to a MachineDesign
[TPS_MANI_03011]	Server Timing configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03021]	Requirements on the searched minor version from the client's point of view
[TPS_MANI_03025]	Client Timing configuration for a RequiredSomeipServiceInstance
[TPS_MANI_03070]	Size of a length field for a chosen array or map
[TPS_MANI_03103]	Default size for all array and map length fields
[TPS_MANI_03124]	ServiceInterface.event to ISignalTriggering mapping
[TPS_MANI_03125]	ServiceInterface.method to ISignalTriggerings mapping
[TPS_MANI_03126]	ServiceInterface.field mapping to ISignalTriggerings
[TPS_MANI_03134]	Configuration of supported TLS ciphersuites
[TPS_MANI_03137]	ServiceInterfaceElementSecureComConfig is not relevant in case of TLS communication
[TPS_MANI_03157]	Enabling of data collection for upd data transmission
[TPS_MANI_03158]	Configuration of a data collection on a ProvidedServiceInstance for transmission over udp
[TPS_MANI_03165]	Network Interface configuration for DoIP
[TPS_MANI_03170]	CppImplementationDataType of category ARRAY
[TPS_MANI_03173]	Definition of a multidimensional Array
[TPS_MANI_03175]	CppImplementationDataType of category VECTOR
[TPS_MANI_03177]	Definition of a multidimensional Vector
[TPS_MANI_03178]	StdCppImplementationDataType of category STRING
[TPS_MANI_03179]	C++ language binding of StdCppImplementationDataTypes of category STRING
[TPS_MANI_03180]	Definition of Structures
[TPS_MANI_03181]	Definition of members in StdCppImplementationDataType of category STRUCTURE





Number	Heading
[TPS_MANI_03184]	CppImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_03185]	Structure of an CppImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_03187]	Definition of enumeration types
[TPS_MANI_03193]	CppImplementationDataType of category TYPE_REFERENCE
[TPS_MANI_03196]	Semantics of CppImplementationDataTypeElementQualifier.in-place attribute
[TPS_MANI_03503]	Applicability of checkpoints to a specific Process
[TPS_MANI_03512]	Applicability of global supervision without Process context
[TPS_MANI_03516]	Condition evaluation for HealthChannelSupervision
[TPS_MANI_03518]	PhmLogicalExpression definition
[TPS_MANI_03519]	PhmRule definition
[TPS_MANI_03520]	Execution of PhmActionList with actionListExecution=triggeredOnEvaluation
[TPS_MANI_03521]	Execution of PhmActionList with actionListExecution=triggeredOnChange
[TPS_MANI_03522]	Definition of actions for application software
[TPS_MANI_03523]	Definition of actions for Platform Instance
[TPS_MANI_03524]	Definition of actions for Watchdog
[TPS_MANI_03526]	DDS VariableDataPrototype binding
[TPS_MANI_03527]	Definition of DdsProvidedServiceInstance
[TPS_MANI_03528]	Definition of DdsProvidedServiceInstance.eventQosProps
[TPS_MANI_03529]	Definition of DdsRequiredServiceInstance
[TPS_MANI_03530]	Definition of DdsRequiredServiceInstance.eventQosProps
[TPS_MANI_03531]	qosProfile of DdsProvidedServiceInstance.eventQosProps is optional
[TPS_MANI_03532]	qosProfile of DdsRequiredServiceInstance.eventQosProps is optional
[TPS_MANI_03533]	DdsServiceInstanceToMachineMapping
[TPS_MANI_03552]	Supervision cycle for GlobalSupervision

Table E.16: Changed Traceables in R18-10

E.4.3 Deleted Traceables in R18-10

Number	Heading
[TPS_MANI_01008]	Semantics of ExecutableGroup
[TPS_MANI_01009]	Standardized values of ExecutableGroup.category
[TPS_MANI_01018]	ImplementationDataType of category VECTOR





Number	Heading
[TPS_MANI_01028]	ImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_01029]	Usage of ImplementationDataType
[TPS_MANI_01030]	ImplementationDataType of category STRING
[TPS_MANI_01042]	Definition of a linear ImplementationDataType of category VECTOR
[TPS_MANI_01043]	Definition of a rectangular ImplementationDataType of category VECTOR
[TPS_MANI_01044]	Structure of an ImplementationDataType of category ASSOCIATIVE_MAP
[TPS_MANI_01055]	Definition of application-level errors
[TPS_MANI_01056]	Semantics of ApplicationError.errorContext
[TPS_MANI_01058]	Ability to create a mapping of ApplicationErrors aggregated in the role possibleError
[TPS_MANI_01062]	ImplementationDataType to generate a C++ enum
[TPS_MANI_01063]	Sharing of ImplementationDataType with enumeration semantics
[TPS_MANI_01074]	Specification of encryption of persistent data
[TPS_MANI_01075]	Specification of redundancy of persistent data
[TPS_MANI_01077]	Specification of file encryption
[TPS_MANI_01082]	Eligibility of DataPrototypes for the definition of optionality
[TPS_MANI_01083]	Optionality is supported for ApplicationDataType as well as ImplementationDataType
[TPS_MANI_01084]	Optionality for a DataPrototype typed by an ApplicationDataType
[TPS_MANI_01085]	Definition of optionality for a DataPrototype typed by an ImplementationDataType
[TPS_MANI_01087]	Interaction with crypto software
[TPS_MANI_01088]	Semantics of CryptoNeed
[TPS_MANI_01089]	Relation between CryptoNeed and PortPrototype
[TPS_MANI_01090]	Modeling of crypto software as a platform module
[TPS_MANI_01091]	Semantics of CryptoJob
[TPS_MANI_01092]	Mapping between CryptoNeed and CryptoJob
[TPS_MANI_01093]	Semantics of CryptoDriver
[TPS_MANI_01094]	Scope of CryptoDriver
[TPS_MANI_01095]	Semantics of CryptoKeySlot
[TPS_MANI_01096]	Semantics of the CryptoPrimitive
[TPS_MANI_01098]	Constraints on the definition of an ImplementationDataType of category VECTOR
[TPS_MANI_01099]	Semantics of ImplementationDataTypeElementExtension
[TPS_MANI_01101]	Size-constrained allocation of memory
[TPS_MANI_01102]	Specification of a namespace for an ImplementationDataType of category VECTOR
[TPS_MANI_01133]	Optional element of an event
[TPS_MANI_01134]	Optional element in the context of a method





Number	Heading
[TPS_MANI_03121]	Signal-based VariableDataPrototype binding
[TPS_MANI_03122]	Signal-based Field binding
[TPS_MANI_03123]	Signal-based ClientServerOperation binding
[TPS_MANI_03135]	Configuration of TLS PSK Identity
[TPS_MANI_03136]	Configuration of requirements for the TLS cryptographic job
[TPS_MANI_03141]	Mapping between SecOcJobRequirement and CryptoJob
[TPS_MANI_03142]	Mapping between TlsJobRequirement and CryptoJob
[TPS_MANI_03143]	Mapping between PresharedKeyIdentity and CryptoKeySlot
[TPS_MANI_03144]	C++ language binding of ImplementationDataTypes of category STRING
[TPS_MANI_03182]	Definition of members in CppImplementationDataTypeElement of category STRUCTURE

Table E.17: Deleted Traceables in R18-10

E.4.4 Added Constraints in R18-10

Number	Heading
[constr_1593]	Completeness of the existence of a set of TlvDataIdDefinition.tlvArguments
[constr_1594]	Consistent assignment of TLV data ids to ApplicationRecordDataType
[constr_1595]	Consistent assignment of TLV data ids to CppImplementationDataType or Cp- pImplementationDataTypeElement
[constr_1596]	Scope of the uniqueness of the value of TlvDataIdDefinition.id for references to ArgumentDataPrototype
[constr_1597]	Scope of the uniqueness of the value of TlvDataIdDefinition.id for references to ApplicationRecordElement
[constr_1598]	Scope of the uniqueness of the value of TlvDataIdDefinition.id for references to CppImplementationDataTypeElement
[constr_1599]	TlvDataIdDefinition referencing ArgumentDataPrototype
[constr_1600]	TlvDataIdDefinition referencing ApplicationRecordElement
[constr_1601]	TlvDataIdDefinition referencing CppImplementationDataTypeElement
[constr_1603]	Completeness of the existence of a set of TlvDataIdDefinition.tlvRecordElements
[constr_1604]	Completeness of the existence of a set of TlvDataIdDefini- tion.tlvSubElements
[constr_1605]	Standardized values of attribute Executable.category
[constr_1606]	Processes with mutual ExecutionDependency s
[constr_1613]	File name of matching pairs of PersistencyFileProxy and PersistencyFile
[constr_1614]	Existence of attribute TransformationPropsToServiceInterfaceEle- mentMapping.transformationProps.sessionHandling





Number	Heading
[constr_1615]	Existence of attribute <code>SomeipDataPrototypeTransformationProps.someipTransformationProps.sessionHandling</code>
[constr_1618]	Ability to shut down
[constr_1619]	Ability to restart
[constr_1620]	Value of <code>schedulingPriority</code> if <code>schedulingPolicy</code> is set to <code>schedulingPolicyFifo</code> or <code>schedulingPolicyRoundRobin</code>
[constr_1621]	Value of <code>schedulingPriority</code> if <code>StartupConfig.schedulingPolicy</code> is set to <code>schedulingPolicyOther</code>
[constr_1625]	Existence of reference <code>ApApplicationError.errorDomain</code>
[constr_1627]	Supported value range for attribute <code>ApApplicationErrorDomain.value</code>
[constr_1628]	Definition of static length field sizes in case of TLV usage
[constr_1629]	Identical sizes of length fields in case of TLV usage
[constr_1630]	No definition of length field sizes on <code>DataPrototype</code> level in case of TLV usage
[constr_1658]	Number of <code>DiagnosticTroubleCodeUdsToClearConditionGroupMapping</code> elements per <code>DiagnosticTroubleCodeUds</code>
[constr_1659]	Restriction for the usage of <code>CppImplementationDataTypeElementQualifier.inplace</code>
[constr_1660]	Restriction for the usage of <code>CppTemplateArgument.inplace</code>
[constr_1661]	Multiplicity of <code>OsModuleInstantiation.resourceGroup</code>
[constr_1663]	Standardized values of attribute <code>DiagnosticServiceDataIdentifierPortMapping.category</code>
[constr_1664]	Unique <code>ApApplicationError.shortName</code>
[constr_1665]	Unique <code>ApApplicationError.errorCode</code>
[constr_1666]	References from <code>PersistencyPortPrototypeToKeyValueDatabaseMapping</code> to <code>PersistencyKeyValueDatabase</code>
[constr_1667]	References from <code>PersistencyPortPrototypeToFileArrayMapping</code> to <code>PersistencyFileArray</code>
[constr_1668]	Allowed combinations of <code>PersistencyRedundancyCrc.length</code> and <code>algorithmFamily</code>
[constr_1673]	Existence of attributes <code>hasGetter</code> , <code>hasSetter</code> , and <code>hasNotifier</code>
[constr_1674]	Supported encoding of <code>StdCppImplementationDataType</code> of category <code>STRING</code>
[constr_1675]	Existence of attribute <code>ApSomeipTransformationProps.stringEncoding</code>
[constr_1676]	Consistency of references <code>shallRunOn</code> and <code>shallNotRunOn</code>
[constr_1677]	Mutual exclusive existence of references <code>shallRunOn</code> and <code>shallNotRunOn</code>
[constr_1678]	Allowed values for attribute <code>ApSomeipTransformationProps.stringEncoding</code>
[constr_3443]	Specification of a namespace for a <code>StdCppImplementationDataType</code>
[constr_3446]	<code>CppTemplateArgument</code> with <code>allocator</code> reference and the <code>inplace</code> flag
[constr_3447]	<code>ApSomeipTransformationProps.sizeOfArrayLengthField</code> that equals 0
[constr_3462]	<code>CppTemplateArgument.templateType</code> reference to <code>StdCppImplementationDataType</code> of category <code>STRUCTURE</code> and the <code>inplace</code> flag
[constr_3485]	UDP endpoint using DTLS can only serve provided or required service instances exclusively





Number	Heading
[constr_3486]	TCP endpoint using TLS can only serve provided or required service instances exclusively.
[constr_3487]	TCP endpoint can only serve provided or required service instances exclusively
[constr_3492]	<code>DoIpInstantiation.logicalAddress</code> shall be defined as member in the <code>DoIpRequestConfiguration</code>
[constr_3493]	Applicable attributes for standardized E2E Profiles
[constr_3494]	Mandatory Machine States
[constr_3495]	Supported value range for attribute <code>DoIpInstantiation.eid</code>
[constr_3496]	Supported value range for attribute <code>DoIpInstantiation.gid</code>
[constr_3497]	Supported value range for attribute <code>DoIpInstantiation.maxRequestBytes</code>
[constr_3498]	Supported value range for attribute <code>DoIpInstantiation.logicalAddress</code>
[constr_3499]	Supported value range for attribute <code>DoIpRequestConfiguration.startAddress</code>
[constr_3537]	<code>LocalSupervision</code> referenced once in the context of a <code>GlobalSupervision</code>
[constr_3538]	Only one <code>ServiceInstanceToMachineMapping</code> per technology and <code>CommunicationConnector</code>
[constr_3539]	Only one <code>AliveSupervision</code> per <code>SupervisionCheckpoint</code>
[constr_3540]	<code>SupervisionCheckpoint</code> in supervision graph
[constr_3541]	<code>qosProfile</code> mandatory for <code>DdsProvidedServiceInstance</code>
[constr_3542]	<code>qosProfile</code> mandatory for <code>DdsRequiredServiceInstance</code>
[constr_3543]	At least one <code>transportPlugin</code> definition required for each <code>DdsProvidedServiceInstance</code>
[constr_3544]	At least one <code>transportPlugin</code> definition required for each <code>DdsRequiredServiceInstance</code>
[constr_5000]	Supported value range for attribute <code>DoIpRequestConfiguration.endAddress</code>
[constr_5001]	Usage of <code>DoIpNetworkConfiguration.eidUseMac</code>
[constr_5002]	Supported values of <code>ServiceInstanceToMachineMapping.category</code>
[constr_5003]	Existence of <code>TlsCryptoCipherSuite.certificate</code> in the <i>server</i> role
[constr_5004]	Mapping of a <code>Process</code> to a <code>Machine</code> is mandatory in the Execution Manifest

Table E.18: Added Constraints in R18-10

E.4.5 Changed Constraints in R18-10

Number	Heading
[constr_1490]	Allowed value of <code>category</code> for reference <code>ProcessToMachineMapping.process.executable</code>
[constr_1551]	Existence of <code>DataPrototypeInServiceInterfaceRef.dataPrototype</code> vs. <code>DataPrototypeInServiceInterfaceRef.elementInImplDatatype</code>





Number	Heading
[constr_1572]	Usage of <code>SwDataDefProps.implementationDataType</code> within a <code>CppImplementationDataType</code>
[constr_1573]	<code>CppTemplateArgument.isVariadicTemplate</code> is set to True
[constr_1582]	<code>PersistencyKeyValuePair.valueDataType</code> shall match to <code>AbstractImplementationDataType</code> for the corresponding <code>PersistencyDataElement</code>
[constr_1585]	Standardized values of attribute <code>DiagnosticServiceSwMapping.category</code>
[constr_1589]	Value of <code>file.fileName</code>
[constr_3375]	method with attribute <code>fireAndForget</code> set to true shall not reference an <code>ApApplicationError</code>
[constr_3392]	<code>ServiceInterfaceElementSecureComConfig.dataId</code> and <code>ServiceInterfaceElementSecureComConfig.freshnessValueId</code> are mandatory in case of SecOC communication
[constr_3433]	Aggregation of <code>templateArguments</code> for an ARRAY
[constr_3434]	Aggregation of <code>templateArguments</code> for a VECTOR
[constr_3527]	<code>PhmLogicalExpression</code> referenced by one <code>PhmRule</code>
[constr_3528]	Value range of <code>domainId</code>
[constr_3529]	Value range of <code>serviceInstanceId</code>

Table E.19: Changed Constraints in R18-10

E.4.6 Deleted Constraints in R18-10

Number	Heading
[constr_1474]	<code>SwDataDefProps</code> applicable to <code>ImplementationDataTypes</code> exclusive to the <i>AUTOSAR adaptive platform</i>
[constr_1475]	<code>ImplementationDataType</code> of category STRING is limited
[constr_1476]	<code>ImplementationDataType</code> of category VECTOR is limited
[constr_1477]	<code>ImplementationDataType</code> of category ASSOCIATIVE_MAP is limited
[constr_1479]	No support for certain values of <code>ImplementationDataType.category</code>
[constr_1484]	Applicability of <code>ModeDependentStartupConfig.executionDependency</code>
[constr_1485]	No <code>subElement</code> for <code>ImplementationDataType</code> of category STRING
[constr_1486]	<code>ImplementationDataType</code> of category STRING and <code>SwBaseType</code>
[constr_1487]	Number of <code>subElements</code> of an <code>ImplementationDataType</code> of category ASSOCIATIVE_MAP
[constr_1491]	Semantics of <code>ServiceInterface.possibleError</code>
[constr_1493]	<code>ArgumentDataPrototype</code> referenced in the role <code>ApplicationError.errorContext</code>
[constr_1495]	Initial value for <code>field</code>



△

Number	Heading
[constr_1506]	ImplementationDataType of category VECTOR shall not define dynamicArraySizeProfile
[constr_1508]	BaseTypeDirectDefinition.nativeDeclaration shall not be set to the value enum
[constr_1522]	Semantics of ClientServerOperation.possibleError
[constr_1527]	ImplementationDataTypeElement finally referenced as the target element in the context of an ImplementationDataTypeElementInAutosarDataPrototypeRef
[constr_1528]	Definition of optionality for multiple DataPrototypes typed by the same AutosarDataType
[constr_1529]	Standardized values of CryptoNeed.category
[constr_1530]	Standardized values of CryptoPrimitive.algorithmFamily and CryptoKeySlot.algorithmFamily
[constr_1531]	Standardized values of CryptoPrimitive.algorithmMode
[constr_1532]	Consistent assignment of TLV data ids to data structures with optional members
[constr_1537]	Consistent assignment of TLV data ids to arguments of a given ClientServerOperation
[constr_1546]	Existence of attributes of ServiceInterfaceSubElement
[constr_1547]	Reference from ImplementationDataTypeExtension to ImplementationDataType
[constr_1548]	Reference from ImplementationDataTypeElementExtension to ImplementationDataTypeElement
[constr_1577]	Specification of a nativeDeclaration for a CppImplementationDataType
[constr_1587]	DiagnosticServiceSwMapping.category set to DATA_IDENTIFIER
[constr_1588]	DiagnosticServiceSwMapping.category set to GENERIC_UDS_SERVICE
[constr_3293]	Mandatory information of a RequiredSomeipServiceInstance
[constr_3303]	ANY not allowed for SomeipServiceInterfaceDeployment.serviceInterfaceVersion
[constr_3350]	Consistent value of category for ExecutableGroups referencing an Executable
[constr_3377]	Restriction of ISignalTriggering references in SignalBasedFieldToISignalTriggeringMapping
[constr_3422]	CppImplementationDataType of category STRING and SwBaseType
[constr_3428]	Structure shall own at least one element
[constr_3432]	Allowed subElements for Structures

Table E.20: Deleted Constraints in R18-10

E.5 Constraint and Specification Item History of this document according to AUTOSAR Release R19-03

E.5.1 Added Traceables in R19-03

Number	Heading
[TPS_MANI_01211]	Specification of executable software within SoftwareClusterDesign
[TPS_MANI_01212]	Usage of attribute typeEmitter in the context of a CustomCppImplementationDataType
[TPS_MANI_01213]	Semantics of meta-class StrongRevisionLabelString
[TPS_MANI_01214]	Semantics of SoftwareCluster.conflictsTo
[TPS_MANI_01215]	Semantics of meta-class SoftwareActivationDependencyFormula
[TPS_MANI_01216]	Semantics of meta-class SoftwareActivationDependencyFormula-Part
[TPS_MANI_01217]	Semantics of metaclass SoftwareActivationDependencyCompare-Condition
[TPS_MANI_01218]	Cryptographic signature of SoftwareCluster
[TPS_MANI_01219]	License of software in included SoftwareCluster
[TPS_MANI_01220]	Release notes of software in included SoftwareCluster
[TPS_MANI_01221]	Semantics of meta-class SoftwarePackage
[TPS_MANI_01222]	Cryptographic signature of SoftwarePackage
[TPS_MANI_01223]	Semantics of attribute SoftwarePackage.packagerId
[TPS_MANI_01224]	Actions taken after installation of a SoftwarePackage
[TPS_MANI_01225]	Actions taken during installation of a SoftwarePackage
[TPS_MANI_01226]	Machine-specific configuration settings for the UCM module
[TPS_MANI_01227]	Semantics of attribute UcmModuleInstantiation.identifier
[TPS_MANI_01228]	Semantics of meta-class ProcessDesign
[TPS_MANI_01229]	Pre-allocation of a given ProcessDesign on a specific MachineDesign
[TPS_MANI_01230]	Semantics of DiagnosticProvidedDataMapping
[TPS_MANI_01231]	GrantDesign references ProcessDesign
[TPS_MANI_01232]	Semantics of meta-class ComOfferServiceGrantDesign
[TPS_MANI_01233]	Semantics of meta-class ComFindServiceGrantDesign
[TPS_MANI_01234]	Semantics of ComFieldGrantDesign
[TPS_MANI_01235]	Semantics of ComEventGrantDesign
[TPS_MANI_01236]	Semantics of ComMethodGrantDesign
[TPS_MANI_01237]	Semantics of meta-class ComFieldGrant
[TPS_MANI_01238]	Semantics of meta-class ComMethodGrant
[TPS_MANI_01239]	Semantics of meta-class ComEventGrant
[TPS_MANI_01240]	Semantics of meta-class ComOfferServiceGrant
[TPS_MANI_01241]	Semantics of meta-class ComFindServiceGrant





Number	Heading
[TPS_MANI_01242]	PortInterfaces used for communication with the AUTOSAR Diagnostic Manager
[TPS_MANI_01243]	Semantics of DiagnosticDataIdentifierInterface
[TPS_MANI_01244]	Semantics of DiagnosticDataElementInterface
[TPS_MANI_01245]	Semantics of DiagnosticDataIdentifierGenericInterface
[TPS_MANI_01246]	Semantics of DiagnosticMonitorInterface
[TPS_MANI_01247]	Semantics of DiagnosticDTCInformationInterface
[TPS_MANI_01248]	Semantics of DiagnosticEventInterface
[TPS_MANI_01249]	Semantics of DiagnosticConditionInterface
[TPS_MANI_01250]	Semantics of DiagnosticIndicatorInterface
[TPS_MANI_01251]	Semantics of DiagnosticSecurityLevelInterface
[TPS_MANI_01252]	Semantics of DiagnosticServiceValidationInterface
[TPS_MANI_01253]	Semantics of DiagnosticOperationCycleInterface
[TPS_MANI_01254]	Semantics of DiagnosticGenericUdsInterface
[TPS_MANI_01255]	Semantics of DiagnosticGenericUdsInterface
[TPS_MANI_01256]	AdaptiveApplicationSwComponentType offers a PPortPrototype typed by DiagnosticIndicatorInterface
[TPS_MANI_01257]	AdaptiveApplicationSwComponentType offers a PPortPrototype typed by DiagnosticConditionInterface
[TPS_MANI_01258]	AdaptiveApplicationSwComponentType offers a PPortPrototype typed by DiagnosticGenericUdsInterface
[TPS_MANI_01259]	Mapping of DiagnosticClearCondition to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01260]	Mapping of DiagnosticIndicator to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01261]	Mapping of DiagnosticMemoryDestination to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01262]	Mapping of DiagnosticSecurityLevel to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01263]	Mapping of DiagnosticDataIdentifier to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01264]	Mapping of DiagnosticServiceInstance to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01265]	Semantics of DiagnosticDownloadInterface and DiagnosticDownloadInterface
[TPS_MANI_01266]	Mapping of DiagnosticServiceInstance for upload/download to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_03223]	Existence of CppImplementationDataType
[TPS_MANI_03224]	Modeling of a Partial Network Cluster
[TPS_MANI_03225]	References to vlans in PncMapping
[TPS_MANI_03226]	Collection of partialNetworks and vlans in NmNetworkHandle

Table E.21: Added Traceables in R19-03

E.5.2 Changed Traceables in R19-03

Number	Heading
[TPS_MANI_01012]	Formal modeling of application startup behavior
[TPS_MANI_01013]	Semantics of meta-class <code>StateDependentStartupConfig</code>
[TPS_MANI_01017]	Relation of startup configuration to resource group
[TPS_MANI_01041]	Startup configuration supports the definition of a launch sequence dependency
[TPS_MANI_01046]	Semantics of <code>StateDependentStartupConfig.functionGroupState</code>
[TPS_MANI_01049]	Mapping of <code>DiagnosticOperationCycle</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01050]	Mapping of <code>DiagnosticEnableCondition</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01051]	Mapping of <code>DiagnosticStorageCondition</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01136]	<code>AutosarDataPrototype</code> is the target of the <code>DataPrototypeInServiceInterfaceRef</code>
[TPS_MANI_01137]	Applicable use cases for <code>DataPrototypeInServiceInterfaceRef</code>
[TPS_MANI_01164]	Semantics of <code>SoftwareCluster.dependsOn</code>
[TPS_MANI_01177]	Semantics of <code>CppImplementationDataType.typeEmitter</code>
[TPS_MANI_01207]	Standardized values of attribute <code>PersistencyRedundancy-Crc.algorithmFamily</code>
[TPS_MANI_03070]	Size of a length field for a chosen array or map
[TPS_MANI_03071]	Size of a length field for a chosen structure
[TPS_MANI_03072]	Size of a length field for a chosen union
[TPS_MANI_03073]	Alignment of a dynamic <code>DataPrototype</code>
[TPS_MANI_03074]	Size of a type selector field for a chosen union
[TPS_MANI_03075]	Byte Order of chosen <code>DataPrototype</code> in the serialized data stream
[TPS_MANI_03116]	Size of a length field for a chosen string
[TPS_MANI_03127]	Usage of <code>End2EndEventProtectionProps</code>
[TPS_MANI_03128]	Usage of same <code>dataId</code> in case of Multi-Binding
[TPS_MANI_03152]	Assignment of a <code>StateDependentStartupConfig</code> to a function group state
[TPS_MANI_03187]	Definition of enumeration types
[TPS_MANI_03190]	<code>CppImplementationDataType</code> of category <code>VARIANT</code>
[TPS_MANI_03202]	Definition of bitfield types
[TPS_MANI_03217]	On-the-wire encoding for a chosen string

Table E.22: Changed Traceables in R19-03

E.5.3 Deleted Traceables in R19-03

Number	Heading
[TPS_MANI_01038]	Diagnostic software mapping on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01170]	Semantics of <code>CppTypeArgument.isVariadicTemplate</code>
[TPS_MANI_01181]	Use cases for the application of <code>DiagnosticServiceSwMapping</code>
[TPS_MANI_01193]	Combination of <code>ModeDependentStartupConfig.machineMode</code> and <code>ModeDependentStartupConfig.functionGroupMode</code>
[TPS_MANI_03066]	Description of machine states
[TPS_MANI_03153]	Semantics of <code>ModeDependentStartupConfig.functionGroupMode</code>

Table E.23: Deleted Traceables in R19-03

E.5.4 Added Constraints in R19-03

Number	Heading
[constr_1687]	Definition of machine state
[constr_1688]	<code>StateDependentStartupConfig</code> shall only refer to function group states of the same function group
[constr_1689]	Modeling of a startup dependency between different <code>Processes</code>
[constr_1690]	<code>SoftwareCluster</code> shall only be referenced by a single <code>SoftwarePackage</code> .
[constr_1691]	<code>UcmModuleInstantiation.identifier</code> shall be unique
[constr_1692]	Value of <code>schedulingPriority</code>
[constr_1693]	Relation of <code>Executable</code> , <code>ProcessDesign</code> , and <code>Process</code>
[constr_1695]	Semantics of a <code>Grant</code> depends on the existence of <code>IamModuleInstantiation</code>
[constr_1696]	<code>ClientServerOperation</code> aggregated by <code>DiagnosticRoutineInterface</code>
[constr_1697]	Restriction for <code>ClientServerOperation</code> aggregated by a <code>DiagnosticDataIdentifierInterface</code> or <code>DiagnosticDataElementInterface</code>
[constr_1698]	Target <code>SwcServiceDependency</code> of <code>DiagnosticClearConditionPortMapping.swcServiceDependencyInExecutable</code>
[constr_1699]	Target <code>SwcServiceDependency</code> of <code>DiagnosticIndicatorPortMapping.swcServiceDependencyInExecutable</code>
[constr_1700]	Target <code>SwcServiceDependency</code> of <code>DiagnosticMemoryDestinationPortMapping.swcServiceDependencyInExecutable</code>
[constr_1701]	Target <code>SwcServiceDependency</code> of <code>DiagnosticSecurityLevelPortMapping.swcServiceDependencyInExecutable</code>
[constr_1702]	Target <code>SwcServiceDependency</code> of <code>DiagnosticServiceDataIdentifierPortMapping.swcServiceDependencyInExecutable</code>
[constr_1703]	Target <code>SwcServiceDependency</code> of <code>DiagnosticGenericUdsPortMapping.swcServiceDependencyInExecutable</code>
[constr_1704]	Target <code>SwcServiceDependency</code> of <code>DiagnosticUploadDownloadPortMapping.swcServiceDependencyInExecutable</code>





Number	Heading
[constr_5033]	Compatibility of data types with <code>category VALUE</code>
[constr_5034]	Compatibility of data types with <code>category BOOLEAN</code>
[constr_5035]	Compatibility of data types with <code>category STRING</code>
[constr_5036]	Compatibility of data types with <code>category ARRAY</code>
[constr_5037]	Compatibility of data types with <code>category ARRAY</code> with <code>variableSize</code>
[constr_5038]	Compatibility of data types with <code>category ARRAY</code> with <code>fixedSize</code>
[constr_5039]	Compatibility of data types with <code>category STRUCTURE</code>
[constr_5040]	Compatibility of <code>ApplicationRecordDataType</code> and <code>CppImplementationDataType</code> that both represent an Optional Element Structure
[constr_5041]	Compatibility of data types with <code>category ASSOCIATIVE_MAP</code>
[constr_5042]	No data type mapping for <code>CppImplementationDataType</code> of <code>category VARIANT</code>
[constr_5043]	Forbidden mappings to <code>CppImplementationDataType</code>
[constr_5044]	<code>DataTypeMap</code> for composite data types
[constr_5045]	Only one <code>SomeipServiceDiscovery</code> configuration per VLAN is allowed
[constr_5046]	Usage of <code>DoIpNetworkConfiguration.eidUseMac</code>
[constr_5047]	Supported values of <code>ServiceInstanceToMachineMapping.category</code>
[constr_5048]	Existence of <code>TlsCryptoCipherSuite.certificate</code> in the <code>server</code> role

Table E.24: Added Constraints in R19-03

E.5.5 Changed Constraints in R19-03

Number	Heading
[constr_1481]	Usage of <code>DataPrototypeInServiceInterfaceRef</code> in the <i>AUTOSAR adaptive platform</i>
[constr_1500]	Target <code>SwcServiceDependency</code> of <code>DiagnosticEventPortMapping.swcServiceDependencyInExecutable</code>
[constr_1501]	Target <code>SwcServiceDependency</code> of <code>DiagnosticOperationCyclePortMapping.swcServiceDependencyInExecutable</code>
[constr_1502]	Target <code>SwcServiceDependency</code> of <code>DiagnosticEnableConditionPortMapping.swcServiceDependencyInExecutable</code>
[constr_1503]	Target <code>SwcServiceDependency</code> of <code>DiagnosticStorageConditionPortMapping.swcServiceDependencyInExecutable</code>
[constr_1551]	Existence of <code>DataPrototypeInServiceInterfaceRef.dataPrototype</code> vs. <code>DataPrototypeInServiceInterfaceRef.elementInImplDatatype</code>
[constr_1567]	Existence of <code>SoftwareCluster.subSoftwareCluster</code> and <code>SoftwareCluster.dependsOn/conflictsTo</code>
[constr_1595]	Consistent assignment of TLV data ids to <code>CppImplementationDataType</code> or <code>CppImplementationDataTypeElement</code>





Number	Heading
[constr_1606]	Processes with mutual ExecutionDependency
[constr_1615]	Existence of attribute SomeipDataPrototypeTransformationProps.someipTransformationProps.sessionHandling
[constr_1618]	Ability to shut down
[constr_1619]	Ability to restart
[constr_3396]	Number of Process.stateDependentStartupConfig that refer to the same functionGroupState
[constr_3413]	StateDependentStartupConfig of a Process is mapped to exactly one ResourceGroup
[constr_3421]	Fibex elements applicable for a System of category MACHINE_DESIGN_EXTRACT
[constr_3423]	StateDependentStartupConfig of a Process shall reference a functionGroupState
[constr_3424]	StateDependentStartupConfig shall never reference the functionGroupState Off
[constr_3447]	ApSomeipTransformationProps.sizeOfArrayLengthField that equals 0

Table E.25: Changed Constraints in R19-03

E.5.6 Deleted Constraints in R19-03

Number	Heading
[constr_1499]	Target SwcServiceDependency of DiagnosticServiceSwMapping.mappedSwcServiceDependencyInExecutable
[constr_1504]	Number of Process.modeDependentStartupConfig that refer to the same machineMode
[constr_1573]	CppTemplateArgument.isVariadicTemplate is set to True
[constr_1574]	Number of CppTemplateArguments with isVariadicTemplate set to True
[constr_1575]	Position of CppTemplateArgument with isVariadicTemplate set to True
[constr_1585]	Standardized values of attribute DiagnosticServiceSwMapping.category
[constr_1586]	DiagnosticServiceSwMapping.category set to DATA_ELEMENT
[constr_1620]	Value of schedulingPriority if schedulingPolicy is set to schedulingPolicyFifo or schedulingPolicyRoundRobin
[constr_1621]	Value of schedulingPriority if StartupConfig.schedulingPolicy is set to schedulingPolicyOther
[constr_1663]	Standardized values of attribute DiagnosticServiceDataIdentifierMapping.category
[constr_3380]	End2EndEventProtectionProps shall not reference an event and a notifier at the same time
[constr_3397]	ModeDependentStartupConfig that refers to a functionGroupMode and to a machineMode





Number	Heading
[constr_3398]	ModeDependentStartupConfig that refers to function group modes of different function groups
[constr_3494]	Mandatory Machine States
[constr_3531]	Mandatory definition of healthChannelId
[constr_3536]	Mandatory definition of supervisedEntityId
[constr_5001]	Usage of DoIpNetworkConfiguration.eidUseMac
[constr_5002]	Supported values of ServiceInstanceToMachineMapping.category
[constr_5003]	Existence of TlsCryptoCipherSuite.certificate in the server role

Table E.26: Deleted Constraints in R19-03

E.6 Constraint and Specification Item History of this document according to AUTOSAR Release R19-11

E.6.1 Added Traceables in R19-11

Number	Heading
[TPS_MAIN_01281]	Usage of meta-class RecoveryViaApplicationAction
[TPS_MANI_01267]	Semantics of attribute SoftwareClusterDesign.dependsOn
[TPS_MANI_01268]	Semantics of attribute SoftwareClusterDesign.conflictsTo
[TPS_MANI_01269]	Specification of boundaries for resource consumption
[TPS_MANI_01270]	Reference from TransformationPropsToServiceInterfaceElementMapping to TlvDataIdDefinitionSet
[TPS_MANI_01271]	Semantics of Executable.loggingBehavior
[TPS_MANI_01272]	Duplicate entries in logTraceLogMode
[TPS_MANI_01273]	Support for trusted Platform
[TPS_MANI_01274]	System category for a design description that has one single Adaptive Machine in scope
[TPS_MANI_01275]	Semantics of meta-class ServiceInstanceToSwClusterDesignPort-PrototypeMapping
[TPS_MANI_01276]	Semantics of CompositionRPortToExecutableRPortMapping and CompositionPPortToExecutablePPortMapping
[TPS_MANI_01277]	Definition of a start-up timeout for a StartupConfig of a Process
[TPS_MANI_01278]	Definition of a termination timeout for a StartupConfig of a Process
[TPS_MANI_01279]	Semantics of Executable.reportingBehavior
[TPS_MANI_01280]	Semantics of meta-class PhmRecoveryActionInterface
[TPS_MANI_01282]	Semantics of reference CompositionPortToExecutablePortMapping.processDesign





Number	Heading
[TPS_MANI_01283]	Semantics of meta-class <code>RawDataStreamInterface</code>
[TPS_MANI_01284]	Granularity of meta-class <code>RawDataStreamGrantDesign</code>
[TPS_MANI_01285]	Purpose of meta-class <code>RawDataStreamDeployment</code>
[TPS_MANI_01286]	Semantics of attribute <code>RawDataStreamMethodDeployment.callTimeout</code>
[TPS_MANI_01287]	Semantics of <code>RawDataStreamMapping</code>
[TPS_MANI_01288]	Impact of the <code>SoftwarePackage</code> on the value of function group states on the target platform
[TPS_MANI_01289]	Order of function group states is relevant
[TPS_MANI_01290]	<code>VehiclePackage</code> names affected UCMs
[TPS_MANI_01291]	Identification of an actual UCM in the context of an update campaign
[TPS_MANI_01292]	Definition of fallback-order for UCM master
[TPS_MANI_01294]	Update campaign depends on driver's acceptance
[TPS_MANI_01295]	Semantics of <code>VehicleRolloutStep</code>
[TPS_MANI_01296]	Ordered execution of rollout steps in an update campaign
[TPS_MANI_01297]	Semantics of meta-class <code>UcmStep</code>
[TPS_MANI_01298]	No ordering of <code>VehicleRolloutStep.ucmProcessing</code>
[TPS_MANI_01299]	Aggregation of <code>SoftwarePackageSteps</code> at <code>UcmStep</code>
[TPS_MANI_01300]	Semantics of reference <code>SoftwarePackageStep.transfer.transfer</code>
[TPS_MANI_01301]	Semantics of aggregation <code>SoftwarePackageStep.transfer</code>
[TPS_MANI_01302]	Semantics of reference <code>SoftwarePackageStep.process</code>
[TPS_MANI_01303]	Semantics of reference <code>SoftwarePackageStep.preActivate</code>
[TPS_MANI_01304]	Semantics of reference <code>SoftwarePackageStep.verify</code>
[TPS_MANI_01305]	Semantics of attribute <code>SoftwarePackageStep.activationSwitch</code>
[TPS_MANI_01306]	Simultaneous existence of attributes <code>SoftwarePackageStep.transfer</code> and <code>SoftwarePackageStep.process</code>
[TPS_MANI_01307]	Semantics of meta-class <code>EthernetRawDataStreamGrant</code>
[TPS_MANI_03227]	Usage of ephemeral ports
[TPS_MANI_03228]	Usage of <code>End2EndMethodProtectionProps</code>
[TPS_MANI_03229]	Usage of same <code>End2EndMethodProtectionProps.dataId</code> in case of Multi-Binding
[TPS_MANI_03230]	Sharing timers for <code>ProvidedSomeipServiceInstance</code>
[TPS_MANI_03231]	Sharing timers for <code>RequiredSomeipServiceInstance</code>
[TPS_MANI_03232]	Definition of general IPsec configuration settings
[TPS_MANI_03233]	IPsec mode
[TPS_MANI_03234]	IPsec AH and ESP CipherSuites
[TPS_MANI_03573]	Definition of no minimum deadline supervision
[TPS_MANI_03574]	Definition of no maximum deadline supervision
[TPS_MANI_03575]	Definition of no minimum alive supervision
[TPS_MANI_03576]	Definition of no maximum alive supervision





Number	Heading
[TPS_MANI_03577]	<code>headerId</code> required for signal-service-translation
[TPS_MANI_03578]	Signal-based <code>ServiceInterface</code> binding over Ethernet
[TPS_MANI_03579]	Signal-based <code>ServiceEventDeployment</code> over Ethernet
[TPS_MANI_03580]	Service offer at startup
[TPS_MANI_03581]	Service find at startup
[TPS_MANI_03582]	Service find for required signal
[TPS_MANI_03583]	Service subscribe for required signal
[TPS_MANI_03584]	Definition of transmission triggers for translations with different sources
[TPS_MANI_03585]	Processing order of COM-Stack features
[TPS_MANI_03586]	No transmission trigger for translations with different sources
[TPS_MANI_03587]	Transmission trigger for translations with different sources
[TPS_MANI_03588]	Full translation before transmission triggering
[TPS_MANI_03589]	Reception data filter of COM-Stack
[TPS_MANI_03590]	Transfer properties and transmission modes of COM-Stack
[TPS_MANI_03591]	<code>SomeipEventDeployment.serializer</code> equals <code>signalBased</code>
[TPS_MANI_03592]	<code>ISignal</code> invalidation of COM-Stack
[TPS_MANI_03593]	<code>handleInvalid = dontInvalidate</code> behavior of COM-Stack
[TPS_MANI_03594]	<code>handleInvalid = replace</code> behavior of COM-Stack
[TPS_MANI_03595]	Update Bit support for <code>ISignal</code>
[TPS_MANI_03596]	Update Bit support for <code>ISignalIPdu</code>
[TPS_MANI_03597]	Support for <code>MultiplexedIPdu</code>
[TPS_MANI_03598]	Expected check period of E2E-Protected payload
[TPS_MANI_03599]	Expected update period of E2E-Protected payload
[TPS_MANI_03600]	Signal-service-translation of E2E protected payload
[TPS_MANI_03601]	Signal-service-translation of E2E protected payload - timeout handling
[TPS_MANI_03602]	Signal-service-translation of E2E protected payload - error handling
[TPS_MANI_03603]	Service-signal-translation of E2E protected payload
[TPS_MANI_03604]	Service-signal-translation of E2E protected payload - timeout handling
[TPS_MANI_03605]	Service-signal-translation of E2E protected payload - error handling
[TPS_MANI_03606]	Service offer for provided signal
[TPS_MANI_03607]	Handling of safe signal-service-translation in one <code>Executable</code>
[TPS_MANI_03608]	Support for safe signal-service-translation and service-signal-translation
[TPS_MANI_03609]	Support for safe signal-service-translation with same or different E2E profiles
[TPS_MANI_03610]	1:n mapping for E2E protected data
[TPS_MANI_03611]	E2E protected target out of E2E protected sources
[TPS_MANI_03612]	Sufficient ASIL level of translation software
[TPS_MANI_03614]	No translation of not OK E2E protected data out of several sources
[TPS_MANI_03615]	<code>SomeipEventDeployment.serializer</code> equals <code>someip</code>





Number	Heading
[TPS_MANI_03616]	Semantic versioning of <code>ServiceInterface.majorVersion</code> and <code>ServiceInterface.minorVersion</code>
[TPS_MANI_03617]	Version mapping between <code>ServiceInterface</code> and <code>ServiceInterfaceDeployment</code>
[TPS_MANI_03618]	Usage of <code>RequiredSomeipServiceInstance.blacklistedVersion</code>
[TPS_MANI_03619]	SOME/IP Service search for <code>requiredMinorVersion</code>
[TPS_MANI_03620]	Service discovery control
[TPS_MANI_03621]	Data filter inside the signal-service-translation

Table E.27: Added Traceables in R19-11

E.6.2 Changed Traceables in R19-11

Number	Heading
[TPS_MANI_01032]	Usage of ServiceInterfaceMapping
[TPS_MANI_01057]	Semantics of RPortPrototypeProps.searchIntention
[TPS_MANI_01164]	Semantics of SoftwareCluster.dependsOn
[TPS_MANI_01196]	Semantics of PersistencyDeployment.minimumSustainedSize
[TPS_MANI_01197]	Semantics of PersistencyDeployment.maximumAllowedSize
[TPS_MANI_01214]	Semantics of SoftwareCluster.conflictsTo
[TPS_MANI_01215]	Semantics of meta-class SoftwareActivationDependencyFormula
[TPS_MANI_01216]	Semantics of meta-class SoftwareActivationDependencyFormula-Part
[TPS_MANI_01217]	Semantics of metaclass SoftwareActivationDependencyCompare-Condition
[TPS_MANI_01249]	Semantics of DiagnosticConditionInterface
[TPS_MANI_01255]	Semantics of DoIP DiagnosticPortInterfaces
[TPS_MANI_03004]	IPv4 Multicast event destination address
[TPS_MANI_03010]	Udp Transport Protocol Configuration in case of IP-Multicast
[TPS_MANI_03061]	IPv6 Multicast event destination address
[TPS_MANI_03114]	Usage of AssemblySwConnectors in the System Design model
[TPS_MANI_03130]	Standardized E2EProfileConfiguration.profileName values
[TPS_MANI_03160]	Log and Trace configuration options in the Execution Manifest
[TPS_MANI_03161]	Log and Trace configuration options in the Service Instance Manifest
[TPS_MANI_03167]	Network configuration for Nm
[TPS_MANI_03205]	IPsec policy
[TPS_MANI_03206]	IPsec AH and ESP protocol configuration
[TPS_MANI_03207]	IPsec Internet Key Exchange protocol configuration
[TPS_MANI_03216]	Existence of TlsCryptoCipherSuite.certificate and TlsCryptoCipherSuite.pskIdentity in the <i>client</i> role

Table E.28: Changed Traceables in R19-11

E.6.3 Deleted Traceables in R19-11

Number	Heading
[TPS_MANI_01051]	Mapping of DiagnosticStorageCondition to PortPrototype(s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01052]	Semantics of RPortPrototypeProps.portInstantiationBehavior
[TPS_MANI_01162]	Semantics of SoftwareClusterDesign.dependsOn
[TPS_MANI_03120]	Signal-based ServiceInterface binding





Number	Heading
[TPS_MANI_03146]	Configuration of timeouts for a selected machine state or function group state
[TPS_MANI_03149]	Definition of a start-up timeout for a Process
[TPS_MANI_03150]	Definition of a termination timeout for a Process
[TPS_MANI_03550]	Usage of RPortPrototype for the interaction with Platform Health Management

Table E.29: Deleted Traceables in R19-11

E.6.4 Added Constraints in R19-11

Number	Heading
[constr_1705]	Target of reference SoftwareActivationDependencyCompareCondition.softwareActivationDependency
[constr_1707]	Eligible subclasses of HeapUsage in the context of StateDependentStartupConfig.resourceConsumption
[constr_1708]	Combination of CppImplementationDataTypeElement.isOptional and CppImplementationDataTypeElementQualifier.inplace
[constr_1709]	Applicability of attribute PersistencyRedundancyEnum.redundantPerKey
[constr_1710]	Consistency of values of attributes PersistencyInterface.redundancy and PersistencyRedundancyHandling.scope
[constr_1723]	ProvidedSomeipServiceInstance shall be unique in respect of serviceInstanceId , serviceInterfaceId and majorVersion
[constr_1727]	Qualified combinations of PortPrototypes and PhmSupervisedEntityInterface on application software level
[constr_1728]	Qualified combinations of PortPrototypes and PhmHealthChannelInterface on application software level
[constr_1729]	Qualified combinations of PortPrototypes and PhmRecoveryActionInterface on application software level
[constr_1730]	Restriction regarding the modeling of the PhmRecoveryActionInterface.recovery
[constr_1731]	Value of UcmDescription.identifier in the scope of a VehiclePackage
[constr_1732]	Existence of attribute activationSwitch set to <code>True</code> in the context of the enclosing UcmStep
[constr_1733]	Simultaneous existence of SoftwarePackageStep.preActivate and SoftwarePackageStep.verify
[constr_1734]	Restriction for attribute SoftwarePackageStep.activationSwitch
[constr_1736]	Multiplicity of reference LogicalSupervision.initialCheckpoint
[constr_1737]	Multiplicity of reference LogicalSupervision.finalCheckpoint
[constr_1738]	Multiplicity of reference GlobalSupervision.localSupervision
[constr_1739]	Multiplicity of aggregation LocalSupervision.transition





Number	Heading
[constr_1740]	Multiplicity of reference <code>LogicalSupervision.transition</code>
[constr_1742]	Multiplicity of reference <code>SupervisionCheckpoint.phmCheckpoint</code>
[constr_3550]	Existence of <code>ServiceInstanceToSignalMapping</code> for an event with <code>signal-Based</code> serialization
[constr_3551]	Full mapping of target <code>ISignalGroup</code>
[constr_3552]	Full mapping of target <code>event</code>
[constr_3553]	Existence of <code>ServiceInstanceToSignalMapping</code> for an field with <code>signal-Based</code> serialization
[constr_3554]	E2E protection configuration check
[constr_3555]	No support for <code>useAsCryptographicIPdu</code> is true
[constr_3556]	Unique transport layer mapping
[constr_3557]	Mandatory <code>majorVersion</code> at <code>SomeipServiceInterfaceDeployment.serviceInterfaceVersion</code>
[constr_3558]	<code>RequiredSomeipServiceInstance.blacklistedVersion</code> is restricted to the usage of <code>minorVersion</code>
[constr_3561]	<code>minimumMinorVersion</code> and <code>RequiredSomeipServiceInstance.requiredMinorVersion</code> value
[constr_3562]	Existence of <code>NonqueuedReceiverComSpec.filter</code>
[constr_5052]	SOME/IP ServiceInstances of the same <code>serviceInterface</code> on one Machine
[constr_5056]	Restriction of <code>CompositionSwComponentType.connector</code> usage in AP
[constr_5057]	<code>PassThroughSwConnector</code> and <code>ServiceInterfaceMapping</code>
[constr_5102]	Usage of remote port ranges in <code>IPSecRule</code> is not allowed
[constr_5103]	Usage of local port ranges in <code>IPSecRule</code> is not allowed

Table E.30: Added Constraints in R19-11

E.6.5 Changed Constraints in R19-11

Number	Heading
[constr_1561]	Existence of <code>SoftwareClusterDesign.subSoftwareCluster</code> and <code>SoftwareClusterDesign.dependsOn.dependentSoftwareClusterDesign</code>
[constr_1567]	Existence of <code>SoftwareCluster.subSoftwareCluster</code> and <code>SoftwareCluster.dependsOn/conflictsTo</code>
[constr_1570]	Restriction for <code>UserDefinedServiceInterfaceDeployment</code> of category <code>SERVICE_INTERFACE_DEPLOYMENT_IPC</code>
[constr_1579]	<code>SwDataDefProps</code> applicable to <code>CppImplementationDataTypes</code> exclusive to the <i>AUTOSAR adaptive platform</i>
[constr_1630]	No definition of length field sizes on <code>DataPrototype</code> level in case of TLV usage
[constr_3375]	<code>method</code> with attribute <code>fireAndForget</code> set to true shall not reference an <code>ApApplicationError</code>





Number	Heading
[constr_3419]	Allowed usage of UdpNmNetworkConfiguration attributes
[constr_3426]	The <code>logTraceFilePath</code> is mandatory in case that <code>logTraceLogMode</code> is set to <code>file</code>
[constr_3427]	The <code>logTraceFilePath</code> is only relevant if <code>logTraceLogMode</code> is set to <code>file</code>
[constr_3493]	Applicable attributes for standardized E2E Profiles
[constr_5048]	Existence of <code>TlsCryptoCipherSuite.certificate</code> and <code>TlsCryptoCipherSuite.pskIdentity</code> in the <code>server</code> role

Table E.31: Changed Constraints in R19-11

E.6.6 Deleted Constraints in R19-11

Number	Heading
[constr_1503]	Target <code>SwcServiceDependency</code> of <code>DiagnosticStorageConditionPortMapping.swcServiceDependencyInExecutable</code>
[constr_3387]	Compatibility of <code>PortPrototypes</code> of different <code>ServiceInterfaces</code>
[constr_3388]	Compatibility of <code>events</code>
[constr_3389]	Compatibility of <code>methods</code>
[constr_3390]	Compatibility of <code>fields</code>
[constr_3411]	<code>eventMulticastUdpPort</code> , <code>ipv4MulticastIpAddress</code> and <code>ipv6MulticastIpAddress</code> not relevant for <code>RequiredSomeipServiceInstances</code>
[constr_3420]	System <code>category</code> for a design description that has one single Adaptive <code>Machine</code> in scope

Table E.32: Deleted Constraints in R19-11

E.7 Constraint and Specification Item History of this document according to AUTOSAR Release R20-11

E.7.1 Added Traceables in R20-11

Number	Heading
[TPS_MANI_01308]	<code>Process</code> is not designed for re-usability
[TPS_MANI_01309]	Semantics of attribute <code>CppImplementationDataType.headerFile</code>
[TPS_MANI_01310]	Semantics of <code>SoftwareClusterDesign.dependsOn</code>
[TPS_MANI_01311]	Handling of manufacturer checks





Number	Heading
[TPS_MANI_01312]	Handling of supplier checks
[TPS_MANI_01313]	Definition of <code>updateStrategy</code> on element level
[TPS_MANI_01314]	Further qualification of properties of <code>PortPrototypes</code> typed by <code>PersistenceKeyValueStorageInterfaces</code>
[TPS_MANI_01315]	<code>PersistenceKeyValuePair.initValue</code> overrides <code>PersistenceDataRequiredComSpec.initValue</code>
[TPS_MANI_01316]	Existence of <code>ServiceInstanceToPortPrototypeMapping.processDesign</code>
[TPS_MANI_01317]	Existence of <code>ServiceInstanceToPortPrototypeMapping.process</code>
[TPS_MANI_01319]	Modeling of redundancy in the context of <code>PersistenceInterface</code>
[TPS_MANI_01320]	Definition of redundancy on interface level may be overruled in deployment
[TPS_MANI_01321]	Semantics of meta-class <code>PersistenceDeploymentElement</code>
[TPS_MANI_01322]	Semantics of meta-class <code>PersistencePortPrototypeToDeploymentMapping</code>
[TPS_MANI_01323]	Matching pairs of <code>PersistenceDataElement</code> and <code>PersistenceKeyValuePair</code>
[TPS_MANI_01324]	Semantics of E2E attributes in <code>ClientComSpec</code>
[TPS_MANI_01325]	Semantics of E2E attributes in <code>ServerComSpec</code>
[TPS_MANI_01326]	Generic Mapping to a <code>DiagnosticServiceInstance</code> on the AUTOSAR Adaptive Platform
[TPS_MANI_01327]	Value of <code>EndToEndTransformationComSpecProps.disableEndToEndCheck</code> vs. value of <code>EndToEndTransformationComSpecProps.disableEndToEndStateMachine</code>
[TPS_MANI_01328]	Standardized values for attribute <code>StartupConfig.schedulingPolicy</code>
[TPS_MANI_01329]	Reference to model elements in different <code>SoftwareClusters</code>
[TPS_MANI_01330]	Definition of machine function group
[TPS_MANI_01331]	Standardized values of attribute <code>SoftwareCluster.category</code>
[TPS_MANI_01332]	Semantics of <code>DiagnosticEcuResetInterface</code>
[TPS_MANI_01333]	Attribute <code>NotAvailableValueSpecification.defaultPattern</code> is not applicable
[TPS_MANI_01334]	Semantics of <code>StartupConfig.terminationBehavior</code>
[TPS_MANI_01335]	Semantics of <code>SoftwareClusterDependencyFormula.category</code>
[TPS_MANI_01336]	Two use cases for using the <code>DiagnosticEventPortMapping</code>
[TPS_MANI_01337]	Standardized values for attribute <code>Process.functionClusterAffiliation</code>
[TPS_MANI_01338]	Semantics of <code>SecurityEventReportToSecurityEventDefinitionMapping</code>
[TPS_MANI_01339]	Existence of the <code>SecurityEventReportToSecurityEventDefinitionMapping</code> is motivated by the AUTOSAR methodology
[TPS_MANI_01340]	Semantics of <code>SecurityEventReportInterface</code>
[TPS_MANI_01341]	Security events that are actually reported by a local IdsM
[TPS_MANI_01342]	Semantics of <code>SecurityEventMapping</code>





Number	Heading
[TPS_MANI_03235]	Usage of <code>ApSomeipTransformationProps.sessionHandling</code>
[TPS_MANI_03236]	Mapping of <code>ProvidedSomeipServiceInstance</code> to different <code>PPortPrototypes</code>
[TPS_MANI_03237]	Transport Protocol attributes defined for a <code>RequiredSomeipServiceInstance</code>
[TPS_MANI_03238]	Definition of <code>ComMethodGrantDesign.remoteSubject</code>
[TPS_MANI_03239]	Definition of <code>ComEventGrantDesign.remoteSubject</code>
[TPS_MANI_03240]	Modeling of a remote peer in case of TLS-based secure channel
[TPS_MANI_03241]	Modeling of relevant <code>TlsSecureComProps</code> for <code>TlsIamRemoteSubject</code>
[TPS_MANI_03242]	Modeling of a remote peer in case of IPsec-based secure channel
[TPS_MANI_03244]	Modeling of a remote peer in case of a general IP communication
[TPS_MANI_03245]	Definition of <code>ComMethodGrant.remoteSubjects</code> on server side
[TPS_MANI_03246]	Definition of <code>ComMethodGrant.remoteSubjects</code> on client side
[TPS_MANI_03247]	Definition of <code>ComEventGrant.remoteSubjects</code> on provider side
[TPS_MANI_03248]	Definition of <code>ComEventGrant.remoteSubjects</code> on receiver side
[TPS_MANI_03249]	Definition of <code>ComFieldGrant.remoteSubjects</code> on provider side
[TPS_MANI_03250]	Definition of <code>ComFieldGrant.remoteSubjects</code> on client side
[TPS_MANI_03251]	Definition of <code>ComFieldGrantDesign.remoteSubject</code>
[TPS_MANI_03252]	Usage of same <code>End2EndMethodProtectionProps.sourceId</code> in case of Multi-Binding
[TPS_MANI_03253]	Interaction with crypto software
[TPS_MANI_03254]	Modeling of application that uses and modifies a Crypto Key
[TPS_MANI_03255]	Modeling of Key Manager application that manages a Crypto Key that is used by Stack Services
[TPS_MANI_03256]	Modeling of application that accesses a Crypto Certificate
[TPS_MANI_03257]	Modeling of application that accesses a Crypto Provider
[TPS_MANI_03258]	Modeling of application designed as trust-master
[TPS_MANI_03259]	Linking of Crypto Certificate to a Crypto Key Slot
[TPS_MANI_03260]	Semantics of meta-class <code>CryptoModuleInstantiation</code>
[TPS_MANI_03261]	Support of <code>CryptoProviders</code>
[TPS_MANI_03262]	Semantics of <code>CryptoProviderToPortPrototypeMapping</code>
[TPS_MANI_03263]	Assignment of <code>CryptoKeySlots</code> to <code>CryptoProviders</code>
[TPS_MANI_03264]	Semantics of <code>CryptoKeySlotToPortPrototypeMapping</code>
[TPS_MANI_03265]	Support of <code>CryptoCertificates</code>
[TPS_MANI_03266]	Semantics of <code>CryptoCertificateToCryptoKeySlotMapping</code>
[TPS_MANI_03267]	Semantics of <code>CryptoCertificateToPortPrototypeMapping</code>
[TPS_MANI_03268]	Semantics of <code>FunctionalClusterInteractsWithFunctionalClusterMapping</code>
[TPS_MANI_03269]	Semantics of <code>ComCertificateToCryptoCertificateMapping</code>
[TPS_MANI_03270]	Semantics of <code>ComKeyToCryptoKeySlotMapping</code>





Number	Heading
[TPS_MANI_03271]	Semantics of ComSecOcToCryptoKeySlotMapping
[TPS_MANI_03272]	Semantics of PersistencyDeploymentToCryptoKeySlotMapping
[TPS_MANI_03273]	Semantics of PersistencyDeploymentElementToCryptoKeySlotMapping
[TPS_MANI_03274]	Configuration of log and trace message source
[TPS_MANI_03275]	Configuration of log and trace message source on design level
[TPS_MANI_03276]	Semantics of PersistencyDeploymentToDltLogChannelMapping
[TPS_MANI_03622]	DDS Transport Protocols are up to the stack implementer
[TPS_MANI_03623]	Usage of checkpointId in application code
[TPS_MANI_03624]	Usage of statusId in application code
[TPS_MANI_03625]	Consistency of HealthChannelExternalReportedStatus.statusId and PhmHealthChannelStatus.statusId
[TPS_MANI_03626]	Consistency of SupervisionCheckpoint.phmCheckpoint and PhmCheckpoint.checkpointId
[TPS_MANI_03627]	No signal-service-translation for methods
[TPS_MANI_03628]	Standardized values of ServiceInterface.category
[TPS_MANI_03629]	Relation of ServiceInstanceToSignalMapping and CommunicationConnector
[TPS_MANI_03630]	Semantics of triggersRecoveryNotification
[TPS_MANI_03631]	Semantics of meta-class PhmHealthChannelRecoveryNotificationInterface
[TPS_MANI_03632]	Semantics of TimeBaseProviderToPersistencyMapping

Table E.33: Added Traceables in R20-11

E.7.2 Changed Traceables in R20-11

Number	Heading
[TPS_MANI_01061]	Requirements on scheduling
[TPS_MANI_01065]	Purpose of PersistencyKeyValueStorageInterface
[TPS_MANI_01067]	Purpose of PersistencyFileStorageInterface
[TPS_MANI_01068]	Semantics of PersistencyFileStorageInterface.maxNumberOfFiles
[TPS_MANI_01073]	Semantics of PortPrototype typed by PersistencyKeyValueStorageInterface
[TPS_MANI_01078]	Semantics of PersistencyPortPrototypeToKeyValueStorageMapping
[TPS_MANI_01079]	Semantics of PersistencyKeyValueStorage
[TPS_MANI_01080]	Semantics of meta-class PersistencyPortPrototypeToFileStorageMapping





Number	Heading
[TPS_MANI_01081]	Semantics of <code>PortPrototype</code> typed by <code>PersistencyFileStorageInterface</code>
[TPS_MANI_01106]	Specification of intentions for the receiver of <code>events</code> or <code>field</code> notifiers
[TPS_MANI_01107]	Specification of intentions for the sender of <code>events</code> or <code>field</code> notifiers
[TPS_MANI_01108]	Specification of intentions for the caller of a <code>methods</code> or <code>field</code> setter/getter
[TPS_MANI_01135]	Semantics of <code>PersistencyKeyValueStorageInterface.dataTypeForSerialization</code>
[TPS_MANI_01138]	Semantics of <code>PersistencyKeyValueStorageInterface.dataElement</code>
[TPS_MANI_01139]	Semantics of <code>PersistencyInterface.updateStrategy</code>
[TPS_MANI_01140]	Semantics of <code>PersistencyInterfaceElement.updateStrategy</code>
[TPS_MANI_01142]	Semantics of <code>PersistencyFileElement</code>
[TPS_MANI_01144]	Semantics of <code>PersistencyKeyValuePair</code>
[TPS_MANI_01147]	Semantics of <code>PersistencyDeployment.updateStrategy</code>
[TPS_MANI_01148]	Semantics of <code>PersistencyDeploymentElement.updateStrategy</code>
[TPS_MANI_01149]	Semantics of <code>PersistencyFileStorage.file</code>
[TPS_MANI_01150]	Semantics of <code>PersistencyFileStorage</code>
[TPS_MANI_01155]	<code>PersistencyDeployment.updateStrategy</code> overrides <code>PersistencyInterface.updateStrategy</code>
[TPS_MANI_01156]	<code>PersistencyDeploymentElement.updateStrategy</code> overrides <code>PersistencyDeployment.updateStrategy</code>
[TPS_MANI_01157]	Semantics of <code>updateStrategy</code> on collection level
[TPS_MANI_01159]	Semantics of <code>updateStrategy</code> on element level
[TPS_MANI_01160]	Definition of initial value for <code>PersistencyDataElement</code>
[TPS_MANI_01164]	Semantics of <code>SoftwareCluster.dependsOn</code>
[TPS_MANI_01176]	Standardized value for attribute <code>CppImplementationDataType.typeEmitter</code>
[TPS_MANI_01177]	Semantics of attribute <code>CppImplementationDataType.typeEmitter</code>
[TPS_MANI_01179]	Semantics of <code>PersistencyFileElement.contentUri/PersistencyFileElement.contentUri</code> vs. <code>PersistencyFileStorage.uri</code> and <code>PersistencyFileElement.fileName/PersistencyFileElement.fileName</code>
[TPS_MANI_01180]	Collection of data types that requires serialization support
[TPS_MANI_01182]	Value of <code>PersistencyDeploymentElement.updateStrategy</code> overrides <code>PersistencyInterfaceElement.updateStrategy</code>
[TPS_MANI_01187]	Matching pairs of <code>PersistencyFileElement</code> and <code>PersistencyFile</code>
[TPS_MANI_01194]	Semantics of <code>PersistencyInterface.minimumSustainedSize</code>
[TPS_MANI_01196]	Semantics of <code>PersistencyDeployment.minimumSustainedSize</code>
[TPS_MANI_01197]	Semantics of <code>PersistencyDeployment.maximumAllowedSize</code>
[TPS_MANI_01204]	Specification of redundancy of persistent data
[TPS_MANI_01206]	Modeling of redundancy in the context of <code>PersistencyDeployment</code>
[TPS_MANI_01207]	Standardized values of attribute <code>PersistencyRedundancyChecksum.algorithmFamily</code>





Number	Heading
[TPS_MANI_01213]	Semantics of meta-class StrongRevisionLabelString
[TPS_MANI_01214]	Semantics of SoftwareCluster.conflictsTo
[TPS_MANI_01215]	Semantics of meta-class SoftwareClusterDependencyFormula
[TPS_MANI_01216]	Semantics of meta-class SoftwareClusterDependencyFormulaPart
[TPS_MANI_01217]	Semantics of meta-class SoftwareClusterDependencyCompareCondition
[TPS_MANI_01263]	Mapping of DiagnosticDataIdentifier or DiagnosticDataElement to PortPrototype (s) on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01272]	Duplicate entries in logTraceLogMode
[TPS_MANI_01280]	Semantics of meta-class PhmSupervisionRecoveryNotificationInterface
[TPS_MANI_01284]	Granularity of meta-class RawDataStreamGrantDesign
[TPS_MANI_01285]	Purpose of meta-class RawDataStreamDeployment
[TPS_MANI_01300]	Semantics of reference SoftwarePackageStep.transfer.transfer
[TPS_MANI_03059]	RequiredSomeipServiceInstance.requiredServiceInstanceId
[TPS_MANI_03111]	Mapping between method and operation located in a ClientServerInterface
[TPS_MANI_03113]	Mapping between a field and elements of Classic Platform PortInterfaces
[TPS_MANI_03130]	Standardized E2EProfileConfiguration.profileName values
[TPS_MANI_03145]	Description of a function group
[TPS_MANI_03160]	Further configuration options in DltLogChannel
[TPS_MANI_03163]	Network configuration for Log and Trace messages
[TPS_MANI_03165]	Network Interface configuration for DoIP
[TPS_MANI_03194]	Function Group State
[TPS_MANI_03195]	Off state in Function Group
[TPS_MANI_03207]	IPsec Internet Key Exchange protocol configuration
[TPS_MANI_03209]	The meaning of MachineDesign.accessControl
[TPS_MANI_03516]	Status for HealthChannelSupervision
[TPS_MANI_03517]	Evaluation of HealthChannelExternalStatus
[TPS_MANI_03535]	Definition of Time Synchronization interaction
[TPS_MANI_03536]	Time Synchronization interaction in a provider role
[TPS_MANI_03537]	Time Synchronization interaction in a consumer role
[TPS_MANI_03539]	Definition of Time-Base Resources
[TPS_MANI_03541]	Definition of SynchronizedTimeBaseConsumer
[TPS_MANI_03542]	Definition of SynchronizedTimeBaseProvider
[TPS_MANI_03543]	Definition of time sync correction attributes
[TPS_MANI_03546]	Definition of reported health status RPortPrototype
[TPS_MANI_03548]	Definition of TimeSyncPortPrototypeToTimeBaseMapping
[TPS_MANI_03549]	Usage of PortPrototype for the interaction with Time Synchronization





Number	Heading
[TPS_MANI_03551]	Definition of Time Base kind
[TPS_MANI_03556]	DDS-RPC Service Binding
[TPS_MANI_03557]	DDS <code>ClientServerOperation</code> Binding
[TPS_MANI_03558]	DDS <code>Field</code> Binding
[TPS_MANI_03598]	Expected check period of E2E-Protected payload
[TPS_MANI_03599]	Expected update period of E2E-Protected payload
[TPS_MANI_03612]	Sufficient ASIL level of translation software
[TPS_MANI_03617]	Version mapping between <code>ServiceInterface</code> and <code>ServiceInterfaceDeployment</code>

Table E.34: Changed Traceables in R20-11

E.7.3 Deleted Traceables in R20-11

Number	Heading
[TPS_MAIN_01281]	Usage of meta-class <code>RecoveryViaApplicationAction</code>
[TPS_MANI_01015]	Semantics of meta-class <code>StartupOption</code>
[TPS_MANI_01059]	Different values of <code>optionKind</code> within a <code>StartupConfig.startupOption</code>
[TPS_MANI_01069]	Further qualification of properties of <code>PortPrototypes</code> typed by <code>PersistenceKeyValueDatabaseInterfaces</code>
[TPS_MANI_01141]	Semantics of <code>PersistenceFileProxyInterface.updateStrategy</code>
[TPS_MANI_01143]	Semantics of <code>PersistenceFileProxy.updateStrategy</code>
[TPS_MANI_01151]	Semantics of <code>PersistenceFileArray.updateStrategy</code>
[TPS_MANI_01152]	Semantics of <code>PersistenceFile.updateStrategy</code>
[TPS_MANI_01154]	<code>PersistenceFileArray.updateStrategy</code> overrides <code>PersistenceFileProxyInterface.updateStrategy</code>
[TPS_MANI_01158]	<code>PersistenceFile.updateStrategy</code> overrides <code>PersistenceFileArray.updateStrategy</code>
[TPS_MANI_01163]	Impact of values of <code>category</code> on the semantics of <code>SoftwareCluster</code>
[TPS_MANI_01183]	<code>PersistenceFile.updateStrategy</code> overrides <code>PersistenceFileProxy.updateStrategy</code>
[TPS_MANI_01195]	Semantics of <code>PersistenceFileProxyInterface.minimumSustainedSize</code>
[TPS_MANI_01224]	Actions taken after installation of a <code>SoftwarePackage</code>
[TPS_MANI_01264]	Mapping of <code>DiagnosticServiceInstance</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01266]	Mapping of <code>DiagnosticServiceInstance</code> for upload/download to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01267]	Semantics of attribute <code>SoftwareClusterDesign.dependsOn</code>



△

Number	Heading
[TPS_MANI_01268]	Semantics of attribute <code>SoftwareClusterDesign.conflictsTo</code>
[TPS_MANI_01283]	Semantics of meta-class <code>RawDataStreamInterface</code>
[TPS_MANI_01286]	Semantics of attribute <code>RawDataStreamMethodDeployment.callTimeout</code>
[TPS_MANI_03065]	Hardware resources of the machine
[TPS_MANI_03161]	Log and Trace configuration options in the Service Instance Manifest
[TPS_MANI_03518]	<code>PhmLogicalExpression</code> definition
[TPS_MANI_03519]	<code>PhmRule</code> definition
[TPS_MANI_03520]	Execution of <code>PhmActionList</code> with <code>actionListExecution=triggeredOnEvaluation</code>
[TPS_MANI_03521]	Execution of <code>PhmActionList</code> with <code>actionListExecution=triggeredOnChange</code>
[TPS_MANI_03522]	Definition of actions for application software
[TPS_MANI_03523]	Definition of actions for Platform Instance
[TPS_MANI_03524]	Definition of actions for Watchdog
[TPS_MANI_03538]	Time Synchronization interaction with a local Time Base
[TPS_MANI_03540]	Definition of <code>PureLocalTimeBase</code>
[TPS_MANI_03559]	Definition of <code>DdsProvidedServiceInstance.methodQosProps</code>
[TPS_MANI_03560]	<code>qosProfile</code> of <code>DdsProvidedServiceInstance.methodQosProps</code> is optional
[TPS_MANI_03563]	Definition of <code>DdsProvidedServiceInstance.fieldGetSetQosProps</code>
[TPS_MANI_03564]	<code>qosProfile</code> of <code>DdsProvidedServiceInstance.fieldGetSetQosProps</code> is optional
[TPS_MANI_03565]	Definition of <code>DdsRequiredServiceInstance.methodQosProps</code>
[TPS_MANI_03566]	<code>qosProfile</code> of <code>DdsRequiredServiceInstance.methodQosProps</code> is optional
[TPS_MANI_03569]	Definition of <code>DdsRequiredServiceInstance.fieldGetSetQosProps</code>
[TPS_MANI_03570]	<code>qosProfile</code> of <code>DdsRequiredServiceInstance.fieldGetSetQosProps</code> is optional
[TPS_MANI_03571]	transportPlugin for <code>DdsProvidedServiceInstance</code>
[TPS_MANI_03572]	transportPlugin for <code>DdsRequiredServiceInstance</code>

Table E.35: Deleted Traceables in R20-11

E.7.4 Added Constraints in R20-11

Number	Heading
[constr_1743]	CppImplementationDataType.headerFile vs. CppImplementation-DataType.typeEmitter
[constr_1744]	Definition of process state In the context of the ExecutionDependency
[constr_1746]	Mutual exclusive existence of PersistencyInterface.redundancy and PersistencyInterface.redundancyHandling
[constr_1747]	Completeness of the SoftwareCluster.version
[constr_1748]	Existence of references TlvDataIdDefinition.tlvArgument, TlvDataIdDefinition.tlvRecordElement, and TlvDataIdDefinition.tlvSubElement
[constr_1751]	Value of PersistencyRedundancyMOutOfN.n and PersistencyRedundancyMOutOfN.m
[constr_1764]	Counterpart of PhmCheckpoint
[constr_1765]	Diagnostic Services eligible for DiagnosticServiceGenericMapping
[constr_1769]	Existence of ProcessArgument.argument
[constr_1770]	Value of ProvidedSomeipServiceInstance.serviceInstanceId
[constr_1784]	Restriction for the reference to UploadableExclusivePackageElement
[constr_1785]	Restriction regarding the reference into another SoftwareCluster
[constr_1786]	Restriction to use functionGroup in terms of SoftwareCluster
[constr_1787]	Restricted use of function groups in the context of a SoftwareCluster
[constr_1788]	Restriction to SoftwareCluster of category PLATFORM_CORE
[constr_1789]	Scope of machine function group
[constr_1809]	Global supervision restricted to one function group
[constr_3563]	Mandatory topic name values
[constr_3564]	Consistency between DDS Service Interface Deployment and Provided DDS Service Instance
[constr_3565]	Consistency between DDS Service Interface Deployment and Required DDS Service Instance
[constr_3568]	No support for cross PlatformHealthManagementContribution references
[constr_3569]	Applicability of attribute invalidValue on CppImplementationDataType of category TYPE_REFERENCE
[constr_3612]	Multiplicity of references recoveryNotification, recoveryAction, and process at RecoveryNotificationToPPortPrototypeMapping
[constr_3613]	Reference to a PhmSupervisionRecoveryNotificationInterface in the context of a HealthChannelSupervision
[constr_3614]	Reference to a PhmHealthChannelRecoveryNotificationInterface in the context of a HealthChannelExternalStatus
[constr_3619]	Mandatory references of TimeBaseProviderToPersistencyMapping
[constr_5115]	Search for a specific SOME/IP ServiceInstance and for all SOME/IP ServiceInstances over the same RPortPrototype





Number	Heading
[constr_5155]	<code>SomeipServiceInstanceToMachineMapping</code> only supports a single Address Family
[constr_5156]	<code>SomeipEventDeployment.transportProtocol</code> setting to <code>udp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_5161]	<code>RequiredSomeipServiceInstance</code> that is mapped by a <code>SomeipServiceInstanceToMachineMapping</code> without a configured <code>tcpPort</code> and <code>udpPort</code>
[constr_5227]	Mandatory elements of <code>UdpNmCluster</code>
[constr_5228]	Partial Networking timing constraint
[constr_5230]	Existence of attribute <code>E2EProfileCompatibilityProps.transitToInvalidExtended</code> is mandatory for each <code>E2EProfileConfiguration</code>
[constr_5238]	<code>CryptoKeySlotAllowedModification.restrictUpdate</code> and the relationship to <code>maxNumberOfAllowedUpdates</code>
[constr_5239]	Predefined values for <code>CryptoKeySlotContentAllowedUsage.allowedKeyslotUsage</code>
[constr_5240]	Restriction applicable for <code>CryptoProviderToPortPrototypeMapping.portPrototype</code>
[constr_5241]	Restriction applicable for <code>CryptoKeySlotToPortPrototypeMapping.portPrototype</code>
[constr_5242]	Restriction applicable for <code>CryptoCertificateToPortPrototypeMapping.portPrototype</code>
[constr_5243]	Restriction of <code>LogAndTraceInstantiation.dltEcuId</code> attribute value
[constr_10002]	Only one mapping per <code>PortPrototype</code>
[constr_10003]	Restriction for the existence of <code>DiagnosticServiceDataIdentifierPortMapping.diagnosticDataIdentifier</code> vs. <code>DiagnosticServiceDataIdentifierPortMapping.diagnosticDataElement</code>
[constr_10004]	Consistency of <code>DiagnosticServiceGenericMapping</code> for <code>PortPrototype</code> typed by <code>DiagnosticDataIdentifierGenericInterface</code>
[constr_10007]	Existence of <code>ProcessExecutionError.executionError</code>
[constr_10008]	Value of <code>ProcessExecutionError.executionError</code>
[constr_10010]	Usage of attribute <code>category</code> in a <code>SoftwareClusterDependencyFormula</code>
[constr_10011]	Definition of sub-software-cluster
[constr_10021]	Existence of <code>IdsmModuleInstantiation</code>
[constr_10022]	Restriction for <code>SecurityEventMapping.process.securityEvent.id</code> w.r.t <code>SecurityEventMapping.id</code>
[constr_10023]	Mandatory content of any <code>functionGroup</code>

Table E.36: Added Constraints in R20-11

E.7.5 Changed Constraints in R20-11

Number	Heading
[constr_1490]	Allowed value for <code>Executable.category</code> if <code>ProcessToMachineMapping</code> references a <code>NonOsModuleInstantiation</code>
[constr_1500]	Target <code>SwcServiceDependency</code> of <code>DiagnosticEventPortMapping.swcServiceDependencyInExecutable</code>
[constr_1507]	<code>PortInterfaceToDataTypeMapping</code> is only applicable to <code>ServiceInterface</code> or <code>PersistencyKeyValueStorageInterface</code>
[constr_1555]	Restriction applicable for <code>PersistencyPortPrototypeToKeyValueStorageMapping.portPrototype</code>
[constr_1556]	Restriction applicable for <code>PersistencyPortPrototypeToFileStorageMapping.portPrototype</code>
[constr_1564]	Existence of <code>SoftwareCluster.diagnosticAddress</code>
[constr_1566]	Usage of <code>SoftwareCluster.containedARElement</code>
[constr_1568]	Existence of <code>SoftwareCluster.diagnosticExtract</code>
[constr_1581]	Value of <code>fileElement.fileName</code>
[constr_1589]	Value of <code>file.fileName</code>
[constr_1613]	File name of matching pairs of <code>PersistencyFileElement</code> and <code>PersistencyFile</code>
[constr_1659]	Restriction for the usage of <code>CppImplementationDataTypeElementQualifier.inplace</code>
[constr_1666]	References from <code>PersistencyPortPrototypeToKeyValueStorageMapping</code> to <code>PersistencyKeyValueStorage</code>
[constr_1667]	References from <code>PersistencyPortPrototypeToFileStorageMapping</code> to <code>PersistencyFileStorage</code>
[constr_1668]	Allowed combinations of <code>PersistencyRedundancyChecksum.length</code> and <code>algorithmFamily</code>
[constr_1673]	Existence of attributes <code>hasGetter</code> , <code>hasSetter</code> , and <code>hasNotifier</code>
[constr_1710]	Consistency of values of attributes <code>PersistencyInterface.redundancy</code> and <code>PersistencyRedundancyHandling.scope</code>
[constr_1729]	Qualified combinations of <code>PortPrototypes</code> and <code>PhmSupervisionRecoveryNotificationInterface</code> / <code>PhmHealthChannelRecoveryNotificationInterface</code> on State Management software level
[constr_3305]	Value of attribute <code>SomeipEventDeployment.eventId</code> shall be unique
[constr_3306]	Value of attribute <code>methodId</code> shall be unique per <code>SomeipServiceInterfaceDeployment</code>
[constr_3356]	Restriction in usage of <code>ApSomeipTransformationProps.alignment</code>
[constr_3414]	Allowed usage of <code>PlatformModuleEthernetEndpointConfiguration</code> attributes
[constr_3421]	Fibex elements applicable for a <code>System</code> of <code>category MACHINE_DESIGN_EXTRACT</code>
[constr_3426]	The <code>logTraceFilePath</code> is mandatory in case that <code>logTraceLogMode</code> is set to <code>file</code>
[constr_3427]	The <code>logTraceFilePath</code> is only relevant if <code>logTraceLogMode</code> is set to <code>file</code>





Number	Heading
[constr_3493]	Applicable attributes for standardized E2E Profiles
[constr_3552]	Full mapping of target <code>event</code>
[constr_3554]	E2E protection configuration check
[constr_5052]	<code>ProvidedSomeipServiceInstances</code> of the same <code>serviceInterface</code> on one Machine

Table E.37: Changed Constraints in R20-11

E.7.6 Deleted Constraints in R20-11

Number	Heading
[constr_1481]	Usage of <code>DataPrototypeInServiceInterfaceRef</code> in the <i>AUTOSAR adaptive platform</i>
[constr_1497]	Attribute <code>optionKind</code> set to <code>commandLineSimpleForm</code>
[constr_1498]	Attribute <code>optionKind</code> set to <code>commandLineShortForm</code> or <code>commandLineLongForm</code>
[constr_1524]	Standardized values of <code>PersistencyFileProxyInterface.category</code>
[constr_1534]	Existence of <code>DiagnosticSoftwareClusterProps</code>
[constr_1542]	No nested definition of <code>SoftwareCluster</code>
[constr_1561]	Existence of <code>SoftwareClusterDesign.subSoftwareCluster</code> and <code>SoftwareClusterDesign.dependsOn.dependentSoftwareClusterDesign</code>
[constr_1563]	Standardized values of <code>SoftwareClusterDesign.category</code> and <code>SoftwareCluster.category</code>
[constr_1565]	Existence of <code>SoftwareCluster.subSoftwareCluster</code>
[constr_1567]	Existence of <code>SoftwareCluster.subSoftwareCluster</code> and <code>SoftwareCluster.dependsOn/conflictsTo</code>
[constr_1615]	Existence of attribute <code>SomeipDataPrototypeTransformationProps.someipTransformationProps.sessionHandling</code>
[constr_1687]	Definition of machine state
[constr_1703]	Target <code>SwcServiceDependency</code> of <code>DiagnosticGenericUdsPortMapping.swcServiceDependencyInExecutable</code>
[constr_1704]	Target <code>SwcServiceDependency</code> of <code>DiagnosticUploadDownloadPortMapping.swcServiceDependencyInExecutable</code>
[constr_1705]	Target of reference <code>SoftwareActivationDependencyCompareCondition.softwareActivationDependency</code>
[constr_1709]	Applicability of attribute <code>PersistencyRedundancyEnum.redundantPerKey</code>
[constr_1730]	Restriction regarding the modeling of the <code>PhmRecoveryActionInterface.recovery</code>
[constr_3296]	Transport Protocol attributes defined for a <code>RequiredSomeipServiceInstance</code>
[constr_3297]	<code>SomeipServiceInstanceToMachineMapping</code> only supports a single Address Family





Number	Heading
[constr_3307]	<code>SomeipEventDeployment.transportProtocol</code> setting to <code>udp</code> and the impact on <code>ProvidedSomeipServiceInstances</code>
[constr_3412]	<code>OsModuleInstantiation</code> shall have at least one <code>ResourceGroup</code>
[constr_3527]	<code>PhmLogicalExpression</code> referenced by one <code>PhmRule</code>
[constr_3543]	At least one <code>transportPlugin</code> definition required for each <code>DdsProvidedServiceInstance</code>
[constr_3544]	At least one <code>transportPlugin</code> definition required for each <code>DdsRequiredServiceInstance</code>
[constr_3556]	Unique transport layer mapping

Table E.38: Deleted Constraints in R20-11

E.8 Constraint and Specification Item History of this document according to AUTOSAR Release R21-11

E.8.1 Added Traceables in R21-11

Number	Heading
[TPS_MANI_01343]	Relation between Function Group states and <code>NmNetworkHandle</code>
[TPS_MANI_01344]	Actions taken after installation of a <code>SoftwarePackage</code>
[TPS_MANI_01345]	Ability to attach checksums to <code>SoftwareCluster</code>
[TPS_MANI_01346]	No formal definition of checksum algorithm
[TPS_MANI_01347]	Definition of a <code>DiagnosticDataElement</code> used in the context of a DID obtained from a <code>PPortPrototype</code> typed by a <code>DiagnosticDataElementInterface</code>
[TPS_MANI_01348]	Definition of a <code>DiagnosticDataElement</code> used in the context of a DID obtained from a <code>PPortPrototype</code> typed by a <code>DiagnosticDataIdentifierInterface</code>
[TPS_MANI_01349]	Configuration of diagnostic-related properties of a <code>SoftwareCluster</code>
[TPS_MANI_01350]	Semantics of <code>DiagnosticServiceValidationConfiguration</code>
[TPS_MANI_01351]	Reporting the status of a <code>DiagnosticEvent</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01352]	Definition of <code>DiagnosticServiceValidationMapping</code>
[TPS_MANI_01353]	Semantics of <code>DiagnosticExternalAuthenticationInterface</code>
[TPS_MANI_01354]	Rationale for the existence of meta-class <code>AbstractRawDataStreamEthernetCredentials</code>
[TPS_MANI_01355]	Definition of local Ethernet credentials
[TPS_MANI_01356]	Definition of remote server's Ethernet credentials
[TPS_MANI_01357]	Definition of remote client's Ethernet credentials





Number	Heading
[TPS_MANI_01358]	Restriction for the configuration of diagnostic debouncing
[TPS_MANI_01359]	Semantics of DiagnosticAuthenticationInterface
[TPS_MANI_01360]	Creation of two diagnostic mappings the fulfill different roles in the context of authenticating a diagnostic client
[TPS_MANI_01361]	Support the authentication request of a diagnostic client
[TPS_MANI_01362]	Support the responding to an authentication request of a diagnostic client
[TPS_MANI_01363]	Semantics of DiagnosticComControlInterface
[TPS_MANI_02384]	DltLogSink with category DLT_LOGSINK_REMOTE
[TPS_MANI_02385]	DltLogSink with category DLT_LOGSINK_DLT
[TPS_MANI_02386]	DltLogSink with category DLT_LOGSINK_FILE
[TPS_MANI_02387]	DltLogSink with category DLT_LOGSINK_CONSOLE
[TPS_MANI_02388]	Semantics of DltLogSinkToPortPrototypeMapping
[TPS_MANI_03277]	ServiceInterfaceElementMappings for a subset of elements of a single ServiceInterface
[TPS_MANI_03278]	Usage of ApSomeipTransformationProps.byteOrder
[TPS_MANI_03279]	Priority of Nm messages
[TPS_MANI_03280]	Semantics of ApApplicationEndpoint
[TPS_MANI_03281]	Port specific TCP configuration settings
[TPS_MANI_03282]	Assignment of a Dlt Ecu Identifier to a LogAndTraceInstantiation
[TPS_MANI_03283]	Standardized values for attribute DltLogSink.category
[TPS_MANI_03284]	Semantics of LogAndTraceInterface
[TPS_MANI_03285]	Semantics of PortPrototype.logAndTraceMessageCollectionSet
[TPS_MANI_03286]	Assignment of DltApplication to a Process
[TPS_MANI_03287]	ServiceInterface.trigger to ISignalTriggering mapping
[TPS_MANI_03288]	ApSomeipTransformationProps for triggers
[TPS_MANI_03289]	Semantics of ServiceInterfaceTriggerMapping
[TPS_MANI_03290]	Semantics of ComTriggerGrantDesign
[TPS_MANI_03291]	Semantics of ServiceInterface.trigger
[TPS_MANI_03633]	Semantics of several supervisionMode references for one supervision
[TPS_MANI_03635]	Determination of translation direction
[TPS_MANI_03636]	Definition of ServiceInterfaceElementSecureComConfig in the context of signal/service translation
[TPS_MANI_03637]	Ignored attributes of ServiceInterfaceElementSecureComConfig in the context of signal/service translation
[TPS_MANI_03638]	Mapping of MultiplexedIPdu
[TPS_MANI_03639]	Mapping of MultiplexedIPdu static part
[TPS_MANI_03640]	Mapping of MultiplexedIPdu dynamic part
[TPS_MANI_03641]	No mapping of MultiplexedIPdu selector field value
[TPS_MANI_03642]	Exactly one alternative defined for mapped event / field during runtime





Number	Heading
[TPS_MANI_03643]	Translation- <i>Executable</i> category
[TPS_MANI_03644]	Supported reception data filters
[TPS_MANI_03645]	Applicability of a filter to the <i>scoped filtered element</i>
[TPS_MANI_03646]	Definition of transmission triggers for <i>signal-service-translation</i>
[TPS_MANI_03647]	Full translation before transmission triggering
[TPS_MANI_03648]	Transmission trigger for <i>signal-service-translation</i>
[TPS_MANI_03649]	No transmission trigger for <i>signal-service-translation</i>
[TPS_MANI_03650]	Definition of <i>DdsServiceInstanceResourceIdentifierTypeEnum</i>
[TPS_MANI_03651]	Mandatory <i>SupervisionCheckpoint.process</i> reference
[TPS_MANI_03652]	<i>Signal/service translation</i> header format
[TPS_MANI_03653]	<i>Signal/service translation</i> header endianness
[TPS_MANI_03654]	Definition of <i>Partial SOME/IP Header ID</i>
[TPS_MANI_03655]	Definition of <i>No Message Header</i> - implicit SOME/IP Message Identification
[TPS_MANI_03656]	Definition of <i>No Message Header</i> - implicit Arbitrary Message Identification
[TPS_MANI_03657]	<i>Signal-service-translation</i> SOME/IP Service Discovery Find
[TPS_MANI_03658]	<i>Service-signal-translation</i> SOME/IP Service Discovery Offer
[TPS_MANI_03659]	No <i>signal-service-translation</i> SOME/IP Service Discovery Find
[TPS_MANI_03660]	No <i>signal-service-translation</i> SOME/IP Service Discovery Offer
[TPS_MANI_03661]	Configuration of Governance in DDS Security
[TPS_MANI_03662]	Configuration of Topic access rules

Table E.39: Added Traceables in R21-11

E.8.2 Changed Traceables in R21-11

Number	Heading
[TPS_MANI_01001]	Meaning of <i>ServiceInterface</i>
[TPS_MANI_01048]	Retrieving the status of a <i>DiagnosticEvent</i> to <i>PortPrototype(s)</i> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01049]	Mapping of <i>DiagnosticOperationCycle</i> to <i>PortPrototype(s)</i> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01050]	Mapping of <i>DiagnosticEnableCondition</i> to <i>PortPrototype(s)</i> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01111]	Diagnostic Address of a <i>SoftwareCluster</i>
[TPS_MANI_01176]	Standardized value for attribute <i>CppImplementationDataType.typeEmitter</i>





Number	Heading
[TPS_MANI_01239]	Semantics of meta-class <code>ComEventGrant</code>
[TPS_MANI_01244]	Semantics of <code>DiagnosticDataElementInterface</code>
[TPS_MANI_01259]	Mapping of <code>DiagnosticClearCondition</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01260]	Mapping of <code>DiagnosticIndicator</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01261]	Mapping of <code>DiagnosticMemoryDestination</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01262]	Mapping of <code>DiagnosticSecurityLevel</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01263]	Mapping of <code>DiagnosticDataIdentifier</code> or <code>DiagnosticDataElement</code> to <code>PortPrototype(s)</code> on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01274]	Standardized System Category Definitions for the Adaptive Platform
[TPS_MANI_01287]	Semantics of <code>RawDataStreamMapping</code>
[TPS_MANI_01326]	Generic Mapping to a <code>DiagnosticServiceInstance</code> on the AUTOSAR Adaptive Platform
[TPS_MANI_01331]	Standardized values of attribute <code>SoftwareCluster.category</code>
[TPS_MANI_03007]	Udp Transport Protocol Configuration for <code>ProvidedSomeipServiceInstance</code>
[TPS_MANI_03008]	Tcp Transport Protocol Configuration for <code>ProvidedSomeipServiceInstance</code>
[TPS_MANI_03010]	Udp Transport Protocol Configuration in case of IP-Multicast
[TPS_MANI_03038]	Purpose of <code>ServiceEventDeployment</code>
[TPS_MANI_03101]	SOME/IP serialization
[TPS_MANI_03109]	<code>TransformationProps</code> on the level of <code>DataPrototypes</code> overwrites <code>TransformationProps</code> settings on the level of a <code>ServiceInterface</code>
[TPS_MANI_03114]	Usage of <code>AssemblySwConnectors</code> in the System Design model
[TPS_MANI_03130]	Standardized values of the attribute <code>E2EProfileConfiguration.profileName</code>
[TPS_MANI_03131]	Non-Standardized values of attribute <code>E2EProfileConfiguration.profileName</code>
[TPS_MANI_03163]	Network configuration for Log and Trace messages
[TPS_MANI_03165]	Network Interface configuration for DoIP
[TPS_MANI_03185]	Structure of a <code>CppImplementationDataType</code> of category <code>ASSOCIATIVE_MAP</code>
[TPS_MANI_03225]	References to VLANs in <code>PncMapping</code>
[TPS_MANI_03227]	Usage of ephemeral ports
[TPS_MANI_03252]	Usage of same <code>End2EndMethodProtectionProps.sourceId</code> in case of Multi-Binding
[TPS_MANI_03274]	Configuration of log and trace sinks
[TPS_MANI_03276]	Semantics of <code>PersistencyDeploymentToDltLogSinkMapping</code>
[TPS_MANI_03512]	Applicability of global supervision without <code>Process</code> context





Number	Heading
[TPS_MANI_03513]	Collection of supervisions into a GlobalSupervision
[TPS_MANI_03514]	Expiration tolerance for SupervisionMode
[TPS_MANI_03515]	Failure tolerance for AliveSupervision
[TPS_MANI_03527]	Definition of DdsProvidedServiceInstance
[TPS_MANI_03529]	Definition of DdsRequiredServiceInstance
[TPS_MANI_03577]	Definition of Arbitrary Message Header ID
[TPS_MANI_03585]	Processing order of COM-Stack features
[TPS_MANI_03589]	Reception data filter of COM-Stack
[TPS_MANI_03590]	Transfer properties and transmission modes of COM-Stack
[TPS_MANI_03592]	ISignal invalidation of COM-Stack
[TPS_MANI_03593]	handleInvalid = dontInvalidate behavior of COM-Stack
[TPS_MANI_03594]	handleInvalid = replace behavior of COM-Stack
[TPS_MANI_03597]	Support for MultiplexedIPdu
[TPS_MANI_03600]	Signal-service-translation of E2E protected payload
[TPS_MANI_03601]	Signal-service-translation of E2E protected payload - timeout handling
[TPS_MANI_03602]	Signal-service-translation of E2E protected payload - error handling
[TPS_MANI_03603]	Service-signal-translation of E2E protected payload
[TPS_MANI_03604]	Service-signal-translation of E2E protected payload - timeout handling
[TPS_MANI_03605]	Service-signal-translation of E2E protected payload - error handling
[TPS_MANI_03607]	Handling of safe signal/service translation in one Executable
[TPS_MANI_03608]	Support for safe signal/service translation
[TPS_MANI_03609]	Support for safe signal/service translation with same or different E2E profiles
[TPS_MANI_03621]	Data filtering during the signal-service-translation
[TPS_MANI_03627]	No signal/service translation for methods

Table E.40: Changed Traceables in R21-11

E.8.3 Deleted Traceables in R21-11

Number	Heading
[TPS_MANI_01014]	Semantics of meta-class StartupConfigSet
[TPS_MANI_01037]	Diagnostic data mapping on the <i>AUTOSAR adaptive platform</i>
[TPS_MANI_01054]	Definition of the queue length of an event or field notifier
[TPS_MANI_01060]	Use cases for the application of DiagnosticServiceDataMapping
[TPS_MANI_01103]	Three-level approach to REST modeling
[TPS_MANI_01105]	Semantics of RestServiceInterface





Number	Heading
[TPS_MANI_01120]	Recursive definition of <code>RestResourceDef</code>
[TPS_MANI_01121]	Semantics of <code>RestResourceDef.endpoint</code>
[TPS_MANI_01122]	Arguments to endpoints
[TPS_MANI_01123]	System Triggered Event
[TPS_MANI_01124]	Semantics of <code>RestElementDef</code>
[TPS_MANI_01125]	Properties of REST elements can either be primitive or have array semantics
[TPS_MANI_01126]	Definition of string properties
[TPS_MANI_01127]	Limited support for data semantics in <code>RestAbstractNumericalPropertyDef</code>
[TPS_MANI_01128]	Difference between <code>RestIntegerPropertyDef</code> and <code>RestNumberPropertyDef</code>
[TPS_MANI_01129]	<code>RestObjectRef</code> is only needed for specific implementations of REST-based communication
[TPS_MANI_01130]	Structure of a typical URI for a REST service
[TPS_MANI_01131]	Impact of nested REST resources on the structure of REST URI
[TPS_MANI_01178]	Semantics of <code>RestHttpPortPrototypeMapping.acceptEncoding</code>
[TPS_MANI_01256]	<code>AdaptiveApplicationSwComponentType</code> offers a <code>PPortPrototype</code> typed by <code>DiagnosticIndicatorInterface</code>
[TPS_MANI_01257]	<code>AdaptiveApplicationSwComponentType</code> offers a <code>PPortPrototype</code> typed by <code>DiagnosticConditionInterface</code>
[TPS_MANI_01258]	<code>AdaptiveApplicationSwComponentType</code> offers a <code>PPortPrototype</code> typed by <code>DiagnosticGenericUdsInterface</code>
[TPS_MANI_01272]	Duplicate entries in <code>logTrageLogMode</code>
[TPS_MANI_01288]	Impact of the <code>SoftwarePackage</code> on the value of function group states on the target platform
[TPS_MANI_01289]	Order of function group states is relevant
[TPS_MANI_01303]	Semantics of reference <code>SoftwarePackageStep.preActivate</code>
[TPS_MANI_01304]	Semantics of reference <code>SoftwarePackageStep.verify</code>
[TPS_MANI_01311]	Handling of manufacturer checks
[TPS_MANI_01312]	Handling of supplier checks
[TPS_MANI_01336]	Two use cases for using the <code>DiagnosticEventPortMapping</code>
[TPS_MANI_03075]	Byte Order of chosen <code>DataPrototype</code> in the serialized data stream
[TPS_MANI_03160]	Further configuration options in <code>DltLogChannel</code>
[TPS_MANI_03275]	Configuration of log and trace message source on design level
[TPS_MANI_03552]	Supervision cycle for <code>GlobalSupervision</code>
[TPS_MANI_03584]	Definition of transmission triggers for translations with different sources
[TPS_MANI_03586]	No transmission trigger for translations with different sources
[TPS_MANI_03587]	Transmission trigger for translations with different sources
[TPS_MANI_03588]	Full translation before transmission triggering
[TPS_MANI_03596]	Update Bit support for <code>ISignalIPdu</code>

Table E.41: Deleted Traceables in R21-11

E.8.4 Added Constraints in R21-11

Number	Heading
[constr_3623]	SupervisionCheckpoints in the context of a GlobalSupervision
[constr_3624]	At least one Supervision defined in the context of a GlobalSupervision
[constr_3625]	DeadlineSupervision referencing CheckpointTransition in the context of a GlobalSupervision
[constr_3626]	LogicalSupervision referencing CheckpointTransition in the context of a GlobalSupervision
[constr_3627]	Existence of SupervisionModeCondition.stateReference
[constr_3628]	Reference to Function Group State from a SupervisionModeCondition
[constr_3629]	Identical Function Group in the scope of a GlobalSupervision
[constr_3630]	GlobalSupervision and Process relation
[constr_3631]	Global supervision restricted to one Function Group
[constr_3632]	Supervision of a Supervised Entity Instance in the scope of a Function Group State
[constr_3633]	Mandatory attributes of AliveSupervision
[constr_3634]	Multiplicity of CheckpointTransition.source and CheckpointTransition.target
[constr_3635]	Mandatory attributes of DeadlineSupervision
[constr_3636]	Consistent ISignal communication direction in and RequiredApServiceInstance
[constr_3637]	Consistent ISignal communication direction out and ProvidedApServiceInstance
[constr_3639]	Existence of SupervisionMode.expiredSupervisionTolerance
[constr_3640]	Existence of SupervisionMode.modeCondition
[constr_3641]	Allowed combinations of ServiceInterfaceDeployment, AdaptivePlatformServiceInstance, ServiceInstanceToMachineMapping
[constr_3642]	Restriction of aggregation of PortPrototypeProps to the Adaptive Platform
[constr_3643]	No filter support for service-signal-translation direction
[constr_3644]	No transmissionTrigger support for service-signal-translation direction
[constr_3645]	discoveryType mandatory for DdsProvidedServiceInstance
[constr_3646]	resourceIdentifierType mandatory for DdsProvidedServiceInstance
[constr_3647]	resourceIdentifierType value for USER_DATA QoS-based discovery
[constr_3648]	discoveryType mandatory for DdsRequiredServiceInstance
[constr_3649]	Consistent SupervisionCheckpoint.process reference
[constr_3650]	headerId required in case of Arbitrary Message Header
[constr_3674]	Existence of NoSupervision.targetPhmSupervisedEntity
[constr_3675]	Existence of NoSupervision.process
[constr_3676]	Exclusive usage of NoSupervision





Number	Heading
[constr_3677]	ComGrants referencing DDS Service Instances
[constr_3678]	Existence of attributes for DdsSecureComProps
[constr_3679]	Existence of attributes for DdsSecureGovernance
[constr_3680]	Existence of attributes for DdsTopicAccessRule
[constr_3681]	Supported values of DdsTopicAccessRule.dataProtectionKind
[constr_3682]	Values of DdsDomainRange.min and DdsDomainRange.max
[constr_3683]	Attributes referencing DdsTopicAccessRule
[constr_3684]	Mutual exclusivity of Secure Communication Properties
[constr_5250]	Protection of AdaptivePlatformServiceInstances of the same ServiceInterfaceDeployment
[constr_5260]	UDP endpoint using DTLS CLIENT role can only serve required service instances
[constr_5261]	TCP endpoint using TLS CLIENT role can only serve required service instances
[constr_5275]	Existence of LogAndTraceInstantiation.dltEcu
[constr_5276]	Existence of LogAndTraceInstantiation.logSink
[constr_5277]	applicable DltLogSink categories
[constr_5278]	DltLogSink with category DLT_LOGSINK_REMOTE is only allowed to be referenced by DltLogSinkToPortPrototypeMapping
[constr_5279]	DltLogSink with category DLT_LOGSINK_DLT is only allowed to be referenced by LogAndTraceInstantiation
[constr_5280]	Existence of DltLogSink.defaultLogThreshold
[constr_5281]	Existence of DltLogSink.defaultTraceState
[constr_5282]	Existence of DltLogSinkToPortPrototypeMapping.process
[constr_5283]	Existence of DltLogSinkToPortPrototypeMapping.dltLogSink
[constr_5284]	Existence of DltLogSinkToPortPrototypeMapping.dltContext
[constr_5285]	Existence of PortPrototype references in DltLogSinkToPortPrototypeMapping
[constr_5286]	Restriction applicable for DltLogSinkToPortPrototypeMapping.rPortPrototype
[constr_5287]	Restriction applicable for DltLogSinkToPortPrototypeMapping.pPortPrototype
[constr_5288]	Existence of process reference in DltApplicationToProcessMapping
[constr_5289]	Existence of dltApplication reference in DltApplicationToProcessMapping
[constr_5290]	PPortPrototype is not allowed to be typed by LogAndTraceInterface
[constr_5291]	Allowed usage of PortPrototype.logAndTraceMessageCollectionSet
[constr_5292]	Assigned dltSessionId shall be consistent for the same PortPrototype
[constr_5316]	Allowed ServiceEventDeployment.trigger references
[constr_5317]	ServiceEventDeployment not allowed to reference an event and a trigger at the same time
[constr_5318]	Existence of ServiceInstanceToSignalMapping for an trigger with signalBased serialization





Number	Heading
[constr_10029]	<code>ServiceInterfaceDeployment</code> shall cover all elements of the corresponding <code>ServiceInterfaceDeployment</code>
[constr_10030]	Existence of <code>DiagnosticDataIdentifierInterface.read</code>
[constr_10031]	Existence of <code>DiagnosticRoutineInterface.start</code>
[constr_10035]	Completeness of the <code>PersistencyDeployment.version</code>
[constr_10037]	Existence of attribute <code>TagWithOptionalValue.sequenceOffset</code> in the context of attribute <code>capabilityRecord</code> owned by <code>ProvidedSomeipServiceInstance</code> , <code>RequiredSomeipServiceInstance</code> , <code>SdServerConfig</code> , <code>SdClientConfig</code> , or <code>AbstractServiceInstance</code>
[constr_10046]	Value of <code>PersistencyRedundancyMOutOfN.n</code>
[constr_10047]	Restriction for the applicability of <code>DiagnosticMonitorPortMapping</code>
[constr_10048]	Existence of reference from <code>DiagnosticMonitorPortMapping</code> to <code>DiagnosticEvent</code>
[constr_10049]	Restriction for the applicability of <code>DiagnosticEventPortMapping</code>
[constr_10050]	Restriction for the applicability of <code>DiagnosticOperationCyclePortMapping</code>
[constr_10051]	Existence of reference from <code>DiagnosticOperationCyclePortMapping</code> to <code>DiagnosticOperationCycle</code>
[constr_10052]	Restriction for the applicability of <code>DiagnosticEnableConditionPortMapping</code>
[constr_10053]	Existence of reference from <code>DiagnosticEnableConditionPortMapping</code> to <code>DiagnosticEnableCondition</code>
[constr_10054]	Restriction for the applicability of <code>DiagnosticClearConditionPortMapping</code>
[constr_10055]	Existence of reference from <code>DiagnosticClearConditionPortMapping</code> to <code>DiagnosticClearCondition</code>
[constr_10056]	Restriction for the applicability of <code>DiagnosticIndicatorPortMapping</code>
[constr_10057]	Restriction for the applicability of <code>DiagnosticMemoryDestinationPortMapping</code>
[constr_10058]	Restriction for the applicability of <code>DiagnosticSecurityLevelPortMapping</code>
[constr_10059]	Existence of reference from <code>DiagnosticSecurityLevelPortMapping</code> to <code>DiagnosticSecurityLevel</code>
[constr_10060]	<code>PortInterface</code> of <code>PPortPrototype</code> referenced by <code>DiagnosticDataPortMapping</code>
[constr_10061]	Mapping to <code>DiagnosticDataIdentifierInterface</code> , <code>DiagnosticDataElementInterface</code> , or <code>DiagnosticDataIdentifierGenericInterface</code>
[constr_10062]	<code>DiagnosticServiceInstances</code> that can be mapped by a <code>DiagnosticServiceGenericMapping</code>
[constr_10063]	Possible values for <code>DiagnosticServiceValidationMapping.category</code>
[constr_10064]	Existence of <code>DiagnosticServiceValidationMapping.pPortPrototypeInExecutable</code>
[constr_10065]	Validity of <code>DiagnosticServiceValidationConfiguration.manufacturerValidationOrder</code>
[constr_10066]	Validity of <code>DiagnosticServiceValidationConfiguration.supplierValidationOrder</code>





Number	Heading
[constr_10069]	Existence of <code>SoftwareClusterDiagnosticProps.powerDownTime</code>
[constr_10070]	Value of <code>RequiredSomeipServiceInstance.requiredServiceInstanceId</code>
[constr_10076]	Existence of <code>RawDataStreamEthernetUdpCredentials.udpPort</code>
[constr_10077]	Existence of <code>ipV4Address</code> and <code>ipV6Address</code> within <code>AbstractRawDataStreamEthernetCredentials</code>
[constr_10078]	Existence of <code>RawDataStreamEthernetTcpUdpCredentials.tcpPort</code> and <code>udpPort</code>
[constr_10079]	Existence of <code>EthernetRawDataStreamMapping.localTcpPort</code> and <code>localUdpPort</code>
[constr_10080]	Existence of initial values for <code>PersistencyFileElement</code>
[constr_10081]	Existence of initial values in the definition of <code>PersistencyDataRequiredComSpec</code>
[constr_10082]	Existence of initial values for <code>PersistencyFile</code>
[constr_10083]	Existence of initial values for <code>PersistencyKeyValuePair</code>
[constr_10086]	Existence of <code>unicastUdpCredentials</code> and <code>multicastCredentials</code> in the context of a <code>EthernetRawDataStreamServerMapping</code>
[constr_10090]	Existence of <code>ProcessToMachineMapping.persistencyCentralStorageURI</code>
[constr_10092]	Restriction for the applicability of <code>DiagnosticAuthenticationPortMapping</code>
[constr_10093]	Existence of reference from <code>DiagnosticAuthenticationPortMapping</code> to <code>DiagnosticAuthentication</code>
[constr_10094]	Restriction for the applicability of <code>DiagnosticExternalAuthenticationPortMapping</code>
[constr_10095]	Existence of reference from <code>DiagnosticExternalAuthenticationPortMapping</code> to <code>DiagnosticAuthentication</code>

Table E.42: Added Constraints in R21-11

E.8.5 Changed Constraints in R21-11

Number	Heading
[constr_1482]	Mapping of service interfaces vs. mapping of service interface elements
[constr_1564]	Existence of <code>SoftwareCluster.diagnosticProps.diagnosticAddress</code>
[constr_1598]	Scope of the uniqueness of the value of <code>TlvDataIdDefinition.id</code> for references to <code>CppImplementationDataTypeElement</code>
[constr_1601]	<code>TlvDataIdDefinition</code> referencing <code>CppImplementationDataTypeElement</code>
[constr_1604]	Completeness of the existence of a set of <code>TlvDataIdDefinition.tlvImplementationDataTypeElements</code>





Number	Heading
[constr_1697]	Restriction for <code>ClientServerOperation</code> aggregated by a <code>DiagnosticDataIdentifierInterface</code> or <code>DiagnosticDataElementInterface</code>
[constr_1748]	Existence of references <code>TlvDataIdDefinition.tlvArgument</code> , <code>TlvDataIdDefinition.tlvRecordElement</code> , and <code>TlvDataIdDefinition.tlvImplementationDataTypeElement</code>
[constr_1751]	Value of <code>PersistencyRedundancyMOutOfN.m</code>
[constr_1764]	Counterpart of <code>PhmCheckpoint</code>
[constr_1770]	Value of <code>ProvidedSomeipServiceInstance.serviceInstanceId</code>
[constr_3288]	IP configuration restriction for <code>unicastNetworkEndpoints</code>
[constr_3395]	<code>TransformationPropsToServiceInterfaceElementMapping</code> is restricted to one single <code>ServiceInterface</code>
[constr_3421]	Fibex elements applicable for a <code>System</code> of <code>category</code> <code>MACHINE_DESIGN_EXTRACT</code>
[constr_3485]	UDP endpoint using DTLS SERVER role can only serve provided service instances
[constr_3486]	TCP endpoint using TLS SERVER role can only serve provided service instances
[constr_3493]	Applicable attributes for standardized E2E Profiles
[constr_3539]	Only one <code>AliveSupervision</code> per <code>SupervisionCheckpoint</code>
[constr_3540]	<code>SupervisionCheckpoint</code> in supervision graph
[constr_3541]	<code>qosProfile</code> mandatory for <code>DdsProvidedServiceInstance</code>
[constr_3542]	<code>qosProfile</code> mandatory for <code>DdsRequiredServiceInstance</code>
[constr_3555]	No support for <code>useAsCryptographicIPdu</code> is true
[constr_5047]	Supported values of <code>TlsSecureComProps.category</code>
[constr_5052]	<code>ProvidedSomeipServiceInstances</code> of the same <code>serviceInterface</code> on one Machine
[constr_5056]	Restriction of sub-class of <code>CompositionSwComponentType.connector</code>
[constr_5057]	<code>PassThroughSwConnector</code> and <code>ServiceInterfaceMapping</code>
[constr_5155]	<code>SomeipServiceInstanceToMachineMapping</code> only supports a single Address Family
[constr_10002]	Only one mapping per <code>PortPrototype</code>
[constr_10003]	Restriction for the existence of <code>DiagnosticDataPortMapping.diagnosticDataIdentifier</code> vs. <code>DiagnosticDataPortMapping.diagnosticDataElement</code>

Table E.43: Changed Constraints in R21-11

E.8.6 Deleted Constraints in R21-11

Number	Heading
[constr_1496]	DiagnosticServiceDataMapping.mappedApDataElement shall only refer to specific sub-classes of DataPrototype
[constr_1500]	Target SwcServiceDependency of DiagnosticEventPortMapping.swcServiceDependencyInExecutable
[constr_1501]	Target SwcServiceDependency of DiagnosticOperationCyclePortMapping.swcServiceDependencyInExecutable
[constr_1502]	Target SwcServiceDependency of DiagnosticEnableConditionPortMapping.swcServiceDependencyInExecutable
[constr_1569]	Restriction for the scope of RestHttpPortPrototypeMapping.acceptEncoding
[constr_1580]	Restriction for the usage of RestHttpPortPrototypeMapping.acceptEncoding
[constr_1698]	Target SwcServiceDependency of DiagnosticClearConditionPortMapping.swcServiceDependencyInExecutable
[constr_1699]	Target SwcServiceDependency of DiagnosticIndicatorPortMapping.swcServiceDependencyInExecutable
[constr_1700]	Target SwcServiceDependency of DiagnosticMemoryDestinationPortMapping.swcServiceDependencyInExecutable
[constr_1701]	Target SwcServiceDependency of DiagnosticSecurityLevelPortMapping.swcServiceDependencyInExecutable
[constr_1702]	Target SwcServiceDependency of DiagnosticServiceDataIdentifierPortMapping.swcServiceDependencyInExecutable
[constr_1733]	Simultaneous existence of SoftwarePackageStep.preActivate and SoftwarePackageStep.verify
[constr_1738]	Multiplicity of reference GlobalSupervision.localSupervision
[constr_1739]	Multiplicity of aggregation localSupervision.transition
[constr_1744]	Definition of process state In the context of the ExecutionDependency
[constr_1765]	Diagnostic Services eligible for DiagnosticServiceGenericMapping
[constr_1809]	Global supervision restricted to one function group
[constr_3366]	System category for a system design description with Adaptive Platform and Classic Platform content
[constr_3426]	The logTraceFilePath is mandatory in case that logTrageLogMode is set to file
[constr_3427]	The logTraceFilePath is only relevant if logTrageLogMode is set to file
[constr_3537]	localSupervision referenced once in the context of a GlobalSupervision
[constr_3562]	Existence of NonqueuedReceiverComSpec.filter
[constr_5243]	Restriction of LogAndTraceInstantiation.dltEcuId attribute value
[constr_10004]	Consistency of DiagnosticServiceGenericMapping for PortPrototype typed by DiagnosticDataIdentifierGenericInterface

Table E.44: Deleted Constraints in R21-11

E.9 Constraint and Specification Item History of this document according to AUTOSAR Release R22-11

E.9.1 Added Traceables in R22-11

Number	Heading
[TPS_MANI_01365]	Semantics of attribute <code>NmHandleToFunctionGroupStateMapping.mappingDirection</code> set to <code>functionGroupStateToNmHandle</code>
[TPS_MANI_01366]	Semantics of attribute <code>NmHandleToFunctionGroupStateMapping.mappingDirection</code> set to <code>nmHandleInactiveToFunctionGroupState</code>
[TPS_MANI_01367]	Semantics of attribute <code>NmHandleToFunctionGroupStateMapping.mappingDirection</code> set to <code>nmHandleActiveToFunctionGroupState</code>
[TPS_MANI_01369]	Semantics of reference <code>SoftwareClusterDesign.requiredARElement</code>
[TPS_MANI_01370]	Semantics of <code>ExecutableImplementationProps</code>
[TPS_MANI_01371]	<code>PersistencyDeployment.redundancyHandling</code> does not exist
[TPS_MANI_01372]	Properties of data obtained from the application software
[TPS_MANI_01373]	Semantics of <code>DiagnosticRequestFileTransferInterface</code>
[TPS_MANI_01374]	Semantics of <code>UcmToTimeBaseResourceMapping</code>
[TPS_MANI_01375]	Semantics of meta-class <code>UcmRetryStrategy</code>
[TPS_MANI_01376]	Semantics of meta-class <code>UcmMasterModuleInstantiation</code>
[TPS_MANI_01377]	Semantics of meta-class <code>UcmSubordinateModuleInstantiation</code>
[TPS_MANI_01378]	Semantics of meta-class <code>PersistencyKeyValueDataTypeMapping</code>
[TPS_MANI_01379]	Semantics of <code>FunctionalClusterInteractsWithPersistencyDeploymentMapping</code>
[TPS_MANI_01380]	Usage of <code>PersistencyDeployment</code>
[TPS_MANI_01381]	Semantics of meta-class <code>ArtifactLocator</code>
[TPS_MANI_01382]	Location of artifact that contains executable code represented by <code>Executable</code>
[TPS_MANI_01383]	Semantics of <code>ExecutableLoggingImplementationProps</code>
[TPS_MANI_01384]	Semantics of <code>StateManagementRequestRule</code>
[TPS_MANI_01387]	Semantics of meta-class <code>StateManagementActionList</code>
[TPS_MANI_01388]	Semantics of the meta-class <code>StateManagementStateMachineActionItem</code>
[TPS_MANI_01389]	Semantics of meta-class <code>StateManagementSyncActionItem</code>
[TPS_MANI_01390]	Semantics of meta-class <code>StateManagementSetFunctionGroupStateActionItem</code>
[TPS_MANI_01391]	Semantics of <code>StateManagementStateRequest</code>
[TPS_MANI_01392]	Semantics of <code>StateManagementStateNotification</code>
[TPS_MANI_01393]	Initialization of a data object typed by a <code>CppImplementationDataType</code> of category <code>VARIANT</code>





Number	Heading
[TPS_MANI_01394]	Support for the authorization of SOVD clients
[TPS_MANI_01395]	Support for the proximity challenge in the context of SOVD
[TPS_MANI_01396]	Semantics of meta-class <code>DiagnosticSovdLock</code>
[TPS_MANI_01397]	Standardized values of <code>DiagnosticDataIdentifier.category</code> of the usage in SOVD context
[TPS_MANI_01398]	Definition of an <i>SOVD data group</i>
[TPS_MANI_01399]	Modeling of the configuration of Service-oriented Vehicle Diagnostics
[TPS_MANI_01400]	Secure communication between SOVD Gateway and SOVD Server
[TPS_MANI_01401]	Support for TLS in vehicle-internal SOVD communication
[TPS_MANI_01402]	Identification of the SOVD Server
[TPS_MANI_01403]	External communication of the SOVD gateway
[TPS_MANI_01404]	Secure communication between SOVD gateway and <code>SOVD Client</code>
[TPS_MANI_01405]	Semantics of sub-classes of <code>SoftwareClusterDiagnosticAddress</code>
[TPS_MANI_01406]	Semantics of <code>DeterministicSyncMaster</code>
[TPS_MANI_01407]	Semantics of abstract base class <code>DeterministicSyncVerificationPolicy</code>
[TPS_MANI_01408]	Semantics of reference <code>DeterministicClient.deterministicSyncMaster</code>
[TPS_MANI_01409]	Semantics of meta-class <code>DeterministicSyncMasterToTimeBaseConsumerMapping</code>
[TPS_MANI_01410]	Semantics of attribute <code>SoftwareCluster.installationBehavior</code>
[TPS_MANI_01835]	Semantics of <code>StateManagementRequestTrigger.rule</code>
[TPS_MANI_01836]	Semantics of <code>StateManagementRequestError.rule</code>
[TPS_MANI_01863]	Supported value range for attribute <code>ApApplicationErrorDomain.value</code>
[TPS_MANI_03292]	Semantic of <code>SomeipServiceInstanceToMachineMapping.tcpPort</code>
[TPS_MANI_03293]	Semantic of <code>SomeipServiceInstanceToMachineMapping.udpPort</code>
[TPS_MANI_03294]	Semantics of <code>DoIpNetworkConfiguration.eidRetrieval</code>
[TPS_MANI_03295]	Semantics of <code>FirewallStateSwitchInterface.firewallStateMachine</code>
[TPS_MANI_03296]	Machine-specific configuration settings for Firewall
[TPS_MANI_03297]	Semantics of <code>AdaptiveFirewallToPortPrototypeMapping</code>
[TPS_MANI_03298]	Semantics of <code>StateDependentFirewall</code>
[TPS_MANI_03299]	Semantics of <code>FirewallRuleProps</code>
[TPS_MANI_03300]	Semantics of <code>FirewallRule</code>
[TPS_MANI_03301]	Semantics of <code>FirewallRule.refillAmount</code> and <code>FirewallRule.bucketSize</code>
[TPS_MANI_03302]	Firewall rules on Data Link Layer
[TPS_MANI_03303]	Filtering of packets with a single MAC address and MAC address range
[TPS_MANI_03304]	Firewall rules on Network Layer
[TPS_MANI_03305]	Filtering of packets with a single IP address and IP address range





Number	Heading
[TPS_MANI_03306]	Firewall rules on Transport Layer
[TPS_MANI_03307]	Byte-Pattern Firewall rule
[TPS_MANI_03308]	Deep inspection of SOME/IP SD messages
[TPS_MANI_03309]	Deep inspection of SOME/IP messages
[TPS_MANI_03310]	Deep inspection of DoIP messages
[TPS_MANI_03311]	Deep inspection of DDS messages
[TPS_MANI_03312]	Static configuration of remote peer addresses for a ProvidedSomeipServiceInstance
[TPS_MANI_03313]	Semantics of SomeipRemoteUnicastConfig.eventGroup reference
[TPS_MANI_03314]	Static configuration of a remote peer address for a RequiredSomeipServiceInstance
[TPS_MANI_03315]	Semantics of SomeipRemoteMulticastConfig
[TPS_MANI_03316]	Semantics of SomeipRemoteMulticastConfig.eventGroup
[TPS_MANI_03317]	MACsec configuration
[TPS_MANI_03318]	MAC Security Key Agreement Entity configuration
[TPS_MANI_03319]	Standardized values for the attribute cipherSuite of meta-class MacSecCipherSuiteConfig
[TPS_MANI_03320]	Semantics of MacSecCipherSuiteConfig.cipherSuitePriority
[TPS_MANI_03321]	Semantics of FirewallStateSwitchInterface
[TPS_MANI_03663]	Ignored references of ServiceInstanceToMachineMapping in the context of signal/service translation
[TPS_MANI_03664]	ServiceInterfaceElementSecureComConfig.securedRxVerification
[TPS_MANI_03665]	ServiceInterface.method with fireAndForget equals <code>true</code> to ISignalTriggerings mapping
[TPS_MANI_03666]	Service Discovery for multi-event ISignalIPdus
[TPS_MANI_03667]	Mapping from one ISignalIPdu to several events in case of signal-service-translation
[TPS_MANI_03668]	Supported type of Ethernet tunneling through CAN XL on Adaptive Platform
[TPS_MANI_03669]	Ethernet tunneling through CAN XL
[TPS_MANI_03670]	Definition of NoCheckpointSupervision
[TPS_MANI_03671]	Periodic storage of time base value
[TPS_MANI_03672]	Definition of RecoveryNotification for an HealthChannel
[TPS_MANI_03673]	RecoveryNotification referenced by several HealthChannel.recoveryNotifications

Table E.45: Added Traceables in R22-11

E.9.2 Changed Traceables in R22-11

Number	Heading
[TPS_MANI_01111]	Diagnostic Address of a SoftwareCluster
[TPS_MANI_01114]	Relation of DiagnosticContributionSet to SoftwareCluster
[TPS_MANI_01164]	Semantics of SoftwareCluster.dependsOn
[TPS_MANI_01179]	Semantics of PersistencyFileElement.contentUri/ PersistencyFile.contentUri vs. PersistencyDeployment. deploymentUri and PersistencyFileElement.fileName/ PersistencyFile.fileName
[TPS_MANI_01203]	Semantics of DeterministicClient
[TPS_MANI_01226]	Machine-specific configuration settings for the UCM module
[TPS_MANI_01255]	Semantics of DoIP DiagnosticPortInterfaces
[TPS_MANI_01269]	Specification of boundaries for resource consumption
[TPS_MANI_01295]	Semantics of VehicleRolloutStep
[TPS_MANI_01297]	Semantics of meta-class UcmStep
[TPS_MANI_01349]	Configuration of diagnostic-related properties of a SoftwareCluster
[TPS_MANI_01360]	Creation of two diagnostic mappings the fulfill different roles in the context of authenticating a diagnostic client
[TPS_MANI_01361]	Support the authentication request of a diagnostic client
[TPS_MANI_01362]	Convey the Authentication state of a diagnostic client to the diagnostic server instance
[TPS_MANI_03013]	Repetition Phase configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03014]	Main Phase configuration for a ProvidedSomeipServiceInstance
[TPS_MANI_03015]	TTL for Offer Service Entries
[TPS_MANI_03027]	Repetition Phase configuration for a RequiredSomeipServiceInstance
[TPS_MANI_03115]	Mapping between a fire and forget method and elements of Classic Platform PortInterfaces
[TPS_MANI_03178]	StdCppImplementationDataType of category STRING
[TPS_MANI_03285]	Semantics of LTMessageCollectionToPortPrototypeMapping
[TPS_MANI_03505]	Existence of SupervisionCheckpoint
[TPS_MANI_03546]	Definition of reported health status RPortPrototype
[TPS_MANI_03618]	Usage of RequiredSomeipServiceInstance.blocklistedVersion
[TPS_MANI_03654]	Definition of Partial SOME/IP Header ID
[TPS_MANI_03659]	No signal-service-translation SOME/IP Service Discovery Find
[TPS_MANI_03660]	No signal-service-translation SOME/IP Service Discovery Offer

Table E.46: Changed Traceables in R22-11

E.9.3 Deleted Traceables in R22-11

Number	Heading
[TPS_MANI_01100]	Semantics of Allocator
[TPS_MANI_01113]	Semantics of SoftwareClusterDesign.diagnosticAddress
[TPS_MANI_01161]	Impact of values of category on the semantics of SoftwareClusterDesign
[TPS_MANI_01271]	Semantics of Executable.loggingBehavior
[TPS_MANI_01305]	Semantics of attribute SoftwarePackageStep.activationSwitch
[TPS_MANI_01310]	Semantics of SoftwareClusterDesign.dependsOn
[TPS_MANI_01335]	Semantics of SoftwareClusterDependencyFormula.category
[TPS_MANI_03028]	TTL for Find Service Entries
[TPS_MANI_03126]	ServiceInterface.field mapping to ISignalTriggerings
[TPS_MANI_03506]	Optionality of SupervisionCheckpoint
[TPS_MANI_03623]	Usage of checkpointId in application code

Table E.47: Deleted Traceables in R22-11

E.9.4 Added Constraints in R22-11

Number	Heading
[constr_3690]	DdsServiceInterfaceDeployment.serviceInterfaceId value shall not conflict with topic-based service discovery
[constr_3691]	Existence of ServiceInterfaceElementSecureComConfig.securedRxVerification
[constr_3692]	DataPrototypeInServiceInterfaceInstanceRef.targetDataPrototype in the context of a SignalBasedFireAndForgetMethodToISignalTriggeringMapping
[constr_3693]	EthernetCommunicationConnector.category is set to CAN_XL
[constr_3694]	Existence of canXlConfig vs. canXlConfigReqs
[constr_3709]	AliveSupervision.terminatingCheckpoint required for self terminating Processes
[constr_3710]	Process referenced by AliveSupervision.terminatingCheckpoint
[constr_3711]	AliveSupervision.terminatingCheckpointTimeoutUntilTermination
[constr_3712]	Exclusive usage of NoCheckpointSupervision
[constr_3715]	Reference in the role SomeipEventGroup.event
[constr_3719]	RecoveryNotification referenced either by HealthChannelExternalStatus or HealthChannelSupervision
[constr_3720]	Upper multiplicity of reference in the role ComGrantDesign.remoteSubject
[constr_3721]	Upper multiplicity of reference in the role EthernetCommunicationConnector.unicastNetworkEndpoint





Number	Heading
[constr_3722]	Upper multiplicity of reference in the role EthernetCommunicationConnector.canXlProps
[constr_3723]	Upper multiplicity of reference in the role MachineDesign.tcpIpProps
[constr_3724]	Upper multiplicity of reference in the role MachineDesign.tcpIpIcmpProps
[constr_3725]	Upper multiplicity of reference in the role MachineDesign.ethIpProps
[constr_3727]	Upper multiplicity of reference in the role SoftwareClusterDesign.intendedTargetMachine
[constr_3728]	Upper multiplicity of reference in the role IdsPlatformInstantiation.networkInterface
[constr_3729]	Upper multiplicity of reference in the role LogAndTraceInstantiation.timeBaseResource
[constr_3730]	Upper multiplicity of reference in the role HealthChannel.recoveryNotification
[constr_3731]	Upper multiplicity of reference in the role ProcessDesign.executable
[constr_3732]	Upper multiplicity of reference in the role Process.executable
[constr_3733]	Upper multiplicity of aggregation in the role ServiceInstanceToSignalMapping.methodMapping
[constr_3734]	Upper multiplicity of reference in the role DoIpNetworkConfiguration.networkConfiguration
[constr_5324]	MachineDesign.communicationController aggregation restriction
[constr_5332]	Mandatory multicast endpoint in case of multicastThreshold different from 0
[constr_5333]	No multicast in case of TCP
[constr_5338]	ProvidedSomeipServiceInstance shall offer all SomeipEventGroups for subscription
[constr_5339]	SomeipEventGroups of a SomeipServiceInterfaceDeployment shall be referenced at most once from a RequiredSomeipServiceInstance that instantiates the SomeipServiceInterfaceDeployment
[constr_5343]	Usage of DoIpNetworkConfiguration.eidRetrieval
[constr_5347]	Supported value range for attribute SecOcSecureComProps.authenticationVerifyAttempts
[constr_5348]	Mandatory initialMode in ModeDeclarationGroup that is referenced by StateDependentFirewall
[constr_5349]	Mandatory defaultAction in StateDependentFirewall
[constr_5350]	Mandatory action in FirewallRuleProps
[constr_5351]	FirewallRule is allowed to aggregate at most one protocol subelement
[constr_5352]	DdsRule.submessageType value restriction
[constr_5353]	DdsRule.readerEntityId and DdsRule.writerEntityId value restriction
[constr_5355]	SomeipServiceInstanceToMachineMapping with configured remote peer addresses shall not mix ProvidedSomeipServiceInstances and RequiredSomeipServiceInstances
[constr_5356]	RequiredSomeipServiceInstance is allowed to have only a single statically configured remote peer as service provider
[constr_5357]	SomeipRemoteMulticastConfig shall only be used on required side





Number	Heading
[constr_5358]	AdaptiveFirewallToPortPrototypeMapping.rPortPrototype restriction
[constr_6815]	Existence of CppTypeArgument.templateType for CppTypeImplementationDataType of category <code>STRING</code>
[constr_10098]	Relation of MachineDesign.pnResetTimer and UdpNmCluster.nmMsgCycleTime
[constr_10101]	Attribute NmHandleToFunctionGroupStateMapping.mappingDirection is set to nmHandleActiveToFunctionGroupState or nmHandleInactiveToFunctionGroupState
[constr_10102]	Existence of initial values for PersistencyKeyValuePair
[constr_10103]	Existence of initial values for PersistencyFile
[constr_10105]	Existence of UcmRetryStrategy.maximumNumberOfRetries
[constr_10106]	Existence of UcmRetryStrategy.retryIntervalTime
[constr_10107]	Existence of the attribute UcmMasterModuleInstantiation.blockInconsistent
[constr_10108]	Existence of the attribute UcmMasterModuleInstantiation.serviceBusy
[constr_10109]	Existence of the attribute UcmMasterModuleInstantiation.updateSessionRejected
[constr_10110]	Existence of UcmSubordinateModuleInstantiation on a Machine
[constr_10111]	Existence of attribute DiagnosticAuthentication.authenticationTimeout
[constr_10113]	Restriction for the existence of ExecutableLoggingImplementationProps
[constr_10114]	Existence of attributes of DiagnosticEnvDataElementCondition if the reference in the role pPortPrototype exists
[constr_10124]	Multiplicity of attribute ApplicationAssocMapDataType.key
[constr_10125]	Multiplicity of attribute ApplicationAssocMapDataType.value
[constr_10126]	Multiplicity of attribute ApplicationAssocMapElementValueSpecification.key
[constr_10127]	Multiplicity of attribute ApplicationAssocMapElementValueSpecification.value
[constr_10128]	Multiplicity of attribute CppTypeImplementationDataTypeElementQualifier.typeReference
[constr_10129]	Multiplicity of attribute Field.hasGetter
[constr_10130]	Multiplicity of attribute Field.hasSetter
[constr_10131]	Multiplicity of attribute Field.hasNotifier
[constr_10132]	Multiplicity of attribute ApApplicationError.errorCode
[constr_10133]	Multiplicity of attribute ApApplicationErrorDomain.value
[constr_10134]	Multiplicity of reference in the role PortInterfaceToDataTypeMapping.dataTypeMappingSet
[constr_10135]	Multiplicity of reference in the role PortInterfaceToDataTypeMapping.portInterface
[constr_10136]	Multiplicity of reference in the role ServiceInterfaceMapping.compositeServiceInterface
[constr_10137]	Multiplicity of reference in the role ServiceInterfaceMapping.sourceServiceInterface





Number	Heading
[constr_10138]	Multiplicity of reference in the role ServiceInterfaceEventMapping.sourceEvent
[constr_10139]	Multiplicity of reference in the role ServiceInterfaceEventMapping.targetEvent
[constr_10140]	Multiplicity of reference in the role ServiceInterfaceFieldMapping.sourceField
[constr_10141]	Multiplicity of reference in the role ServiceInterfaceFieldMapping.targetField
[constr_10142]	Multiplicity of reference in the role ServiceInterfaceMethodMapping.sourceMethod
[constr_10143]	Multiplicity of reference in the role ServiceInterfaceMethodMapping.targetMethod
[constr_10144]	Multiplicity of reference in the role PersistencyRedundancyChecksum.algorithmFamily
[constr_10145]	Multiplicity of reference in the role PersistencyRedundancyChecksum.length
[constr_10146]	Multiplicity of reference in the role PersistencyRedundancyMOutOfN.m
[constr_10147]	Multiplicity of reference in the role PersistencyRedundancyMOutOfN.n
[constr_10148]	Multiplicity of reference in the role PersistencyFileElement.contentUri
[constr_10149]	Multiplicity of reference in the role PersistencyFileElement.fileName
[constr_10150]	Multiplicity of reference in the role SynchronizedTimeBaseProviderInterface.timeBaseKind
[constr_10151]	Multiplicity of reference in the role PhmCheckpoint.checkpointId
[constr_10152]	Multiplicity of reference in the role FieldSenderComSpec.initValue
[constr_10153]	Multiplicity of reference in the role PersistencyDataRequiredComSpec.dataElement
[constr_10154]	Multiplicity of reference in the role ProcessDesignToMachineDesignMapping.processDesign
[constr_10155]	Multiplicity of reference in the role ComOfferServiceGrantDesign.providedServicePort
[constr_10156]	Multiplicity of reference in the role ComFindServiceGrantDesign.requiredServicePort
[constr_10157]	Multiplicity of reference in the role ComFieldGrantDesign.field
[constr_10158]	Multiplicity of reference in the role ComFieldGrantDesign.role
[constr_10159]	Multiplicity of reference in the role ComEventGrantDesign.event
[constr_10160]	Multiplicity of reference in the role ComTriggerGrantDesign.trigger
[constr_10161]	Multiplicity of reference in the role ComMethodGrantDesign.method
[constr_10162]	Multiplicity of reference in the role DiagnosticClearConditionPortMapping.clearCondition
[constr_10163]	Multiplicity of reference in the role DiagnosticIndicatorPortMapping.indicator
[constr_10164]	Multiplicity of reference in the role DiagnosticMemoryDestinationPortMapping.memoryDestination
[constr_10165]	Multiplicity of reference in the role DiagnosticDataPortMapping.process





Number	Heading
[constr_10166]	Multiplicity of attribute DiagnosticProvidedDataMapping.dataProvider
[constr_10167]	Multiplicity of attribute SomeipServiceDiscovery.someipServiceDiscoveryPort
[constr_10169]	Multiplicity of reference in the role Machine.machineDesign
[constr_10170]	Multiplicity of attribute Machine.trustedPlatformExecutableLaunchBehavior
[constr_10171]	Multiplicity of attribute Machine.processor
[constr_10172]	Multiplicity of attribute Processor.core
[constr_10173]	Multiplicity of attribute ProcessorCore.coreId
[constr_10174]	Multiplicity of the reference in the role ProcessToMachineMapping.process
[constr_10175]	Multiplicity of attribute StateDependentStartupConfig.resourceGroup
[constr_10176]	Multiplicity of attribute StateDependentStartupConfig.startupConfig
[constr_10177]	Multiplicity of attribute PersistencyDeployment.updateStrategy
[constr_10178]	Multiplicity of the reference in the role PersistencyPortPrototypeToDeploymentMapping.process
[constr_10179]	Multiplicity of attribute PersistencyKeyValuePair.valueDataType
[constr_10180]	Multiplicity of the reference in the role PersistencyPortPrototypeToKeyValueStorageMapping.keyValueStorage
[constr_10182]	Multiplicity of the reference in the role PersistencyPortPrototypeToFileStorageMapping.fileStorage
[constr_10183]	Multiplicity of attribute PersistencyFile.fileName
[constr_10184]	Multiplicity of the reference in the role SynchronizedTimeBaseConsumer.networkTimeConsumer
[constr_10185]	Multiplicity of the reference in the role SynchronizedTimeBaseProvider.networkTimeProvider
[constr_10186]	Multiplicity of attribute DoIpInstantiation.entityStatusMaxByteFieldUse
[constr_10187]	Multiplicity of attribute DoIpInstantiation.gidInvalidityPattern
[constr_10188]	Multiplicity of attribute DoIpInstantiation.logicalAddress
[constr_10189]	Multiplicity of attribute DoIpInstantiation.maxRequestBytes
[constr_10190]	Multiplicity of attribute DoIpInstantiation.vinInvalidityPattern
[constr_10191]	Multiplicity of attribute DoIpNetworkConfiguration.isActivationLineDependent
[constr_10192]	Multiplicity of attribute DoIpNetworkConfiguration.maxInitialVehicleAnnouncementTime
[constr_10193]	Multiplicity of attribute DoIpNetworkConfiguration.maxTesterConnections
[constr_10194]	Multiplicity of attribute DoIpNetworkConfiguration.networkInterfaceId
[constr_10195]	Multiplicity of attribute DoIpNetworkConfiguration.vehicleIdentificationSyncStatus
[constr_10197]	Multiplicity of attribute DoIpRequestConfiguration.endAddress
[constr_10198]	Multiplicity of attribute DoIpRequestConfiguration.requestType
[constr_10199]	Multiplicity of attribute DoIpRequestConfiguration.startAddress





Number	Heading
[constr_10200]	Multiplicity of attribute <code>UcmModuleInstantiation.identifier</code>
[constr_10201]	Multiplicity of of the reference in the role <code>ComGrant.serviceInstance</code>
[constr_10202]	Multiplicity of attribute <code>ComFieldGrant.role</code>
[constr_10203]	Multiplicity of the reference in the role <code>ComFieldGrant.serviceDeployment</code>
[constr_10204]	Multiplicity of the reference in the role <code>ComMethodGrant.serviceDeployment</code>
[constr_10205]	Multiplicity of the reference in the role <code>ComEventGrant.serviceDeployment</code>
[constr_10206]	Multiplicity of the reference in the role <code>ComOfferServiceGrant.serviceInstance</code>
[constr_10207]	Multiplicity of the reference in the role <code>CryptoProviderToPortPrototypeMapping.cryptoProvider</code>
[constr_10208]	Multiplicity of the reference in the role <code>CryptoProviderToPortPrototypeMapping.process</code>
[constr_10209]	Multiplicity of the reference in the role <code>CryptoKeySlotToPortPrototypeMapping.keySlot</code>
[constr_10210]	Multiplicity of the reference in the role <code>CryptoKeySlotToPortPrototypeMapping.process</code>
[constr_10211]	Multiplicity of the reference in the role <code>CryptoCertificateToCryptoKeySlotMapping.cryptoCertificate</code>
[constr_10212]	Multiplicity of attribute <code>SomeipServiceInterfaceDeployment.serviceInterfaceId</code>
[constr_10213]	Multiplicity of attribute <code>SomeipServiceInterfaceDeployment.serviceInterfaceVersion</code>
[constr_10214]	Multiplicity of attribute <code>SomeipEventGroup.eventGroupId</code>
[constr_10215]	Multiplicity of attribute <code>SomeipEventDeployment.eventId</code>
[constr_10216]	Multiplicity of attribute <code>SomeipEventDeployment.transportProtocol</code>
[constr_10217]	Multiplicity of the attribute <code>DdsServiceInterfaceDeployment.serviceInterfaceId</code>
[constr_10218]	Multiplicity of reference in the role <code>ProvidedSomeipServiceInstance.sdServerConfig</code>
[constr_10219]	Multiplicity of attribute <code>ProvidedSomeipServiceInstance.serviceInstanceId</code>
[constr_10220]	Multiplicity of attribute <code>SomeipProvidedEventGroup.multicastThreshold</code>
[constr_10221]	Multiplicity of reference in the role <code>RequiredSomeipServiceInstance.sdClientConfig</code>
[constr_10222]	Multiplicity of the reference in the role <code>SomeipRequiredEventGroup.sdClientEventGroupTimingConfig</code>
[constr_10223]	Multiplicity of attribute <code>DdsServiceInstanceProps.domainId</code>
[constr_10224]	Multiplicity of reference in the role <code>DdsEventQosProps.event</code>
[constr_10225]	Multiplicity of reference in the role <code>DdsFieldQosProps.field</code>
[constr_10226]	Multiplicity of attribute <code>E2EProfileConfiguration.profileName</code>
[constr_10227]	Multiplicity of attribute <code>SecOcJobRequirement.secOcJobSemantic</code>
[constr_10228]	Multiplicity of attribute <code>SignalBasedFieldToISignalTriggeringMapping.dataPrototypeInServiceInterfaceRef</code>





Number	Heading
[constr_10229]	Multiplicity of reference in the role SignalBasedMethodToISignalTriggeringMapping.method
[constr_10230]	Multiplicity of attribute SignalServiceTranslationEventProps.safeTranslation
[constr_10231]	Multiplicity of attribute SignalServiceTranslationEventProps.secureTranslation
[constr_10232]	Multiplicity of reference in the role PersistencyDeploymentToCryptoKeySlotMapping.persistencyDeployment
[constr_10233]	Multiplicity of the reference in the role SoftwareCluster.vendorSignature
[constr_10234]	Multiplicity of attribute SoftwareCluster.version
[constr_10235]	Multiplicity of attribute SoftwareCluster.vendorId
[constr_10236]	Multiplicity of attribute SoftwareClusterDiagnosticAddress.addressSemantics
[constr_10237]	Multiplicity of attribute SoftwareClusterDependencyCompareCondition.compareType
[constr_10240]	Multiplicity of attribute SoftwarePackage.actionType
[constr_10241]	Multiplicity of attribute SoftwarePackage.compressedSoftwarePackageSize
[constr_10242]	Multiplicity of attribute SoftwarePackage.minimumSupportedUcmVersion
[constr_10243]	Multiplicity of attribute SoftwarePackage.packagerId
[constr_10244]	Multiplicity of reference in the role SoftwarePackage.packagerSignature
[constr_10245]	Multiplicity of reference in the role SoftwarePackage.softwareCluster
[constr_10246]	Multiplicity of attribute SoftwarePackage.uncompressedSoftwareClusterSize
[constr_10247]	Multiplicity of reference in the role VehiclePackage.packagerSignature
[constr_10248]	Multiplicity of reference in the role UcmDescription.identifier
[constr_10249]	Multiplicity of reference in the role VehicleDriverNotification.approvalRequired
[constr_10250]	Multiplicity of reference in the role VehicleDriverNotification.notificationState
[constr_10251]	Multiplicity of the reference in the role ServiceFieldDeployment.field
[constr_10252]	Multiplicity of attribute SignalBasedEventElementToISignalTriggeringMapping.dataPrototypeInServiceInterfaceRef
[constr_10253]	Multiplicity of attribute SoftwareClusterDependencyCompareCondition.considerBuildNumber
[constr_10254]	Multiplicity of attribute SoftwareClusterDependencyCompareCondition.version
[constr_10255]	Multiplicity of attribute SignalServiceTranslationProps.serviceControl
[constr_10256]	Multiplicity of reference in the role SoftwarePackageStoring.storing
[constr_10365]	Existence of PersistencyDeployment.deploymentUri
[constr_10366]	Possible multiplicities of PersistencyDeployment.deploymentUri





Number	Heading
[constr_10367]	Condition for the multiplicity of attribute PersistencyDeployment.deploymentUri
[constr_10374]	Existence of the attribute UcmSubordinateModuleInstantiation.verifyUpdate
[constr_10375]	Existence of the attribute UcmSubordinateModuleInstantiation.prepareUpdate
[constr_10376]	Existence of the attribute UcmSubordinateModuleInstantiation.prepareRollback
[constr_10377]	Completeness of the modeling of PersistencyKeyValueDataTypeMapping
[constr_10378]	PersistencyKeyValueDataTypeMapping references AbstractImplementationDataType in the role currentDataType
[constr_10379]	PersistencyKeyValueDataTypeMapping references ApplicationDataType in the role currentDataType
[constr_10380]	Target of ArtifactLocator.representedModelElement
[constr_10381]	Existence of attribute ArtifactLocator.uri
[constr_10382]	Existence of attribute ArtifactLocator.representedModelElement
[constr_10384]	PortInterface used for trigger state requests
[constr_10385]	PortInterface used for error state requests
[constr_10386]	Existence of references StateManagementStateMachineActionItem.start and stop
[constr_10387]	Consistency of StateManagementSetFunctionGroupStateActionItem.portPrototype and StateManagementSetFunctionGroupStateActionItem.setFunctionGroupState
[constr_10388]	Restriction for a PortInterface used for state switch notifications
[constr_10389]	Existence of attribute StateManagementFunctionGroupSwitchNotificationInterface.modeGroup
[constr_10390]	Existence of attribute StateManagementStateRequest.stateRequestPort
[constr_10391]	Existence of attribute StateManagementStateNotification.notificationPort
[constr_10392]	Existence of attribute StateManagementRequestRule.formula
[constr_10393]	Existence of reference in the role StateManagementRequestRule.nextState
[constr_10394]	Existence of attribute StateManagementCompareCondition.compareType
[constr_10395]	Existence of attribute StateManagementCompareCondition.compareValue
[constr_10396]	Existence of reference in the role StateManagementTriggerCompareRule.assumedCurrentState
[constr_10397]	Existence of reference in the role StateManagementSetFunctionGroupStateActionItem.portPrototype
[constr_10398]	Existence of reference in the role StateManagementSetFunctionGroupStateActionItem.setFunctionGroupState
[constr_10399]	Allowed interval of the “index” field according to the initialization rule for data object typed by a CppImplementationDataType of category VARIANT





Number	Heading
[constr_10400]	Existence of <code>SovdServerInstantiation.componentQualifier</code>
[constr_10401]	Existence of <code>SovdGatewayLocalEndpointTcpConfig.tcpPort</code>
[constr_10402]	Existence of <code>SovdGatewayEthernetCredentials.ipv4Address</code> vs. <code>SovdGatewayEthernetCredentials.ipv6Address</code>
[constr_10403]	Existence of <code>SovdGatewayEthernetCredentials.udpPort</code>
[constr_10404]	Existence of <code>SoftwareClusterSovdAddress.componentQualifier</code>
[constr_10405]	Existence of reference in the role <code>StateManagementActionList.affectedState</code>
[constr_10406]	Existence of <code>DeterministicSyncMOutOfN.numberOfConnectedClients</code>
[constr_10407]	Existence of <code>DeterministicSyncMOutOfN.minimumNumberOfRequests</code>
[constr_10408]	Existence of <code>DeterministicSyncMasterToTimeBaseConsumerMapping.deterministicSyncMaster</code>
[constr_10409]	Existence of <code>DeterministicSyncMasterToTimeBaseConsumerMapping.timeBaseConsumer</code>
[constr_10410]	Value of <code>SoftwareCluster.installationBehavior</code> for a <code>SoftwareCluster</code> of category <code>PLATFORM_CORE</code>
[constr_10411]	Existence of <code>ExecutionDependency</code> and references to <code>Function Group States</code>

Table E.48: Added Constraints in R22-11

E.9.5 Changed Constraints in R22-11

Number	Heading
[constr_1543]	Only one physical address per <code>SoftwareCluster.diagnosticDeploymentProps</code>
[constr_1554]	Restriction regarding attribute <code>PersistencyKeyValuePair.initValue</code>
[constr_1785]	Restriction regarding the reference into another <code>SoftwareCluster</code>
[constr_3305]	Value of attribute <code>SomeipEventDeployment.eventId</code> shall be unique
[constr_3371]	Mutually exclusive existence of <code>FireAndForgetMethodMapping.dataElement</code> reference and <code>FireAndForgetMethodMapping.trigger</code> reference
[constr_3376]	<code>FireAndForgetMethodMapping</code> shall reference only fire and forget methods
[constr_3558]	<code>RequiredSomeipServiceInstance.blocklistedVersion</code> is restricted to the usage of <code>minorVersion</code>
[constr_3632]	Supervision of a Supervised Entity Instance in the scope of a <code>Function Group State</code>
[constr_3639]	Existence of <code>SupervisionMode.expiredSupervisionTolerance</code>
[constr_3676]	Exclusive usage of <code>NoSupervision</code>
[constr_5035]	Compatibility of data types with category <code>STRING</code>
[constr_5291]	Allowed usage of <code>LTMessageCollectionToPortPrototypeMapping.rPortPrototype</code>



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Number	Heading
[constr_10002]	Only one mapping per <code>PortPrototype</code>
[constr_10062]	<code>DiagnosticServiceInstances</code> that can be mapped by a <code>DiagnosticServiceGenericMapping</code>
[constr_10069]	Existence of <code>SoftwareClusterDiagnosticDeploymentProps.powerDownTime</code>
[constr_10090]	Existence of <code>ProcessToMachineMapping.persistenceCentralStorageURI</code>

Table E.49: Changed Constraints in R22-11

E.9.6 Deleted Constraints in R22-11

Number	Heading
[constr_1535]	Existence of <code>DiagnosticSoftwareClusterProps</code> in the context of a <code>DiagnosticContributionSet</code>
[constr_1557]	Standardized values of <code>SoftwareClusterDesign.category</code> and <code>SoftwareCluster.category</code>
[constr_1558]	Existence of <code>SoftwareClusterDesign.diagnosticAddress</code>
[constr_1559]	Existence of <code>SoftwareClusterDesign.subSoftwareCluster</code>
[constr_1562]	Existence of <code>SoftwareClusterDesign.diagnosticContribution</code>
[constr_1564]	Existence of <code>SoftwareCluster.diagnosticProps.diagnosticAddress</code>
[constr_1568]	Existence of <code>SoftwareCluster.diagnosticExtract</code>
[constr_1627]	Supported value range for attribute <code>ApApplicationErrorDomain.value</code>
[constr_1674]	Supported encoding of <code>StdCppImplementationDataType</code> of <code>category</code> <code>STRING</code>
[constr_1707]	Eligible subclasses of <code>HeapUsage</code> in the context of <code>StateDependentStartupConfig.resourceConsumption</code>
[constr_1732]	Existence of attribute <code>activationSwitch</code> set to <code>True</code> in the context of the enclosing <code>UcmStep</code>
[constr_1734]	Restriction for attribute <code>SoftwarePackageStep.activationSwitch</code>
[constr_5046]	Usage of <code>DoIpNetworkConfiguration.eidUseMac</code>
[constr_5280]	Existence of <code>DltLogSink.defaultLogThreshold</code>
[constr_10010]	Usage of attribute <code>category</code> in a <code>SoftwareClusterDependencyFormula</code>
[constr_10011]	Definition of sub-software-cluster

Table E.50: Deleted Constraints in R22-11

E.9.7 Added Advisories in R22-11

Number	Heading
[advisory_01000]	Existence of the reference <code>MethodMapping.clientServerOperation</code>
[advisory_01001]	Existence of reference <code>MethodMapping.method</code>
[advisory_01002]	Existence of reference <code>EventMapping.dataElement</code>
[advisory_01003]	Existence of reference <code>EventMapping.event</code>
[advisory_01004]	Existence of reference <code>FieldMapping.field</code>
[advisory_01005]	Existence of references <code>FieldMapping.getterOperation</code> , <code>setterOperation</code> , and <code>notifierDataElement</code>
[advisory_01006]	Existence of reference <code>FireAndForgetMethodMapping.method</code>
[advisory_01007]	Existence of references <code>FireAndForgetMethodMapping.dataElement</code> and <code>trigger</code>
[advisory_01008]	Multiplicity of reference in the role <code>RootSwClusterDesignComponentPrototype.applicationType</code>
[advisory_01009]	<code>PersistencyKeyValueDataTypeMapping.currentDataType</code> shall refer to a data type used in the context of the <code>PersistencyKeyValueStorageInterface</code>
[advisory_02000]	Define a <code>ServiceInstanceToSignalMapping</code> per member of an <code>AdaptivePlatformServiceInstance</code>
[advisory_02001]	No explicit <code>signal/service</code> translation for <code>ISignalGroups</code>
[advisory_02002]	<code>ServiceInterface.field</code> mapping to <code>ISignalTriggerings</code> for primitive data type <code>fields</code>
[advisory_02003]	<code>ServiceInterface.field</code> mapping to <code>ISignalTriggerings</code> for composite data type <code>fields</code>

Table E.51: Added Advisories in R22-11

E.9.8 Changed Advisories in R22-11

none

E.9.9 Deleted Advisories in R22-11

none

F Splitable Elements in the Scope of this Document

This chapter contains a table of all model elements stereotyped `<<atpSplitable>>` in the scope of this document.

Each entry in the table consists of the identification of the specific model element itself and the applicable value of the tagged value `atp.Splitkey`.

For more information about the concept of splitable model elements and how these shall be treated please refer to [7].

<i>Name of splitable element</i>	<i>Splitkey</i>
AdaptiveApplicationSwComponentType.internalBehavior	internalBehavior.shortName, internalBehavior.variationPoint.shortLabel
CryptoModuleInstantiation.certificateToKeySlotMapping	certificateToKeySlotMapping
CryptoModuleInstantiation.cryptoCertificate	cryptoCertificate.shortName
CryptoModuleInstantiation.cryptoProvider	cryptoProvider.shortName
CryptoProvider.keySlot	keySlot.shortName
DiagnosticAuthenticationPortMapping.process	process
DiagnosticClearConditionGroup.clearCondition	clearCondition
DiagnosticClearConditionPortMapping.process	process
DiagnosticDataPortMapping.process	process
DiagnosticExternalAuthenticationPortMapping.process	process
DiagnosticIndicatorPortMapping.process	process
DiagnosticMemoryDestinationPortMapping.process	process
DiagnosticMonitorPortMapping.process	process
DiagnosticSecurityLevelPortMapping.process	process
DiagnosticServiceGenericMapping.process	process
DiagnosticServiceValidationMapping.process	process
DiagnosticSovdAuthorizationPortMapping.process	process
DiagnosticSovdProximityChallengePortMapping.process	process
GlobalSupervision.supervisionMode	supervisionMode.shortName
IamModuleInstantiation.grant	grant
IdsmModuleInstantiation.reportableSecurityEvent	reportableSecurityEvent
IdsPlatformInstantiation.timeBase	timeBase.timeBaseResource, timeBase.variationPoint.shortLabel
Machine.environmentVariable	environmentVariable
Machine.moduleInstantiation	moduleInstantiation.shortName
Machine.secureCommunicationDeployment	secureCommunicationDeployment.shortName
MachineDesign.communicationConnector	communicationConnector.shortName
MachineDesign.communicationController	communicationController.shortName
MachineDesign.serviceDiscoveryConfig	serviceDiscoveryConfig
PlatformHealthManagementContribution.checkpoint	checkpoint.shortName
PlatformHealthManagementContribution.globalSupervision	globalSupervision.shortName
PlatformHealthManagementContribution.healthChannel	healthChannel.shortName
PlatformHealthManagementContribution.supervisionModeCondition	supervisionModeCondition.shortName
Process.securityEvent	securityEvent
ServiceInstanceToPortPrototypeMapping.process	process





Name of splitable element	Splitkey
ServiceInterface.event	event.shortName, event.variationPoint.shortLabel
ServiceInterface.field	field.shortName, field.variationPoint.shortLabel
ServiceInterface.method	method.shortName, method.variationPoint.shortLabel
ServiceInterface.trigger	trigger.shortName, trigger.variationPoint.shortLabel
SoftwareCluster.artifactChecksum	artifactChecksum.shortName, artifactChecksum.uri
SoftwareCluster.conflictsTo	conflictsTo
SoftwareCluster.containedARElement	containedARElement
SoftwareCluster.containedPackageElement	containedPackageElement
SoftwareCluster.dependsOn	dependsOn
SoftwareCluster.moduleInstantiation	moduleInstantiation
SoftwareClusterDesign.containedProcess	containedProcess
SoftwareClusterDesign.diagnosticContribution	diagnosticContribution
SoftwareClusterDesign.requiredARElement	requiredARElement
SoftwareClusterDesign.requiredFibexElement	requiredFibexElement
SoftwareClusterDesign.requiredPackageElement	requiredPackageElement
SoftwareClusterDiagnosticDeploymentProps.diagnosticAddress	diagnosticAddress
SomeipDataPrototypeTransformationProps.networkRepresentation	networkRepresentation
StateManagementModuleInstantiation.actionItemList	actionItemList.shortName
StateManagementModuleInstantiation.notification	notification.shortName
StateManagementModuleInstantiation.request	request.shortName

Table F.1: Usage of splitable elements

G Variation Points in the Scope of this Document

This chapter contains a table of all model elements stereotyped `<<atpVariation>>` in the scope of this document.

Each entry in the table consists of the identification of the model element itself and the applicable value of the tagged value `vh.latestBindingTime`.

For more information about the concept of variation points and how model elements that contain variation points shall be treated please refer to [7].

<i>Variation Point</i>	<i>Latest Binding Time</i>
AdaptiveApplicationSwComponentType.internalBehavior	preCompileTime
CppImplementationDataType.arraySize	preCompileTime
IdsPlatformInstantiation.timeBase	systemDesignTime
ServiceInterface.event	blueprintDerivationTime
ServiceInterface.field	blueprintDerivationTime
ServiceInterface.method	blueprintDerivationTime
ServiceInterface.trigger	blueprintDerivationTime

Table G.1: Usage of variation points