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1 Introduction

This explanatory provides additional information to [Software Clusters](#) of the AUTOSAR Standard.

1.1 Objectives

The goal of this document is to

- provide an overview about the technical approach [Software Clusters](#)
- explain the utilization of [Software Clusters](#) in AUTOSAR Classic Platform
- lists design and feature restrictions
- provide some examples

1.2 Scope

This document discusses only [Software Clusters](#) in the **AUTOSAR Classic Platform!**

2 Acronyms and abbreviations

The glossary below includes acronyms and abbreviations relevant to Requirements on Software Cluster Connection that are not included in the AUTOSAR Glossary [1].

Abbreviation / Acronym:	Description:
SwCluC	Software Cluster Connection

Table 2.1: Acronyms and Abbreviations

Terms:	Description:
Software Cluster	A Software Cluster groups all AUTOSAR artifacts that are relevant to deploy software on a machine. The full definition is given in document [1]
Software Cluster Connection	The Software Cluster Connection is the BSW module that provides the features to <ul style="list-style-type: none"> connect the Binary Objects deployed on the same machine substitute not locally-available BSW modules in an Application Software Cluster, whose interfaces are required for the integrated SW, by so called Proxy Modules. implement the VFB communication features between Software Clusters together with RTE with the means of an RTE Implementation Plug-In
machine	A machine consists of a set of computing resources - such as microcontroller cores, memory or peripheral (e.g. communication) devices - and has the ability to execute software applications. The representation of a machine in the AUTOSAR Classic Platform could be done with an EcuInstance , but note that this semantic is currently in clarification. Further information is given in document [1].
binary-identical	Bit for Bit identical
Binary Object	A set of files, which contains the binary executable code and data. This binary executable code and data will not be modified again, before programming it on the target ECU.
Binary Manifest	The Binary Manifest is the well-defined interface of the Software Cluster's Binary Object , providing the meta information of a resources and information - so called handles - to access such a resource.
Application Software Cluster	A Software Cluster that mainly contains software components, and only selected BSW modules (e.g. a Service module, transformers, e.t.c.)
Host Software Cluster	The single Software Cluster that contains the major part of the BSW, and especially the micro controller dependent lower layer BSW Modules, e.g. OS and MCAL.
Substitution Software Cluster	The single Software Cluster that can override the provided resources of other Software Clusters for bug fixing purpose.

Terms:	Description:
Proxy Module	A Proxy Module substitutes a BSW module in an Application Software Cluster . A Proxy module itself is split into High Proxy Module and Low Proxy Module . The High Proxy Module provides dedicated interfaces for modules in higher layers or same layer, and the functionality to connect them via the Binary Manifest to the Low Proxy Module in the Host Software Cluster .
High Proxy Module	The part of the Proxy Module residing in an Application Software Cluster .
Low Proxy Module	The part of the Proxy Module residing in the Host Software Cluster .
Os High Proxy	A type of Proxy Module implementing Os APIs in the Application Software Cluster .
Os Low Proxy	A type of proxy Module implementing an Os abstraction in the Host Software Cluster .
NvM High Proxy	A type of Proxy Module substituting the NVRAM Manager in the Application Software Cluster .
NvM Low Proxy	A type of Proxy Module connecting the NvM High Proxy Modules to the NVRAM Manager in the Host Software Cluster .
RTE Implementation Plug-In	A RTE Implementation Plug-In is a part of the overall RTE implementation, which is not provided by the RTE Generator, but from an additional source (e.g. a Plug-In Generator or a manually implemented source code).
Local Software Cluster Communication Plug-In	A Local Software Cluster Communication Plug-In is an RTE Implementation Plug-In , which handles the communication locally inside a Software Cluster . This includes the Transformer handling, if a DataMapping exist for the according Communication Graph
Cross Software Cluster Communication Plug-In	A Cross Software Cluster Communication Plug-In is an RTE Implementation Plug-In that handles the communication towards other Software Clusters . This includes the Transformer handling, if intra ECU transformation is configured.
Communication Graph	The sum of all AbstractAccessPoints to elements of PortInterfaces , instantiated in PortPrototypes which are connected to each other; or the sum of all accesses from BswModuleEntitys to interface elements in a BswModuleDescriptions connected to each other.
Data Communication Graph	The sum of all VariableAccesses to VariableDataPrototypes instantiated in PortPrototypes , which are connected to each other; or the sum of all VariableAccesses to VariableDataPrototypes in the InternalBehavior ; or the sum of all BswVariableAccesses to VariableDataPrototypes in BswModuleDescriptions connected to each other.
Parameter Communication Graph	The sum of all ParameterAccesses to ParameterDataPrototypes instantiated in PortPrototypes , which are connected to each other; or the sum of all ParameterAccesses to ParameterDataPrototypes in the InternalBehavior .
Client Server Communication Graph	The sum of all ServerCallPoints to operations instantiated in PortPrototypes , which are connected to each other, including the associated server runnable .
Trigger Communication Graph	The sum of all ExternalTriggeringPoints for triggers instantiated in PortPrototypes , which are connected to each other, including the associated triggered runnable .

Terms:	Description:
Mode Communication Graph	The sum of all ModeAccessPoints and ModeSwitchPoints to ModeDeclarationGroupPrototypes instantiated in PortPrototypes , which are connected to each other; or the sum of all managedModeGroups and accessedModeGroups to ModeDeclarationGroupPrototypes in BswModuleDescriptions connected to each other.
mode manager	Entering and leaving modes is initiated by a <i>mode manager</i> . A <i>mode manager</i> is either a software component that provides a p-port typed by a ModeSwitchInterface , or a BSW module that defines in its BswModuleDescription a ModeDeclarationGroupPrototype in the role providedModeGroup .
mode switch notification	The communication of a mode switch from the <i>mode manager</i> to the <i>mode user</i> , using either the ModeSwitchInterface or providedModeGroup and requiredModeGroup ModeDeclarationGroupPrototypes .
mode switch port	The port for receiving (or sending) a mode switch notification. For this purpose, a <i>mode switch port</i> is typed by a ModeSwitchInterface .
mode user	An <i>AUTOSAR SW-C</i> or <i>AUTOSAR Basic Software Module</i> that depends on modes, is called a mode user. The dependency can occur through a SwcModeSwitchEvent / BswModeSwitchEvent , a ModeAccessPoint for a provided/required <i>mode switch port</i> , or a accessedModeGroup for a providedModeGroup / requiredModeGroup ModeDeclarationGroupPrototype .
on-entry ExecutableEntity	A RunnableEntity that is triggered by a SwcModeSwitchEvent with <i>ModeActivationKind</i> 'entry'; or a BswSchedulableEntity that is triggered by a BswModeSwitchEvent with <i>ModeActivationKind</i> 'entry'.
on-exit ExecutableEntity	A RunnableEntity that is triggered by a SwcModeSwitchEvent with <i>ModeActivationKind</i> 'exit'; or a BswSchedulableEntity that is triggered by a BswModeSwitchEvent with <i>ModeActivationKind</i> 'exit'.
on-transition ExecutableEntity	A RunnableEntity that is triggered by a SwcModeSwitchEvent with <i>ModeActivationKind</i> 'transition'; or a BswSchedulableEntity that is triggered by a BswModeSwitchEvent with <i>ModeActivationKind</i> 'transition'.
trigger port	A PortPrototype , which is typed by an TriggerInterface
trigger sink	A <i>trigger sink</i> relies on the activation of RunnableEntity or a BswSchedulableEntity , if a particular Trigger is raised. A <i>trigger sink</i> has a dedicated require trigger port (s) and / or requiredTrigger Trigger (s) to communicate to the <i>trigger source</i> (s).
trigger source	A <i>trigger source</i> administrates the particular Trigger , and informs the RTE or <i>Basic Software Scheduler</i> if the Trigger is raised. A <i>trigger source</i> has dedicated provide trigger port (s) and / or releasedTrigger Trigger (s) to communicate to the <i>trigger sink</i> (s).

Terms:	Description:
triggered BswSchedulableEntity	A <code>BswSchedulableEntity</code> that is triggered at least by one <code>BswExternalTriggerOccurredEvent</code> or <code>BswInternalTriggerOccurredEvent</code> . In particular cases, the <i>Trigger Event Communication</i> or the <i>Inter Basic Software Schedulable Entity Triggering</i> is implemented by the <i>Basic Software Scheduler</i> as a direct or trusted function call of the <code>triggered ExecutableEntity</code> , by the triggering <code>ExecutableEntity</code> .
triggered ExecutableEntity	A <code>RunnableEntity</code> that is triggered by at least one <code>ExternalTriggerOccurredEvent</code> / <code>InternalTriggerOccurredEvent</code> ; or a <code>BswSchedulableEntity</code> that is triggered by at least one <code>BswExternalTriggerOccurredEvent</code> / <code>BswInternalTriggerOccurredEvent</code> . In particular cases, the <i>Trigger Event Communication</i> or the <i>Inter Runnable Triggering</i> is implemented by RTE or <i>Basic Software Scheduler</i> as a direct or trusted function call of the <code>triggered ExecutableEntity</code> , by the triggering <code>ExecutableEntity</code> .
triggered runnable	A <code>RunnableEntity</code> that is triggered at least by one <code>ExternalTriggerOccurredEvent</code> or <code>InternalTriggerOccurredEvent</code> . In particular cases, the <i>Trigger Event Communication</i> or the <i>Inter Runnable Triggering</i> is implemented by RTE as a direct or trusted function call of the <i>triggered runnable</i> , by the triggering runnable.
SomIPEvent	SomIPEvent - a message sent by an ECU implementing a service instance to an ECU using this service instance (Publish/Subscribe).
SomIPMethod	SomIPMethod - a remote function which can be invoked via a message sent by an ECU implementing a service instance to an ECU using this service instance. An ECU can be in the role of the provider (offer a Method) and/or in the role of the consumer (invoke a remote Method).
SomIPService	A SomIPService is a type of operation that has a published specification of interface and behavior, involving a contract between the provider of the capability and the potential clients.

Table 2.2: Terms

3 Related Documentation

- [1] Glossary
AUTOSAR_TR_Glossary
- [2] Specification of Memory Mapping
AUTOSAR_SWS_MemoryMapping
- [3] ISO 26262:2018 (all parts) – Road vehicles – Functional Safety
<http://www.iso.org>
- [4] Specification of Timing Extensions
AUTOSAR_TPS_TimingExtensions

4 Software Clusters in Classic Platform

4.1 Software Clusters in a nutshell

This section provides a compact overview about the general solution approach. Please apologize that further details are only given in the section where the detailed solutions are elaborated.

The approach of [Software Clusters](#) in the AUTOSAR Classic Platform, is considering the fact that several ECUs have an inner structure, which is crucial for the SW system. This is illustrated in figure 4.1, which shows the conceptual meta model:

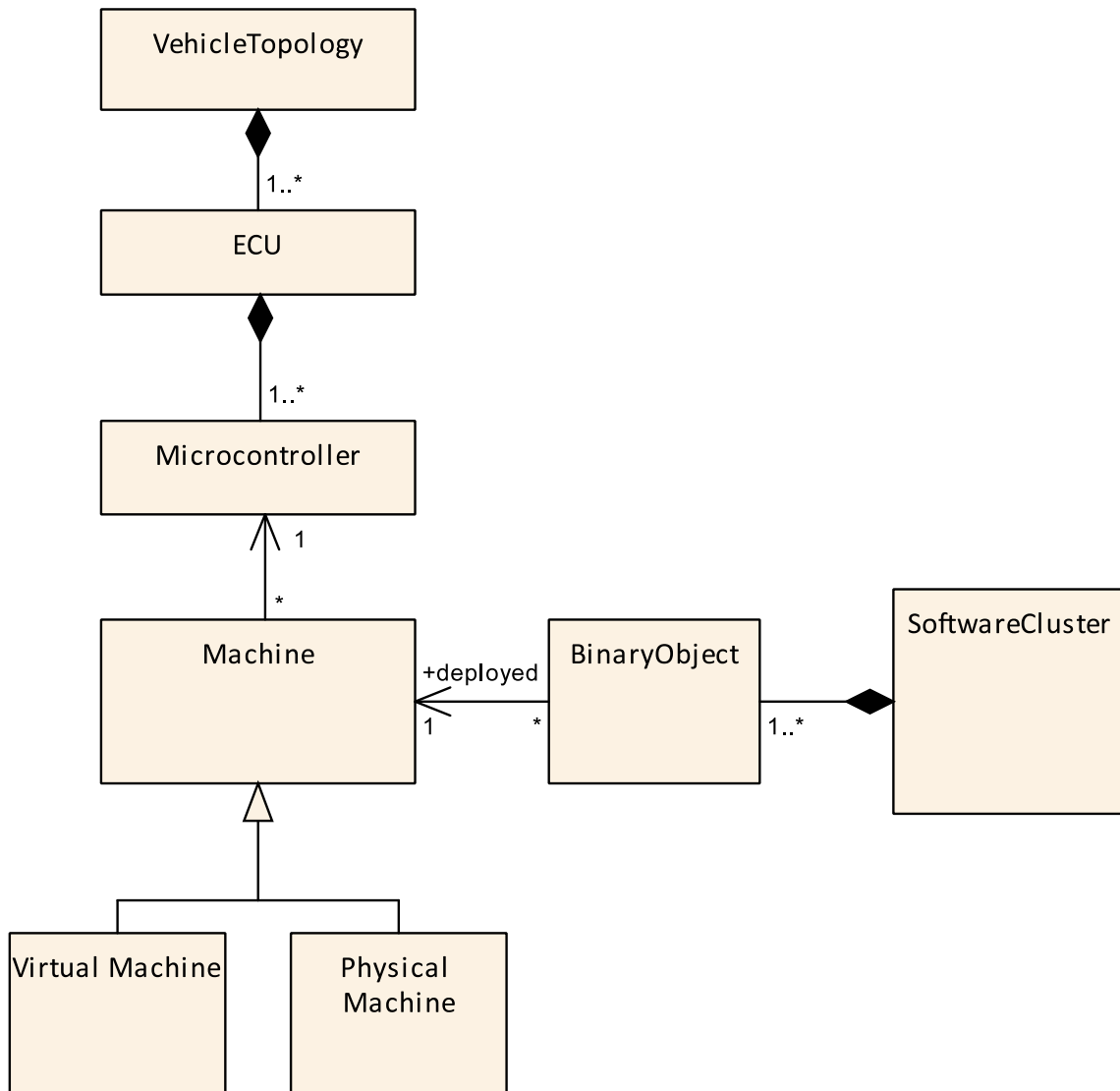


Figure 4.1: Hierarchy of ECUs, Machines and Software Clusters in a vehicle topology

The topology of a vehicle has several ECUs. One ECU can have 1 to N microcontrollers. Since microprocessors are in scope of AUTOSAR Adaptive Platform, they are not considered here. On one micro controller, 1 to N Machines are hosted. In case of $N > 1$, those are virtual and share the resources of the micro controller. Furthermore, each Machine owns one BSW Stack, e.g. from AUTOSAR perspective it is an instance of a Classic Platform Architecture!

This is considered as state of the art, even if the AUTOSAR Methodology might not be able to describe all details of such setups - not to mention that hypervisors are not standardized by AUTOSAR.

With [Software Clusters](#), the overall software of a Classic Platform Architecture is split into independent parts. Each [Software Cluster](#) is an independent Build Unit, and the result of the cluster specific build processes are the [Binary Objects](#).

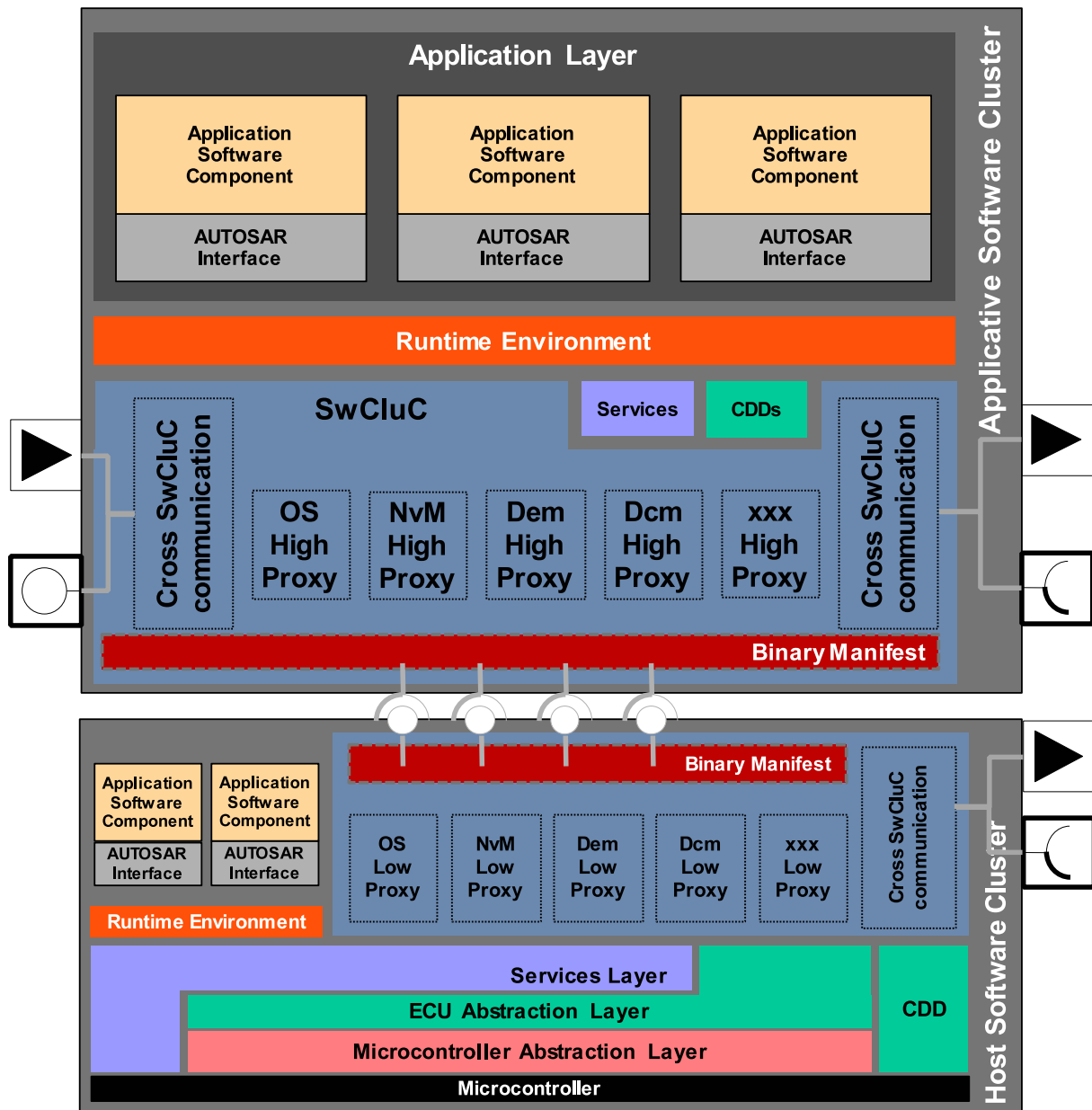


Figure 4.2: Software Cluster Connection in AUTOSAR Layered Software Architecture

As shown in figure 4.2, in a clustered software system the existing Layered Architecture gets extended by one new building block, the Software Cluster Connection. This Software Cluster Connection in turn has three major sub-blocks:

- The [Binary Manifest](#)
- The [Cross Cluster Communication](#)
- The [Proxy Modules](#)

The [Binary Manifests](#) provide the means to connect the [Binary Objects](#) deployed on the same machine.

The Cross Cluster Communication provides the VFB communication features between [Software Clusters](#). Note that service interfaces are out of scope, since the access to BSW modules is provided via the [Proxy Modules](#).

The [High Proxy Modules](#) substitute non-local BSW modules in [Application Software Clusters](#), and implement the connection to the [Low Proxy Modules](#) in the [Host Software Cluster](#), which then connect to the real BSW Modules. The [High Proxy Modules](#) exposes the same interface as the real BSW Module.

The [Host Software Cluster](#) contains the major part of the BSW Stack, especially micro controller dependent modules, including the Operating System. This implies that the dynamic behavior of the machine is mainly determined by the [Host Software Cluster](#), which implements the scheduling. However, the implementation of the [Application Software Clusters](#) needs to conform to the scheduling strategy of the [Host Software Cluster](#).

In an [Application Software Cluster](#), Application Software Components and BSW modules (with strong limitations) can be integrated. Basic Software Modules that are not available locally in an [Application Software Cluster](#), but whose interfaces are required for the integrated software, are substituted by [Proxy Modules](#).

Some RTE features might be restricted, since the implementations of those features do not scale, or may have unintended side effects to other [Software Clusters](#). For instance, synchronous client server calls cross [Software Clusters](#) require full context decoupling, where the impact to overall schedule is hard to foresee in a single [Software Cluster](#) scope.

The BSW Software is still reachable by synchronous client server calls. The implementation of the Multi Core Basic Software distribution concept is considered as prerequisite for scalability and good performance for SW systems applying [Software Clusters](#).

4.1.1 Design Philosophy, Goals and Non-Goals

The goal of [Software Clusters](#) is to provide flexibility for design and implementation of an AUTOSAR system and, by modularization, make it possible to localize the impact of a change in one cluster. Some architectural changes can be introduced step wise, and certain implementation changes no longer require a rebuild of the complete software. It is explicitly not the goal, to support every possible usecase and solve every possible problem, or to reinvent the Adaptive Platform.

While [Software Clusters](#) make it possible to reduce the rate of change, it is still possible to rebuild every [Software Cluster](#), including the [Host Software Cluster](#). Some usecases will be solved only partially by this concept (or not at all), and still require a change to the BSW and a rebuild of the [Host Software Cluster](#). The features in this concept will make changes to the BSW easier, so it might even be that the [Host Software Cluster](#) is rebuilt more often than before. But instead of rare, large changes to the BSW, the concept enables frequent, smaller changes.

4.2 Relation to EcucPartitions

The `Software Cluster` concept targets microcontrollers, which typically are very resource constrained. Therefore, it is important that this concept adds as little overhead as possible. Simply put: you only pay for what you use, but you also only get what you pay for. The relation between `Software Clusters` and `EcucPartitions` is one area where this is evident.

`EcucPartitions` offer the possibility to separate functions. Since they are implemented using `OSApplications`, separation of memory accesses and of runtime behavior can be achieved to a certain degree. On the other hand, the execution of multiple `OSApplications` also causes a relatively large overhead, requiring task switches (which can take hundreds of processor cycles) and additional administrative overhead (depending on the current and next task, it might be required to change the execution level, reconfigure the MPU, etc.). With a growing number of `EcucPartitions`, this overhead can become significant. Therefore, it is possible to reuse one `EcucPartition` in multiple `Software Clusters`.

At the same time, a system designer wants to combine functions from different `EcucPartitions` inside one cluster. This might be the case with large features, where some parts carry different ASIL requirements, or if OBD relevant parts should be separated from those that are not OBD relevant. For example, a brake function cluster might contain functions from different ASIL levels. Some actuate the brake and are safety relevant, but others, like a function that evaluates how smooth the ride is, are not safety relevant. Therefore, one `Software Cluster` can contain multiple `EcucPartitions`.

To fulfill both of these requirements, it is possible to have multiple `EcucPartitions` in one `Software Cluster` and to share an `EcucPartitions` between several `Software Clusters` (n:m relation).

If an `EcucPartition` is shared between `Software Clusters`, at runtime there is no way to enforce the separation between the `Software Components` from different `Software Clusters` it contains. But there is still a slight benefit, because the `Software Clusters` are separated logically and by memory address regions. Some violations could be detected not at runtime, but by static checks outside the ECU. For a given piece of code, the range of allowed memory regions and used features is much smaller. If static check tools would take this into account, it would make static checks or proofs about the software easier.

If the constrained resources allow, it is preferable not to share `EcucPartitions` between `Software Clusters`, since this provides a better separation between `Software Clusters`. Unfortunately, in practice this often cannot be avoided, so the goal should be to minimize this sharing as much as possible.

4.3 Assumption on the applicable target ECUs

Clustering a Classic Platform architecture shall work with state-of-the-art micro controllers. This means on one hand that enough resources especially w.r.t. RAM, ROM and CPU-Cores and their calculation power exist. This might also imply a 32-bit architecture or higher.

On the other hand, a utilization of the concepts and features on today's existing platforms are in scope, supporting various optimizations. For instance, a general software separation of [Software Clusters](#) by hardware features should be avoided since this usually uses rare resources of micro controller.

Targets with Memory Management Units are out of scope or at least are not especially considered by the standardized solution.

4.4 Assumption on safety mechanisms

The AUTOSAR CP Architecture assumes that communication local to an ECU utilizing RAM is safe. Therefore, the communication between [Software Clusters](#) on the same machine is also considered as safe. Integrity of machine local communication is ensured by the usage of partitions (with memory protection) and sufficiently reliable hardware (ECC RAM, suitable FID rates, etc.)

This means spatial and temporal separation of software needs to be implemented on the target microcontroller, based on the already introduced concept of partitions in the AUTOSAR Classic Platform architecture. This concept does not introduce additional methods to ensure such separation.

4.5 Assumption on the to-be-clustered SW system

Note: The numbers given in this chapter shall only express the rough magnitude to indicate a certain complexity. This framework was used in the concept development to prioritize sub-features, optimization capabilities, and to discuss acceptable restrictions of the solution. Nevertheless, in case of accepted restrictions, those will be part as constraints to the elaborated specifications.

The [Software Components](#), which are mapped to different [Software Clusters](#), shall aim for loose coupling.

'In computing and systems design, a loosely coupled system is one in which each of its components has, or makes use of, little or no knowledge of the definitions of other separate components. Subareas include the coupling of classes, interfaces, data, and services.' (See Wikipedia 'Loose coupling is the opposite of tight coupling.')

The concept assumes that the number of interfaces across [Software Clusters](#) is much smaller than the total number of interfaces between [Software Components](#).

This could be condensed into some rough estimate that the interface data of [Software Clusters](#) should be at least a factor of 10 smaller than the internal data flow (approx. 3k/machine). Preferably, interfaces should be well defined and rather stable, nevertheless a change of interfaces during the development time is explicitly supported by this concept.

Beside the static interfaces, the different [Software Clusters](#) shall have only have loose timing dependencies. Basically, the same design goals as for the parallelization and multi-core designs apply. E.g.

- avoid strict sequences
- avoid synchronous interactions
- avoid strict executions orders between Software Clusters

In general, a system designer has to keep in mind that any dependency between [Software Clusters](#) has to be solved at a higher level. E.g.

- interfaces need to be negotiated
- required execution orders needs to be agreed between [Software Cluster](#) providers and ensured during the [Software Cluster](#) integration on a machine
- required execution order needs to be ensured by the [Software Cluster](#) integration on a machine

But those cross [Software Cluster](#) dependencies are contradicting the goals of independent development, test and release of Software Clusters!

The number of [Software Clusters](#) on a physical microcontroller shall be in the area of 2 to 20. But with a growing number of [Software Clusters](#) - considering the absence of virtual memory (MMU) - the fragmentation of memory will increase. This fragmentation depends only on the number of [Software Clusters](#) and their required partitions, regardless of the number of machines. In any case, the precise number needs to be crosschecked with the capabilities of the physical hardware.

The software inside an [Application Software Cluster](#) does not use or implement interrupts.

It is assumed to be mainly control loop SW - usually time driven, but may also react on a limited number of sporadic events.

4.6 Assigning Memory to Software Clusters

Typically, the overall memory of microcontrollers is composed out of different memory types each serving for a specific purpose (e.g. RAM, FLASH program ROM, FLASH data ROM)). In addition, a specific segment of a memory type may have different performance for different use cases (e.g. access speed might be different for different microcontroller cores.) Splitting a monolithic CP software architecture into individual

buildable units requires that each **Software Cluster** provider has a clear notion which memory can be used for which purpose. Since microcontrollers typically do not support memory virtualization, it is not only required to agree on the amount of memory, but also on the specific address ranges.

The suggested methodology works as following:

The machine architect splits the overall memory into logical memory slots and belonging directions for which purpose such memory slot can be used. Those directions correspond to the physical properties of such memory slots (e.g. .RAM or FLASH) but also to the software partitioning (e.g. spatial separation by MPU), functional grouping (e.g. memory of calibration data set) and performance goals.

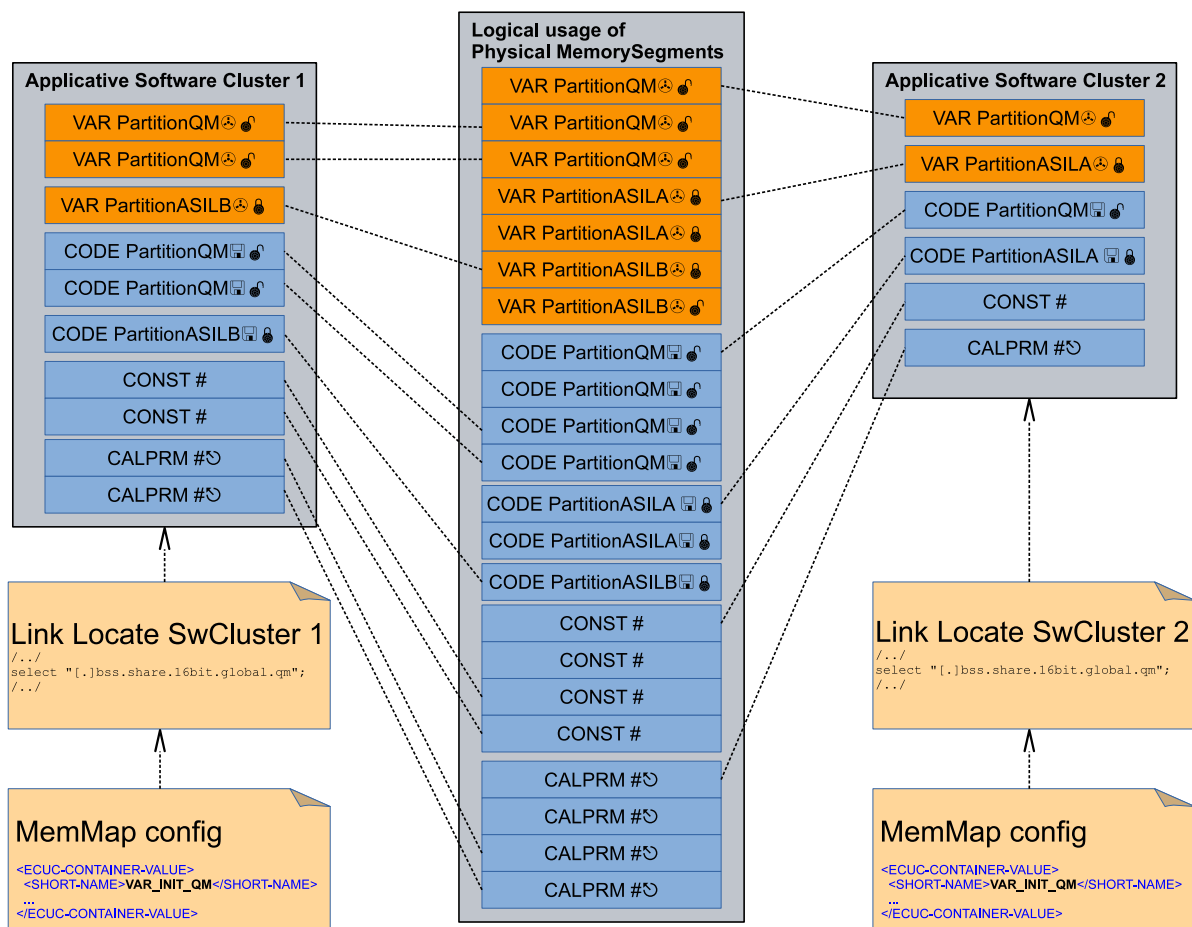


Figure 4.3: Assignment of memory to Software Clusters

The figure 4.3 illustrates the principle how different memory gets assigned to the Software Clusters.

Each **Software Clusters** gets now different memory slots assigned depending on the predicted memory consumption of the contained functionality and the required type of memories. Such an assignment can be directly transferred to a link-locate file and an initial configuration of the AUTOSAR Memory Mapping. The **Software Cluster** specific link-locate file ensures, that the **Software Cluster** specific build only

allocates memory which is reserved for this Software Cluster. The initial configuration of the AUTOSAR Memory Mapping in turn can define the `MemMapAddressing-ModeSets` with the configuration of pragmas controlling the assignment of code and variables to linker sections.

Further details can be found in document [2].

In addition to the static memory usage, the stack usage needs to be considered. Please note that a `Host Software Cluster` calls the 'Proxy' OS Tasks of the `Application Software Cluster` which in turn can invoke functions of BSW in the `Host Software Cluster`. Due to this common call graph a stack estimation and dimensioning has to consider the software architecture of `Host Software Cluster` and the individual `Application Software Cluster` in common.

4.7 Assigning Run-time to Software Clusters

First of all, please be aware that the use case 'freedom from unintended side effects' in a clustered system is different from 'freedom from interference' as a safety goal of ISO26262 [3]. The safety considerations usually assume first a design for coexistence and later apply measures to avoid interference, or at least to have a safe detection and failure reaction in case of interference.

With the native means of an AUTOSAR OS, it is almost impossible to create a schedule, which guarantees a complete 'freedom from unintended side effects' between various software sub systems. In a pure priority-based scheduling, it is always possible to occupy more calculation time on a given priority level, than is acceptable for other functionalities on the same or a lower priority. This can only be strictly avoided, by assigning a distinct set of OS Tasks on a dedicated core to each software sub system, which very likely is not affordable in terms of resources.

Consequently, managing a distributed development with `Software Clusters` requires the upfront design of an overall schedule, and the management of calculation time budgets in such a schedule. In practical use, it is also required to maintain such a design over the development time, in order to react to changing scheduling demands or identified problems.

With the concept of proxy tasks, an `Application Software Cluster` has already well-defined entry points, called dispatch entry points. Those dispatch entry points need to be qualified by timing properties, like trigger conditions (e.g. a periodic occurrence), *jitter*, or *maximum execution time*. Since those dispatch entry points can be described with the AUTOSAR Timing Extensions [4], a formal description of such timing properties is possible.

With this approach, it is possible to give a dynamic framework architecture to the different `Software Cluster` providers, against which they can prove their integration. This proof can be done by static code analyses, and real runtime measurements. A run-time estimation based on static code analysis has the advantage that a first proof

of dynamic architecture boundaries (e.g. the time budget of proxy task) can be already done without any running software.

The online monitoring of those runtime budgets is currently not standardized in AUTOSAR, but could be implemented as vendor-specific functionality with CDDs.

Nonetheless, if software gets integrated in a common AUTOSAR OS schedule, the software design and implementation need to support this coexistence. For example, the maximum runtime of `RunnableEntity` shall be smaller than the expected minimum response time in a non-preemptive schedule.

Additionally to the aspect of software scheduling, the functional impact of communication behavior needs to be taken into consideration. Depending on the executed algorithm, it might have severe impact on the output, whether the input signals from the actual calculation (N), or the ones from the previous calculation (N-1) are taken. Worst-case, the behavior even fluctuates between these two cases, which in turn can add jitter to the calculated output.

In a clustered system (assuming that the task system is shared), the total runtime of OS Tasks, and also the exact point of time when a specific Runnable is executed in an OS Task, frequently changes with each integration of new `Software Cluster` versions. This jeopardizes the approach to localize the functional impact to the changed Software Cluster.

The Logical Execution Time (LET) can support to ensure a stable software behavior, by abstracting the physical execution. In brief, the concept of LET splits the overall schedule into so called Logical Execution Time frames. A LET frame starts with its release point, and ends with its termination point. The communication of software located to different LET frames is executed only at the terminate point of the sending LET frame and the release point of the receiving LET frame.

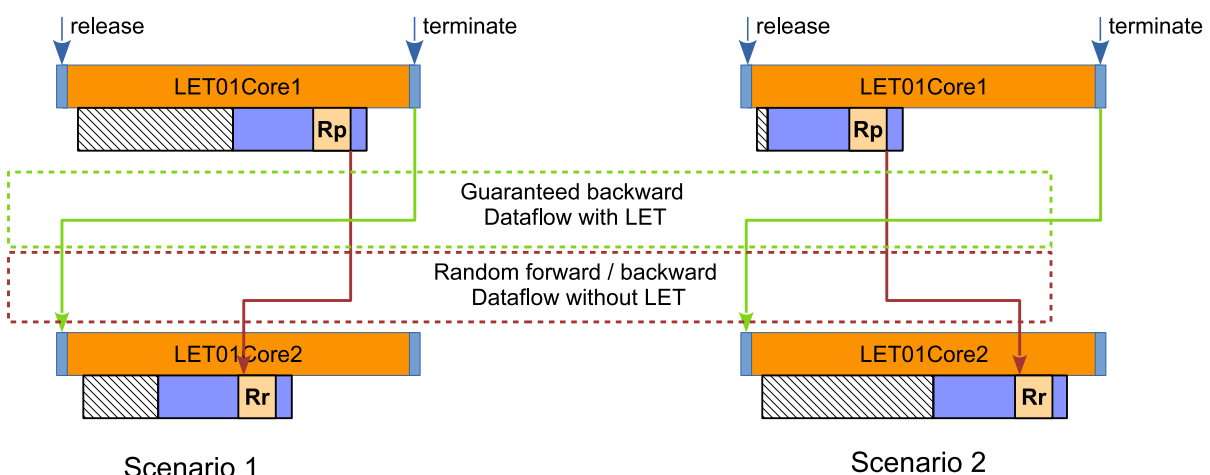


Figure 4.4: LET based communication versus classical communication

Figure 4.4 illustrates a simple data flow between two Runnables `Rp` and `Rr`. For simplicity, it is assumed that both are executed on OS Tasks executed on different cores, but similar situations can also occur in preemptive systems on the same core. The

point in time, at which they finish executing, jitters, which is shown by the hatched area. In Scenario 1, R_p is executed after R_r . Hence, R_c observes the values from R_p 's execution N-1 (also called backward data flow). In Scenario 2, R_p is executed before R_r . Hence, R_c observes the values from R_p 's actual execution N (also called forward data flow). With the application of LET, for both scenarios a deterministic backward data flow is guaranteed.

4.8 Service Oriented Communication in Software Clusters

Changing requirements or general software rework may require a [Software Cluster](#) to offer- and or consume additional or different [SomeIPEvents](#) or [SomeIPMethods](#). In contrast to conventional signal based communication, the PDUs which contain the serialized [SomeIPEvents](#) / [SomeIPMethod](#)-arguments respectively return values are actively controlled by mode management. This means that only after requesting a service, the PDU is actually transported from- and to the application SW-C via the BSW stack. Changes in the set of [SomeIPEvents](#) or [SomeIPMethods](#) that a [Software Cluster](#) provides or consumes hence require changes in the mode management. When it is not possible or desirable to build a new version of the [Host Software Cluster](#), changes can also be brought in by a mix of pre-prepared configuration elements and post-build configuration of the [Host Software Cluster](#). Since the general pattern in mode management is identical for all service oriented communication, parts can be re-used. Configuration elements that have to be created already during initial configuration(pre-compile) are:

- A set of wildcard [BswMModeRequest](#)- and [BswMSwitchPort](#) for new [SomeIPEvents](#) or [SomeIPMethods](#). These ports exist to already have the possibility to issue- and receive mode changes. Initially, they are not used. Later on, modes bound to specific [SomeIPEvents](#) or [SomeIPMethods](#) are assigned to them.
- The [BswMRules](#) and [BswMLogicalExpressions](#) which evaluate the modes set by the wildcard [BswMModeRequestPort](#)
- All potential [BswMActions](#) to request- and release the [Sd SomeIPEvent](#) or [SomeIPMethod](#) states.
- The [BswM](#) mode declaration groups relevant for service oriented communication

The actual modification is a post-build modification of the [BswMActionLists](#). Here [BswM](#) actions can be added- and/or removed that:

- request [SomeIPEvents](#) or [SomeIPMethods](#).
- bind a mode change to one of the wildcard [BswMSwitchPorts](#)

4.9 Design hints for clustered systems

Since the `Software Cluster` concept builds on existing technologies and concepts, introducing them adds only few additional design considerations.

If a cross cluster interface cannot be connected, the RTE method call (for example `Rte_IRead`) will return `RTE_E_UNCONNECTED` and the output value will be the `ComSpec.initValue` (for example `NonqueuedSenderComSpec.initValue`).

The notion that required ports might not be connected, already exists in systems that do not use Software Clusters. However, in some domains, this behavior is not used and some developers might assume that the interfaces they require are always present. It is therefore important to evaluate the impact of unconnected interfaces on those `Software Components`, who participate in cross cluster communication.

There are three ways, in which this can affect a `Software Component`:

1. The SW-C is not affected, if the input value is the init value. In this case, the SW-C can be used as-is. Example: the init value is a reserved value with neutral behavior.
2. The SW-C can function with the input value, but has to distinguish between the init value and other values. In this case, the SW-C should react to the `RTE_E_UNCONNECTED` return value. Example: the init value is a maximum value and the component should not use this value in its calculations.
3. The SW-C cannot function without the input value. In this case, the attribute `CpSoftwareClusterResource.isMandatory` should be set for the corresponding resource.

In the last case, [SWS_SwCluC_00050] specifies that, if a single mandatory interface on a `Software Component` cannot be connected, the whole cluster containing that `Software Component` will stay unconnected. This avoids situations, in which the `Software Components` integrated in a `Software Cluster` work with partly alive interfaces. It also avoids consecutive faults, for example if the reading `Software Component` calculates a faulty output value that is then read by another `Software Component`.

The `CpSoftwareClusterResource.isMandatory` attribute is set at system design time, when assigning `Software Components` to Clusters. It might also be required to convey this information at component design or implementation time. To indicate this, `VariableAccess.scope` can be set to `communicationIntraPartition`.

It is recommended that architecture tools warn, if `VariableAccess.scope` is set to `communicationIntraPartition`, but `CpSoftwareClusterResource.isMandatory` is not set.

Sidenote: Since `Software Clusters` can share `EcucPartitions`, it is possible that some cross cluster communication happens within the same partition (cross-cluster, but intra-partition). Therefore, there is a slight semantic difference between cross partition and cross cluster. However, due to the flexibility introduced by software

clusters, it is generally not possible to assure that a cross cluster interface will never cross a partition border. So it should be assumed that cross cluster communication might potentially also be cross partition. Therefore, it was decided to use the existing value `communicationIntraPartition`, instead of introducing a special value for communication within a cluster.

5 Software Clusters Example

5.1 Overview of the example system

The system model, corresponding to this example, can be found in the supplementary folder of Concept-670.

Cluster Definition

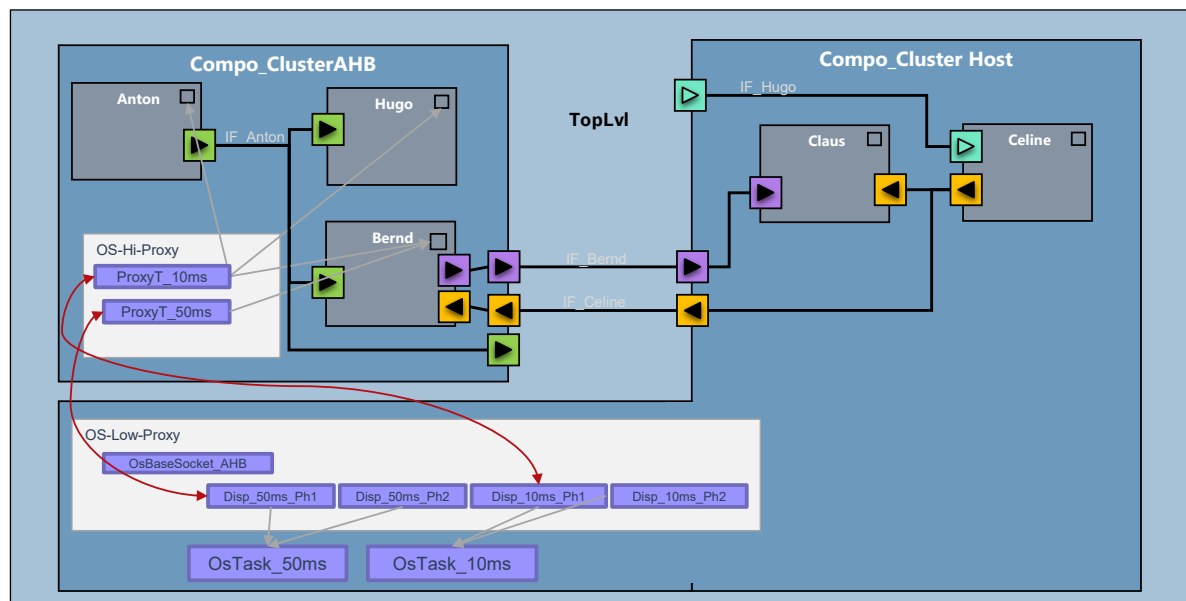


Figure 5.1: Overview of the example model

The example consists of 2 Software Compositions:

- Compo_AHB, with 3 Software Components: Anton, Hugo and Bernd
- Compo_Host, with 2 Software Components: Claus and Celine

Each of them have Providing and Requiring Ports, some of which are connected on Top-Level view.

There are 2 Software Clusters:

- SwClu_AHB, which contains Compo_AHB
- SwClu_Host, which contains Compo_Host

They are described separately, based on the necessary System Elements. Of course, in a real system, a cluster would usually contain several Software Compositions.

As shown in figure 5.1, the 2 Software Clusters have the following interfaces:

- IF_Celine; ports connected from SwClu_Host to SwClu_AHB
- IF_Bernd; ports connected from SwClu_AHB to SwClu_Host

- IF_Hugo; open requiring port on SwClu_Host
- IF_Anton; open providing port on SwClu_AHB

Figure 5.1 also shows the relevant service dependencies, through which a properly configured `Host Software Cluster` and its operating system can run the `Software Cluster AHB`.

For the required Os Services, the proxy pattern for Os is used. In that example, the base configuration consists of 2 OsTasks: `OsTask_50ms` and `OsTask_10ms`. Each of the tasks has 2 entry-points for the so called dispatchers in the `Application Software Clusters`:

- `OsTask_10ms`:
 - `Disp_10ms_Ph1` (Dispatcher for 10ms Task, phase 1)
 - `Disp_10ms_Ph2` (Dispatcher for 10ms Task, phase 2)
- `OsTask_50ms`:
 - `Disp_50ms_Ph1` (Dispatcher for 50ms Task, phase 1)
 - `Disp_50ms_Ph2` (Dispatcher for 50ms Task, phase 2)

In the `Software Cluster AHB`, there is a local implementation for the Os, following the `Os High Proxy` pattern, with the 2 proxy tasks: `ProxyT_10ms` and `ProxyT_50ms`. The matching timing events, from the `Software Component's TimingEvents`, are mapped to these 2 proxy tasks.

Not shown in the picture 5.1, is the `OsBaseSocket_AHB` and `BaseConfigCheck_AHB`. The `OsBaseSocket_AHB` is used for initial setup of the `Software Cluster's AHB` local `OsProxy`. The `BaseConfigCheck_AHB` is used to ensure that the configuration, implemented by the `Host Software Cluster`, fulfills the needs of the `Software Cluster AHB`.

All dependencies between the `Software Clusters` are described in the `RessourcePool`. In this example, there are `Communication-Ressources` based on the `S/R Ports`, `Service-Ressources` for the Os and configuration dependencies.

With all these settings, the system design for this example is complete. As mentioned in the beginning, the corresponding system model can be found in the supplementary folder of `Concept-670`.

5.2 Example Extract of Software Clusters

Based on the example system Model, it is possible to generate a cluster extract of the two `Software Clusters` `SwClu_Host` and `SwClu_AHB`. Through this step, the system will be split into two separate parts:

How to come to a Cluster Extract?

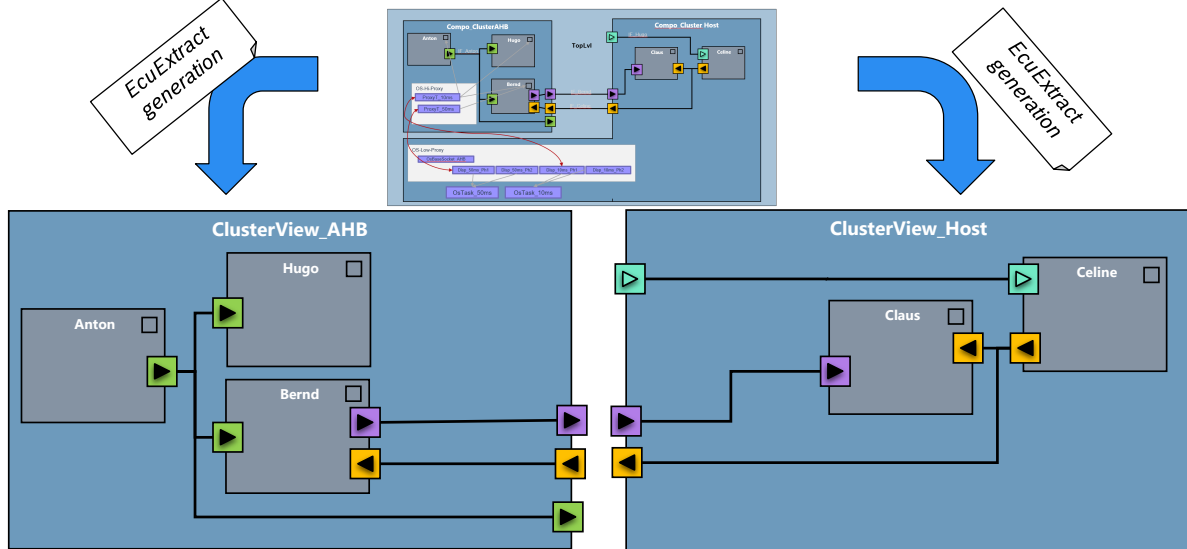


Figure 5.2: Overview of the Software Cluster Extract

Similar to the EcuExtract mechanism, each [Software Cluster](#) will be extracted from the system, and described on its own. In addition to that, the dependencies are referenced from the common RessourcePool. The main parts of such an extract are:

- Software Components
- Software Compositions
- Toplevel Root Composition
- Software Clusters
- COM-Ressources
- CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE
- Service-Needs

with their corresponding mappings. The first three items are already present for an EcuExtract, while the rest is specific to [Software Clusters](#).

This concept uses the analogy to the EcuExtract mechanism, as the task is basically the same. The aim was that it should be possible to reuse the currently available tools and toolchains for configuration and generation, with only minor changes.

In the example model, you can find ARXML-examples for each [Software Cluster](#).

5.3 Example Configuration of ECUC

To enable the generation and implementation of the service layer of a [Software Cluster](#), also new ECU Configuration elements (EcuC) are introduced with this concept. In this example, the configuration describes the settings of the [Os High Proxy](#) and the BinaryManifest, as well as the attributes of the [Software Clusters](#) itself. Such attributes could be: the type of the [Software Clusters](#), its connection settings, or settings needed by the build environment, like compiler flags. It also configures the [Software Cluster Communications Layer](#), e.g. whether or not it is implemented via RIPS-plugin.

5.4 ECUC Configuration of Os High Proxy

The example ARXMLs show a basic configuration of the [Os High Proxy](#), which consists of the Os Task configuration for the proxy-tasks ProxyT_10ms and ProxyT_50ms, and their settings for Priority, Period, Schedule and Activation. Also, an OsApplication "Core1QM" is configured there, to define the same context for both tasks.

5.5 File overview

To ease the creation and maintenance of the example, the model is split into several files. In addition, this file split is used to compose the mode to the different steps in the methodology. The table describes which files have to be used to get the complete model of a methodology step.

	Component Models	Resource Pool	ECU_SYSTEM_DESCRIPTION	SW_CLUSTER_SYSTEM_DESCRIPTION Host	SW_CLUSTER_SYSTEM_DESCRIPTION AHB	ECU configuration AHB
PlatformBase_Types.arxml	X		X	X	X	
Platform_Types.arxml	X		X	X	X	
DOC_SwCluC_SwcAnton_SWCD.arxml	X		X	X	X	
DOC_SwCluC_SwcBernd_SWCD.arxml	X		X	X	X	
DOC_SwCluC_SwcHugo_SWCD.arxml	X		X	X	X	
DOC_SwCluC_SwcCeline_SWCD.arxml	X		X	X	X	
DOC_SwCluC_SwcClaus_SWCD.arxml	X		X	X	X	
DOC_SwCluC_SwcCompoAHB_SWCD.arxml	X		X	X	X	
DOC_SwCluC_SwcCompoHost_SWCD.arxml	X		X	X	X	
DOC_SwCluC_Sys_TopLvl_SWCD.arxml	X		X	X	X	
DOC_SwCluC_Sys_SwClusters.arxml			X	X	X	
DOC_SwCluC_Sys_Descr_TopLvl.arxml			X			
DOC_SwCluC_Sys_HWT.arxml			X	X	X	
DOC_SwCluC_Sys_ResPoolCommunicationResources.arxml		X	X	X	X	
DOC_SwCluC_Sys_ResPoolServiceResources.arxml		X	X	X	X	
DOC_SwCluC_Sys_ResPoolServiceResourceNeeds.arxml		X	X	X	X	
DOC_SwCluC_Sys_Extr_Host.arxml				X		
DOC_SwCluC_Sys_Extr_TopLvl_SWCD_Host.arxml				X		
DOC_SwCluC_Sys_Extr_AHB.arxml					X	
DOC_SwCluC_Sys_Extr_TopLvl_SWCD_AHB.arxml					X	
DOC_SwCluC_Ecuc_EcuC_AHB.arxml						X
DOC_SwCluC_Ecuc_Os_AHB.arxml						X
DOC_SwCluC_Ecuc_SwCluC_AHB.arxml						X
AUTOSAR_MOD_ECUConfigurationParameters.arxml		X	X	X	X	X

Table 5.1: Mapping of files to methodology steps

5.6 From model to code

This section shall illustrate how the AUTOSAR model of a `Software Cluster` is handled over the different methodology steps, and finally processed in the code.

As previously described, three Software Components are integrated in the `Software Cluster` AHB:

- `SwcAnton` (`DOC_SwCluC_SwcAnton_SWCD.arxml`)
- `SwcBernd` (`DOC_SwCluC_SwcBernd_SWCD.arxml`)
- `SwcHugo` (`DOC_SwCluC_SwcHugo_SWCD.arxml`)

All are instantiated in the `CompositionSwComponentType` `SwcCompoAHB` (`DOC_SwCluC_SwcCompoAHB_SWCD.arxml`) that is used to describe the application software of AHB. A `CpSoftwareCluster.swComponentAssignment` exists for `SwCluC_AHB` (`DOC_SwCluC_Sys_SwClusters.arxml`).

From these Software Components, three `dataElements` in the ports

- `RP_Celine`, `dataElement` `Celine`
- `PP_Bernd`, `dataElement` `Bernd`
- `PP_Anton`, `dataElement` `Anton`

are delegated by `SwcCompoAHB`.

For each `dataElement`, a `CpSoftwareClusterCommunicationResource` (`DOC_SwCluC_Sys_ResPoolServiceResources.arxml`) describes the `Software Cluster` related properties.

In the `ECU_SYSTEM_DESCRIPTION` `System_TopLvl` (`DOC_SwCluC_Sys_Descr_TopLvl.arxml`), the according `dataElement` instances are mapped via a `PortElementToCommunicationResourceMapping`. In the `ECU_SYSTEM_DESCRIPTION` `System_TopLvl`, the mapping is consistently defined at the `PPortPrototype` side, if a `PPortPrototype` is available in a `Data Communication Graph`.

Please note `dataElement` `Celine`, mapped at `PP_Celine` of `SwcCompoHost`.

In the `SW_CLUSTER_SYSTEM_DESCRIPTION` AHB (`DOC_SwCluC_Sys_Extra_Host.arxml`) - which is an extract of `ECU_SYSTEM_DESCRIPTION` `System_TopLvl` - the mappings are transformed to the `PortPrototypes`, which are available in the scope of `Software Cluster` AHB.

Please note `dataElement` `Celine`, mapped now at `RP_Celine` of `SwcCompoAHB`.

In the ECU configuration phase of `Software Cluster` AHB, the `Data Communication Graphs` of the `dataElements` `Celine`, `Bernd`, and `Anton` are assigned to the `Cross Software Cluster Communication Plug-In` `Gr8Xcc`.

Due to this configuration, the according RTE APIs are using the RTE Implementation Plug-In Services, when communication cross Cross Software Clusters.

Example 5.1

Rte_Write in software component SwcAnton:

```
1 Std_ReturnType Rte_Write_SwcAnton_PP_Anton_Anton(Type_Anton data)
2 {
3     Std_ReturnType status = RTE_E_OK;
4
5     /* write to Software Cluster local communication buffer */
6     Rte_Buffer_000000_Anton = data;
7
8     /* write to Xcc Plug-In */
9     status = Rte_Rips_Gr8Xcc_Write_SwcAnton_CGI_Anton(data);
10
11     return status;
12 }
```

or

Example 5.2

Rte_DRead in software component SwcBernd:

```
1 Type_Celine Rte_DRead_SwcBernd_RP_Celine_Celine(void)
2 {
3     return Rte_Rips_Gr8Xcc_DRead_SwcBernd_CGI_Celine();
4 }
```

The Gr8Xcc Cross Software Cluster Communication Plug-In can implement the related RTE Implementation Plug-In Services as follows:

Example 5.3

Rte_Rips_Write in Cross Software Cluster Communication Plug-In Gr8Xcc:

```
1 Std_ReturnType Rte_Rips_Gr8Xcc_Write_SwcAnton_CGI_Anton(
2     Rte_Rips_GlobalCopy_CGI_Anton_Type data)
3 {
4     Std_ReturnType status = RTE_E_OK;
5
6     /* sendIndication = none, no indication of send operations */
7     SwCluC_Xcc_Buffer_Anton = data;
8     /* writing data is always successful */
9     return status;
10
11 }
```

The `Rte_Rips_Write` updates the data buffer used for cross cluster communication:

Example 5.4

```
1 Rte_Rips_GlobalCopy_CGI_Bernd_Type SwCluC_Xcc_Buffer_Bernd = 123u;
```

In case of reading the data, the relation to the [Binary Manifest](#) becomes also visible in the source code:

Example 5.5

`Rte_Rips_DRead` in [Cross Software Cluster Communication Plug-In Gr8Xcc](#):

```
1 Rte_Rips_GlobalCopy_CGI_Celine_Type
  Rte_Rips_Gr8Xcc_DRead_SwcBernd_CGI_Celine()
2 {
3   return *((Rte_Rips_GlobalCopy_CGI_Celine_Type *)
  SwCluC_BManif_GetHandle_rXccBasicSR_Celine_dataBuffer());
4 }
```

Please note that `Rte_Rips_DRead` just takes the data reference from [Binary Manifest](#), without checking if the related `Resource Entry` in the [Binary Manifest](#) is connected to another [Software Cluster](#).

This is possible, since the [Cross Software Cluster Communication Plug-In](#) creates a default data instance, and puts this as a default data value into the [Binary Manifest](#).

Example 5.6

Default data instance [Cross Software Cluster Communication Plug-In Gr8Xcc](#):

```
1 const Rte_Rips_GlobalCopy_CGI_Celine_Type SwCluC_Xcc_Default_Celine =
  42;
```

Therefore, the `SwCluC_BManif_GetHandle` API either returns the reference to the data buffer in the connected [Software Cluster](#), or the reference to the default data instance of the own [Software Cluster](#) AHB, in case no connection was possible.

It is the task of the [Cross Software Cluster Communication Plug-In](#) functionality, to configure the `Resource Entries` needed in the [Binary Manifest](#), so that the [Cross Software Cluster Communication](#) works. Such a configuration is shown in [DOC_SwCluC_Ecuc_SwCluC_AHB.arxml](#).

Example 5.7

Interface Descriptor Table for

- Send/Receive Ports Anton, Bernd, Celine,

- OsTasks OsTask_10ms, OsTask_50ms
- dispatchers for OsTask_10ms, OsTask_50ms

```

1  const SwCluC_BManif_ResourcePropertiesType
      SwCluC_BManif_ResourcePropertiesDescriptorColumn[
          SWCLUC_BMANIF_NO_OF_DESCRIPTORS] =
2  {
3      0x80, /* PROVIDED (Anton), N/A, S/R, GID = 0xDA1A0001 */
4      0x80, /* PROVIDED (Bernd), N/A, S/R, GID = 0xDA1A0002 */
5      0x00, /* REQUIRED (Celine), N/A, S/R, GID = 0xDA1A0003 */
6      0x40, /* REQUIRED (OsTask_10ms), MANDATORY, OsTask, GID = 0x05000004
          */
7      0x40, /* REQUIRED (OsTask_50ms), MANDATORY, OsTask, GID = 0x05000003
          */
8      0x40, /* REQUIRED (Disp_10ms_Ph1), MANDATORY, OsDispatcher, GID = 0
          x0500000a */
9      0x40 /* REQUIRED (Disp_50ms_Ph1), MANDATORY, OsDispatcher, GID = 0
          x05000008 */
10 };
11
12 /* descriptor table column for resource type Ids */
13 const SwCluC_BManif_ResourceTypeIdType
      SwCluC_BManif_ResourceTypeIdDescriptorColumn[
          SWCLUC_BMANIF_NO_OF_DESCRIPTORS] =
14 {
15     0x01u, /* PROVIDED (Anton), N/A, S/R, GID = 0xDA1A0001 */
16     0x01u, /* PROVIDED (Bernd), N/A, S/R, GID = 0xDA1A0002 */
17     0x01u, /* REQUIRED (Celine), N/A, S/R, GID = 0xDA1A0003 */
18     0x03u, /* REQUIRED (OsTask_10ms), MANDATORY, OsTask, GID = 0x05000004
          */
19     0x03u, /* REQUIRED (OsTask_50ms), MANDATORY, OsTask, GID = 0x05000003
          */
20     0x04u, /* REQUIRED (Disp_10ms_Ph1), MANDATORY, OsDispatcher, GID = 0
          x0500000a */
21     0x04u /* REQUIRED (Disp_50ms_Ph1), MANDATORY, OsDispatcher, GID = 0
          x05000008 */
22 };
23
24 const SwCluC_BManif_GlobalResourceIdType
      SwCluC_BManif_GlobalResourceIdDescriptorColumn[
          SWCLUC_BMANIF_NO_OF_DESCRIPTORS] =
25 {
26     0xDA1A0001, /* PROVIDED (Anton), N/A, S/R, GID = 0xDA1A0001 */
27     0xDA1A0002, /* PROVIDED (Bernd), N/A, S/R, GID = 0xDA1A0002 */
28     0xDA1A0003, /* REQUIRED (Celine), N/A, S/R, GID = 0xDA1A0003 */
29     0x05000004, /* REQUIRED (OsTask_10ms), MANDATORY, OsTask, GID = 0
          x05000004 */
30     0x05000003, /* REQUIRED (OsTask_50ms), MANDATORY, OsTask, GID = 0
          x05000003 */
31     0x0500000a, /* REQUIRED (Disp_10ms_Ph1), MANDATORY, OsDispatcher,
          GID = 0x0500000a */
32     0x05000008 /* REQUIRED (Disp_50ms_Ph1), MANDATORY, OsDispatcher,
          GID = 0x05000008 */
33 };
34

```



```
35 const SwCluC_BManif_ResourceGuardValueType
    SwCluC_BManif_ResourceGuardValueDescriptorColumn[
        SWCLUC_BMANIF_NO_OF_DESCRIPTOR] =
36 {
37     0x0001DD21, /* PROVIDED (Anton), N/A, S/R, GID = 0xDA1A0001 */
38     0x0001E2FD, /* PROVIDED (Bernd), N/A, S/R, GID = 0xDA1A0002 */
39     0x19D1C26F, /* REQUIRED (Celine), N/A, S/R, GID = 0xDA1A0003 */
40     0x0006F83F, /* REQUIRED (OsTask_10ms), MANDATORY, OsTask, GID = 0
        x05000004 */
41     0x0006F855, /* REQUIRED (OsTask_50ms), MANDATORY, OsTask, GID = 0
        x05000003 */
42     0x0006F83F, /* REQUIRED (Disp_10ms_Ph1), MANDATORY, OsDispatcher, GID
        = 0x0500000a */
43     0x0006F855 /* REQUIRED (Disp_50ms_Ph1), MANDATORY, OsDispatcher, GID
        = 0x05000008 */
44 };
45
46 const SwCluC_BManif_TableIndexType
    SwCluC_BManif_OfferedInterfaceIndexDescriptorColumn[
        SWCLUC_BMANIF_NO_OF_DESCRIPTOR] =
47 {
48     0, /* PROVIDED (Anton), N/A, S/R, GID = 0
        xDA1A0001 */
49     1, /* PROVIDED (Bernd), N/A, S/R, GID = 0
        xDA1A0002 */
50     SWCLUC_BMANIF_NO_TABLE_ENTRY, /* REQUIRED (Celine), N/A, S/R, GID = 0
        xDA1A0003 */
51     SWCLUC_BMANIF_NO_TABLE_ENTRY, /* REQUIRED (OsTask_10ms), MANDATORY,
        OsTask, GID = 0x05000004 */
52     SWCLUC_BMANIF_NO_TABLE_ENTRY, /* REQUIRED (OsTask_50ms), MANDATORY,
        OsTask, GID = 0x05000003 */
53     2, /* REQUIRED (Disp_10ms_Ph1), MANDATORY,
        OsDispatcher, GID = 0x0500000a */
54     3 /* REQUIRED (Disp_50ms_Ph1), MANDATORY,
        OsDispatcher, GID = 0x05000008 */
55 };
56
57 const SwCluC_BManif_HandleIndexType
    SwCluC_BManif_OfferedInterfaceNoOfHandlesDescriptorColumn[
        SWCLUC_BMANIF_NO_OF_DESCRIPTOR] =
58 {
59     0x01u, /* PROVIDED (Anton), N/A, S/R, GID = 0xDA1A0001 */
60     0x01u, /* PROVIDED (Bernd), N/A, S/R, GID = 0xDA1A0002 */
61     0x00u, /* REQUIRED (Celine), N/A, S/R, GID = 0xDA1A0003 */
62     0x00u, /* REQUIRED (OsTask_10ms), MANDATORY, OsTask, GID = 0x05000004
        */
63     0x00u, /* REQUIRED (OsTask_50ms), MANDATORY, OsTask, GID = 0x05000003
        */
64     0x01u, /* REQUIRED (Disp_10ms_Ph1), MANDATORY, OsDispatcher, GID = 0
        x0500000a */
65     0x01u /* REQUIRED (Disp_50ms_Ph1), MANDATORY, OsDispatcher, GID = 0
        x05000008 */
66 };
67
```

```
68 const SwCluC_BManif_TableIndexType
    SwCluC_BManif_SubscribedInterfaceIndexDescriptorColumn[
        SWCLUC_BMANIF_NO_OF_DESCRIPTORS] =
69 {
70     SWCLUC_BMANIF_NO_TABLE_ENTRY, /* PROVIDED (Anton), N/A, S/R, GID = 0
        xDA1A0001 */
71     SWCLUC_BMANIF_NO_TABLE_ENTRY, /* PROVIDED (Bernd), N/A, S/R, GID = 0
        xDA1A0002 */
72     0x00u, /* REQUIRED (Celine), N/A, S/R, GID = 0
        xDA1A0003 */
73     0x01u, /* REQUIRED (OsTask_10ms), MANDATORY,
        OsTask, GID = 0x05000004 */
74     0x02u, /* REQUIRED (OsTask_50ms), MANDATORY,
        OsTask, GID = 0x05000003 */
75     SWCLUC_BMANIF_NO_TABLE_ENTRY, /* REQUIRED (Disp_10ms_Ph1), MANDATORY,
        OsDispatcher, GID = 0x0500000a */
76     SWCLUC_BMANIF_NO_TABLE_ENTRY /* REQUIRED (Disp_50ms_Ph1), MANDATORY,
        OsDispatcher, GID = 0x05000008 */
77 };
78
79 const SwCluC_BManif_HandleIndexType
    SwCluC_BManif_SubscribedInterfaceNoOfHandlesDescriptorColumn[
        SWCLUC_BMANIF_NO_OF_DESCRIPTORS] =
80 {
81     0x00, /* PROVIDED (Anton), N/A, S/R, GID = 0xDA1A0001 */
82     0x00, /* PROVIDED (Bernd), N/A, S/R, GID = 0xDA1A0001 */
83     0x01, /* REQUIRED (Celine), N/A, S/R, GID = 0xDA1A0003 */
84     0x01, /* REQUIRED (OsTask_10ms), MANDATORY, OsTask, GID = 0x05000004
        */
85     0x01, /* REQUIRED (OsTask_50ms), MANDATORY, OsTask, GID = 0x05000003
        */
86     0x00, /* REQUIRED (Disp_10ms_Ph1), MANDATORY, OsDispatcher, GID = 0
        x0500000a */
87     0x00 /* REQUIRED (Disp_50ms_Ph1), MANDATORY, OsDispatcher, GID = 0
        x05000008 */
88 };
89
90 const SwCluC_BManif_HandleIndexType
    SwCluC_BManif_SubscribedInterfaceNoOfHandleSetsDescriptorColumn[
        SWCLUC_BMANIF_NO_OF_DESCRIPTORS] =
91 {
92     0x00, /* PROVIDED (Anton), N/A, S/R, GID = 0xDA1A0001 */
93     0x00, /* PROVIDED (Bernd), N/A, S/R, GID = 0xDA1A0002 */
94     0x00, /* REQUIRED (Celine), N/A, S/R, GID = 0xDA1A0003 */
95     0x00, /* REQUIRED (OsTask_10ms), MANDATORY, OsTask, GID = 0x05000004
        */
96     0x00, /* REQUIRED (OsTask_50ms), MANDATORY, OsTask, GID = 0x05000003
        */
97     0x00, /* REQUIRED (Disp_10ms_Ph1), MANDATORY, OsDispatcher, GID = 0
        x0500000a */
98     0x00 /* REQUIRED (Disp_50ms_Ph1), MANDATORY, OsDispatcher, GID = 0
        x05000008 */
99 };
```

Please note the addressing of the Interface Descriptor Table into the related row of the Offered Interface Table and Subscribed Interface Table.

In this example:

- Resource Anton
 - is provided (line 3), and of type Sender/Receiver (line 15)
 - has one handle in the OfferedInterface (line 59), which occupies the first row in the Offered Interface Table (line 48, OfferedInterfaceIndex = 0)
 - has no handle in the Subscribed interface (SubscribedInterfaceNoOfHandles = 0, line 81, and SubscribedInterfaceIndex = SWCLUC_BMANIF_NO_TABLE_ENTRY, line 70).
- Resource Celine
 - is required (line 5), and of type Sender/Receiver (line 17)
 - has no handle in the OfferedInterface (OfferedInterfaceNoOfHandles = 0, line 61, and OfferedInterfaceIndex = SWCLUC_BMANIF_NO_TABLE_ENTRY, line 50)
 - has one handle in the SubscribedInterface (line 83), which occupies the first row in the Subscribed Interface Table (line 72).

Example 5.8

Offered Interface Table for Anton, Bernd, dispatcher for OsTask_10ms, and dispatcher for OsTask_50ms

```

1  const SwCluC_BManif_HandleType
      SwCluC_BManif_OfferedInterfaceHandleColumn[
      SWCLUC_BMANIF_NO_OF_OFFERED_HANDLES] =
2  {
3  { .dptr = (void *) &SwCluC_Xcc_Buffer_Anton }, /* PROVIDED (Anton),
      N/A, S/R, GID = 0xDA1A0001 */
4  { .dptr = (void *) &SwCluC_Xcc_Buffer_Bernd }, /* PROVIDED (Bernd),
      N/A, S/R, GID = 0xDA1A0002 */
5  { .fptr = (SwCluC_BManif_VoidFncPtrType) SwCluC_OsProxy_ProxyT_10ms
      }, /* REQUIRED (Disp_10ms_Ph1), MANDATORY, OsDispatcher, GID = 0
      x0500000a */
6  { .fptr = (SwCluC_BManif_VoidFncPtrType) SwCluC_OsProxy_ProxyT_50ms }
      /* REQUIRED (Disp_50ms_Ph1), MANDATORY, OsDispatcher, GID = 0
      x05000008 */
7  };

```

In the Offered Interface Table, the data buffers for Anton and Bernd are offered for other [Software Clusters](#).

Example 5.9

Subscribed Interface Table for Celine, OsTask_10ms, and OsTask_50ms

```

1  const SwCluC_BManif_HandleType
      SwCluC_BManif_SubscribedInterfaceDefaultHandleColumn[
          SWCLUC_BMANIF_NO_OF_SUBSCRIBED_HANDLES] =
2  {
3      { .dptr = (void *) &SwCluC_Xcc_Default_Celine }, /* REQUIRED (Celine
          ), N/A, S/R, GID = 0xDA1A0003 */
4      { .fptr = (SwCluC_BManif_VoidFncPtrType)
          SwCluC_OsProxy_ActivateTaskDefault }, /* REQUIRED (OsTask_10ms),
          MANDATORY, OsTask, GID = 0x05000004 */
5      { .fptr = (SwCluC_BManif_VoidFncPtrType)
          SwCluC_OsProxy_ActivateTaskDefault } /* REQUIRED (OsTask_50ms),
          MANDATORY, OsTask, GID = 0x05000003 */
6  };
7
8  const SwCluC_BManif_HandleType
      SwCluC_BManif_SubscribedInterfaceHandleColumn[
          SWCLUC_BMANIF_NO_OF_SUBSCRIBED_HANDLES] =
9  {
10     { .dptr = (void *) &SwCluC_Xcc_Default_Celine }, /* REQUIRED (Celine
          ), N/A, S/R, GID = 0xDA1A0003 */
11     { .fptr = (SwCluC_BManif_VoidFncPtrType)
          SwCluC_OsProxy_ActivateTaskDefault }, /* REQUIRED (OsTask_10ms),
          MANDATORY, OsTask, GID = 0x05000004 */
12     { .fptr = (SwCluC_BManif_VoidFncPtrType)
          SwCluC_OsProxy_ActivateTaskDefault } /* REQUIRED (OsTask_50ms),
          MANDATORY, OsTask, GID = 0x05000003 */
13 };
14
15 const SwCluC_BManif_SwClusterIdType
      SwCluC_BManif_SubscribedInterfaceConnectedSwClusterIdColumn[
          SWCLUC_BMANIF_NO_OF_SUBSCRIBED_HANDLES] =
16 {
17     SWCLUC_BMANIF_SWCL_ID_UNCONNECTED, /* REQUIRED (Celine), N/A, S/R,
          GID = 0xDA1A0003 */
18     SWCLUC_BMANIF_SWCL_ID_UNCONNECTED, /* REQUIRED (OsTask_10ms),
          MANDATORY, OsTask, GID = 0x05000004 */
19     SWCLUC_BMANIF_SWCL_ID_UNCONNECTED /* REQUIRED (OsTask_50ms),
          MANDATORY, OsTask, GID = 0x05000003 */
20 };

```

In the Subscribed Interface Table, the default data instance for Celine is set. This ensures that the initial value is read, in case no connection to another Software Cluster is possible.

6 Limitations and Restrictions

6.1 Out of scope topics

6.1.1 Securing the Binary Objects

Securing the Binary Objects against unauthorized modification (e.g. signature checks during flash).

Rationale: This is not in scope of CP platform in general.

6.1.2 Standardization of hypervisor solutions

Standardization of hypervisor solutions to implement multiple machines one micro controller.

Rationale: There are already existing solutions on the market.

6.1.3 Mere build time optimization

The concept does not target projects that just want to do build time optimization. While it is possible to use the concept to reuse already built parts and thereby reduce build times, it is not designed with this usecase in mind. The scenario that a local integration just uses Software Clusters as independent build units, but keeps the full static and dynamic dependencies between them, is not considered.

The build time reduction will be accompanied by some overhead in memory consumption and runtime, since the concept has to solve the additional requirements for a distributed and independent development and integration. If the flexibility introduced by Software Clusters is not required, and the goal is just to reuse parts of a build, other solutions can be designed that have less (or maybe even no) overhead at run time.

To summarize: Using the concept in this way is possible, but not recommended.

6.1.4 Easy deactivation of Software Clusters

The solution of AUTOSAR to support Software Clusters in the Classic Platform is not designed in a way that clustering can be disabled, or that a clustered system can easily be turned back into a non-clustered system. Simply put: there is no off switch.

Rationale: This is not possible since separate build units support:

- different lib versions
- separate name spaces for compiler / linker

- multi instances of regular BSW modules (e.g. Dem/Dcm/Fim)

If such benefits are used, a simple fall back to a common large-scale integration is technically not possible.

Example: If a project uses different versions of a library in different clusters, the project can no longer be compiled and linked as a single build unit, since the single definition rule is violated. If such a project were to be turned back into an unclustered system, it would first be necessary to consolidate the different library versions to a single version.

Nonetheless, by setting the bit `SWCLUC_BMANIF_DISABLE_ON_ECU_CONNECTION`, defined in [SWS_SwCluC_00056], on the `Host Software Cluster`, it is possible to freeze the `Software Cluster Connection` for all clusters. After setting the bit, it is no longer possible to flash single clusters. Reprogramming can only be done for the whole ECU.

6.2 Utilization of RTE features

No Blocking APIs of RTE can be used by SWCs in a Software Clusters.

Rationale: Several software clusters share the same Basic Software including the operating system. This requires a 'gentle' behavior of the Software Clusters in order to avoid blocking of the schedule by a single Software Cluster.

No synchronous client server calls between Application Software Clusters.

Rationale: Software Clusters are built independently from each other. It is almost impossible to create a software function, which can be called from a completely unknown context. A solution to this problem would involve a complex and blocking RPC mechanism!

6.3 Constraints on feasible decoupling

Please note that Software Clusters in any case do not use run-time measures to enforce a strict separation between different Software Clusters.

This design decision considers the fact that run-time protection requires certain hardware support (for example MPU regions) and CPU performance, whose availability is limited on real existing microcontrollers. To reach specific safety-goals or other separation goals of an ECU, Software Clusters support the existing separation mechanisms, based on Partitions. However, to avoid unnecessary overhead, it is also possible to share partitions between Application Software Clusters.

Nevertheless, it is up to the concrete project to decide, where which kind of separation is required, desirable and affordable on the selected target microcontroller for the concrete software.

Very likely, reaching the goal of independent homologation / certification requires the usage of virtual machines.

Rationale: Different Application Software Clusters share the same BSW Stack and execution environment. Therefore, it will be hard to formally prove that these Software Clusters are free from unintended side effects!

Virtual machines versus software clusters in classic platform

The decision, whether virtual machines (where each of them contains its own BSW Stack) or software clusters are used to split the overall SW System into independent units, is a trade of between complete independence of the SW units and required resources (RAM, ROM, Runtime, etc.)

The current concept setup focuses on a rather lean approach for software clusters, supporting independent development. Use cases that require hard separation are better suited to virtual machines with independent BSW Stacks.

6.4 Basic Software integration in an Application Software Cluster

Even if the solution in AUTOSAR basically supports the integration of BSW modules, it does not provide a generic solution for any flexible BSW module distribution and separation. The standardized solution focuses on the independent usage of RTE, Transformers and Libraries.

The basic motivation for BSW integration in an [Application Software Cluster](#) is either to localize integration decisions, when integrated software components depend on BSW services, or to improve performance by avoidance of cross cluster interface crossing.

An additional motivation is the possible scenario to put an independent set of Diagnosis Modules (Dcm, Dem, Fim) into an Application Software Cluster. In doing so, BSW modules existing in the [Host Software Cluster](#) may also exist as an additional instance in one or several [Application Software Clusters](#)

But adding BSW modules to multiple [Software Clusters](#) leads to a significant increase in the overall BSW resource need.

This concept excludes the use case to move any arbitrary BSW module into a software cluster. It also excludes the objective to enable the independent update of single or smaller sets of BSW modules. The BSW module implementation has to support the integration into an [Application Software Cluster](#), which provides only a limited environment:

- Hardware interrupts are not available (ISR tables reside in [Host Software Cluster](#))
- Direct HW access is not supported and strongly discouraged. This excludes any driver with hardware access!

- In general, interfaces of other BSW modules will not be available and it will not be possible to call other BSW modules. The only exception are interfaces provided by [Proxy Modules](#) and other local BSW modules inside the same cluster.
- Usage of BSW Modules inside a [Software Cluster](#) may not easily be distributable to several cores (or only with some performance penalty), since the low-level mechanisms for partition / core passing are only available in the [Host Software Cluster](#)!

Rationale: BSW Modules in the AUTOSAR Architecture have strong configuration dependencies, which hard to break up into different SW units.

6.5 Functional restrictions

In the current release of AUTOSAR, the usage of features by Software Clusters in general, but especially by Application Software Clusters is restricted to a basic set. This section lists the most prominent not supported functionalities. Nevertheless, it claims not to be complete.

- Postbuild variability for [Software Cluster](#) interfaces is currently out of scope of this concept and will not be supported.
- intra ECU signal based communication by an Application Software Cluster is not supported
- SOME/IP communication by an Application Software Cluster is not supported
- Access to BSW Services by an Application Software Cluster is not supported, with the exception of OS and NvM (e.g. Dem, FiM, Dcm, WdgM, BswM, e.t.c. are not supported)

Some of those restrictions might be removed in future AUTOSAR releases.

6.6 Flashing and Compatibility

One of the goals of this concept is to allow changing and updating single clusters, without having to rebuild and reflash the complete software. This, of course, has some influence on the flashing process. Since flash programming is usually out of scope of the AUTOSAR Classic Platform, these points are not mentioned in the specification document. Nevertheless, some hints are given in this section.

A typical programming session usually consist of the following steps:

- check readiness
- start flash routine
- check compatibility

- upload new data to the ECU
- write new data to flash
- restart ECU

6.6.1 Severe incompatibilities

In non clustered projects, the compatibility check is required to ensure that the new data fits on a certain ECU. Without this check, it would be possible to flash software that does not run on the given ECU.

Such a check is also required for clustered software. A cluster can be totally incompatible to the rest of the software, especially to the [Host Software Cluster](#). For example, if the cluster hex is built for a different memory layout, flashing it might overwrite addresses that are assigned to other clusters, leaving the system in an undefined state. There are many other examples, like using a compiler with a different calling convention.

To handle these severe incompatibilities, the specification document defines the `Software Cluster Base Configuration Check`. This uses a guard value calculated from two parts. One part, `SwCluCAutoBaseConfigDescriptor`, is calculated, and should be implemented to cover incompatibilities that can be detected automatically (e.g. changed memory layout). The other part, `SwCluCUserBaseConfigDescriptor`, is maintained manually. It should be changed, whenever an incompatibility is introduced that cannot be detected manually (e.g. a new compiler).

In case of a severe incompatibility, the flash process should be aborted, before the new data is uploaded.

6.6.2 Severe Connection Errors

In case the connection is done on-Board, a new connection phase has to be done after programming. During this phase, incompatibilities can surface. The section 'Errors during software cluster connection' of the specification document lists errors, which cause an abort of the connection phase. In such a case, the newly programmed cluster will not be started. This can lead to knock-on effects on other clusters, and in some cases might lead to a system that can no longer start. In such a case, the system should, if possible, roll back to the previous state, or enter a state that allows diagnosing this problem and flashing a corrected cluster.

A Example listings

A.1 DOC_SwCluC_SwcAnton_SWCD.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00048.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>CONC_670</SHORT-NAME>
          <AR-PACKAGES>
            <AR-PACKAGE>
              <SHORT-NAME>SwcAnton</SHORT-NAME>
              <AR-PACKAGES>
                <AR-PACKAGE>
                  <SHORT-NAME>SwComponentTypes</SHORT-NAME>
                  <ELEMENTS>
                    <APPLICATION-SW-COMPONENT-TYPE>
                      <SHORT-NAME>SwcAnton</SHORT-NAME>
                      <PORTS>
                        <P-PORT-PROTOTYPE>
                          <SHORT-NAME>PP_Anton</SHORT-NAME>
                          <PROVIDED-INTERFACE-TREF DEST="SENDER-RECEIVER-
                            INTERFACE"/>/AUTOSAR/CONC_670/SwcAnton/
                            PortInterfaces/IF_Anton</PROVIDED-INTERFACE-
                            TREF>
                        </P-PORT-PROTOTYPE>
                      </PORTS>
                      <INTERNAL-BEHAVIORS>
                        <SWC-INTERNAL-BEHAVIOR>
                          <SHORT-NAME>IB_SwcAnton</SHORT-NAME>
                          <DATA-TYPE-MAPPING-REFS>
                            <DATA-TYPE-MAPPING-REF DEST="DATA-TYPE-MAPPING-
                              SET"/>/AUTOSAR/CONC_670/SwcAnton/
                              DataTypeMappingSets/DTMS_SwcAnton</DATA-TYPE-
                              MAPPING-REF>
                          </DATA-TYPE-MAPPING-REFS>
                          <EVENTS>
                            <TIMING-EVENT>
                              <SHORT-NAME>TE_SwcAnton_10ms</SHORT-NAME>
                              <START-ON-EVENT-REF DEST="RUNNABLE-ENTITY"/>/
                                AUTOSAR/CONC_670/SwcAnton/SwComponentTypes
                                /SwcAnton/IB_SwcAnton/RE_SwcAnton_10ms</
                                START-ON-EVENT-REF>
                              <PERIOD>0.01</PERIOD>
                            </TIMING-EVENT>
                          </EVENTS>
                          <RUNNABLES>
                            <RUNNABLE-ENTITY>
                              <SHORT-NAME>RE_SwcAnton_10ms</SHORT-NAME>

```

```

<CAN-BE-INVOKED-CONCURRENTLY>>false</CAN-BE-
  INVOKED-CONCURRENTLY>
<DATA-SEND-POINTS>
  <VARIABLE-ACCESS>
    <SHORT-NAME>DSP_Anton_0</SHORT-NAME>
    <ACCESSED-VARIABLE>
      <AUTOSAR-VARIABLE-IREF>
        <PORT-PROTOTYPE-REF DEST="P-PORT-
          PROTOTYPE"/>/AUTOSAR/CONC_670/
          SwcAnton/SwComponentTypes/SwcAnton
          /PP_Anton</PORT-PROTOTYPE-REF>
        <TARGET-DATA-PROTOTYPE-REF DEST="
          VARIABLE-DATA-PROTOTYPE"/>/AUTOSAR/
          CONC_670/SwcAnton/PortInterfaces/
          IF_Anton/Anton</TARGET-DATA-
            PROTOTYPE-REF>
      </AUTOSAR-VARIABLE-IREF>
    </ACCESSED-VARIABLE>
  </VARIABLE-ACCESS>
</DATA-SEND-POINTS>
<SYMBOL>RE_SwcAnton_10ms</SYMBOL>
</RUNNABLE-ENTITY>
</RUNNABLES>
<SUPPORTS-MULTIPLE-INSTANTIATION>>false</SUPPORTS-
  MULTIPLE-INSTANTIATION>
</SWC-INTERNAL-BEHAVIOR>
</INTERNAL-BEHAVIORS>
</APPLICATION-SW-COMPONENT-TYPE>
</ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
  <SHORT-NAME>SwcImplementations</SHORT-NAME>
  <ELEMENTS>
    <SWC-IMPLEMENTATION>
      <SHORT-NAME>IMPL_SwcAnton</SHORT-NAME>
      <CODE-DESCRIPTORS>
        <CODE>
          <SHORT-NAME>Code</SHORT-NAME>
          <ARTIFACT-DESCRIPTORS>
            <AUTOSAR-ENGINEERING-OBJECT>
              <SHORT-LABEL>AutosarEngineeringObject</SHORT-
                LABEL>
              <CATEGORY>SWSRC</CATEGORY>
            </AUTOSAR-ENGINEERING-OBJECT>
          </ARTIFACT-DESCRIPTORS>
        </CODE>
      </CODE-DESCRIPTORS>
      <PROGRAMMING-LANGUAGE>C</PROGRAMMING-LANGUAGE>
      <BEHAVIOR-REF DEST="SWC-INTERNAL-BEHAVIOR"/>/AUTOSAR/
        CONC_670/SwcAnton/SwComponentTypes/SwcAnton/
        IB_SwcAnton</BEHAVIOR-REF>
    </SWC-IMPLEMENTATION>
  </ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
  <SHORT-NAME>ApplicationDataTypes</SHORT-NAME>

```

```

<ELEMENTS>
  <APPLICATION-PRIMITIVE-DATA-TYPE>
    <SHORT-NAME>Type_Anton</SHORT-NAME>
    <CATEGORY>VALUE</CATEGORY>
    <SW-DATA-DEF-PROPS>
      <SW-DATA-DEF-PROPS-VARIANTS>
        <SW-DATA-DEF-PROPS-CONDITIONAL>
          <SW-CALIBRATION-ACCESS>READ-ONLY</SW-
            CALIBRATION-ACCESS>
          <COMPU-METHOD-REF DEST="COMPU-METHOD"/>/AUTOSAR/
            CONC_670/SwcAnton/CompuMethods/Identical</
            COMPU-METHOD-REF>
          <SW-IMPL-POLICY>STANDARD</SW-IMPL-POLICY>
        </SW-DATA-DEF-PROPS-CONDITIONAL>
      </SW-DATA-DEF-PROPS-VARIANTS>
    </SW-DATA-DEF-PROPS>
  </APPLICATION-PRIMITIVE-DATA-TYPE>
</ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
  <SHORT-NAME>PortInterfaces</SHORT-NAME>
  <ELEMENTS>
    <SENDER-RECEIVER-INTERFACE>
      <SHORT-NAME>IF_Anton</SHORT-NAME>
      <IS-SERVICE>>false</IS-SERVICE>
      <SERVICE-KIND>VENDOR-SPECIFIC</SERVICE-KIND>
      <DATA-ELEMENTS>
        <VARIABLE-DATA-PROTOTYPE>
          <SHORT-NAME>Anton</SHORT-NAME>
          <CATEGORY>VALUE</CATEGORY>
          <SW-DATA-DEF-PROPS>
            <SW-DATA-DEF-PROPS-VARIANTS>
              <SW-DATA-DEF-PROPS-CONDITIONAL>
                <SW-CALIBRATION-ACCESS>READ-ONLY</SW-
                  CALIBRATION-ACCESS>
              </SW-DATA-DEF-PROPS-CONDITIONAL>
            </SW-DATA-DEF-PROPS-VARIANTS>
          </SW-DATA-DEF-PROPS>
          <TYPE-TREF DEST="APPLICATION-PRIMITIVE-DATA-TYPE"
            >/AUTOSAR/CONC_670/SwcAnton/
              ApplicationDataTypes/Type_Anton</TYPE-TREF>
        </VARIABLE-DATA-PROTOTYPE>
      </DATA-ELEMENTS>
    </SENDER-RECEIVER-INTERFACE>
  </ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
  <SHORT-NAME>ImplementationDataTypes</SHORT-NAME>
  <ELEMENTS>
    <IMPLEMENTATION-DATA-TYPE>
      <SHORT-NAME>Type_Anton</SHORT-NAME>
      <CATEGORY>TYPE_REFERENCE</CATEGORY>
      <SW-DATA-DEF-PROPS>
        <SW-DATA-DEF-PROPS-VARIANTS>
          <SW-DATA-DEF-PROPS-CONDITIONAL>

```

```

        <IMPLEMENTATION-DATA-TYPE-REF DEST="
            IMPLEMENTATION-DATA-TYPE">/AUTOSAR_Platform/
            ImplementationDataTypes/uint16</
            IMPLEMENTATION-DATA-TYPE-REF>
        </SW-DATA-DEF-PROPS-CONDITIONAL>
    </SW-DATA-DEF-PROPS-VARIANTS>
</SW-DATA-DEF-PROPS>
</IMPLEMENTATION-DATA-TYPE>
</ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
    <SHORT-NAME>DataTypemappingSets</SHORT-NAME>
    <ELEMENTS>
        <DATA-TYPE-MAPPING-SET>
            <SHORT-NAME>DTMS_SwcAnton</SHORT-NAME>
            <DATA-TYPE-MAPS>
                <DATA-TYPE-MAP>
                    <APPLICATION-DATA-TYPE-REF DEST="APPLICATION-
                        PRIMITIVE-DATA-TYPE">/AUTOSAR/CONC_670/
                        SwcAnton/ApplicationDataTypes/Type_Anton</
                        APPLICATION-DATA-TYPE-REF>
                    <IMPLEMENTATION-DATA-TYPE-REF DEST="
                        IMPLEMENTATION-DATA-TYPE">/AUTOSAR/CONC_670/
                        SwcAnton/ImplementationDataTypes/Type_Anton</
                        IMPLEMENTATION-DATA-TYPE-REF>
                </DATA-TYPE-MAP>
            </DATA-TYPE-MAPS>
        </DATA-TYPE-MAPPING-SET>
    </ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
    <SHORT-NAME>Units</SHORT-NAME>
    <ELEMENTS>
        <UNIT>
            <SHORT-NAME>No_Unit</SHORT-NAME>
            <FACTOR-SI-TO-UNIT>1.0</FACTOR-SI-TO-UNIT>
            <OFFSET-SI-TO-UNIT>0.0</OFFSET-SI-TO-UNIT>
        </UNIT>
    </ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
    <SHORT-NAME>CompuMethods</SHORT-NAME>
    <ELEMENTS>
        <COMPU-METHOD>
            <SHORT-NAME>Identical</SHORT-NAME>
            <CATEGORY>IDENTICAL</CATEGORY>
            <UNIT-REF DEST="UNIT">/AUTOSAR/CONC_670/SwcAnton/
                Units/No_Unit</UNIT-REF>
        </COMPU-METHOD>
    </ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>

```

```

</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.1: DOC_SwCluC_SwcAnton_SWCD.arxml

A.2 DOC_SwCluC_SwcBernd_SWCD.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00048.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>CONC_670</SHORT-NAME>
          <AR-PACKAGES>
            <AR-PACKAGE>
              <SHORT-NAME>SwcBernd</SHORT-NAME>
              <AR-PACKAGES>
                <AR-PACKAGE>
                  <SHORT-NAME>SwComponentTypes</SHORT-NAME>
                  <ELEMENTS>
                    <APPLICATION-SW-COMPONENT-TYPE>
                      <SHORT-NAME>SwcBernd</SHORT-NAME>
                      <ADMIN-DATA>
                        <SDGS>
                          <SDG GID="Master">
                            <SD>true</SD>
                          </SDG>
                        </SDGS>
                      </ADMIN-DATA>
                      <PORTS>
                        <P-PORT-PROTOTYPE>
                          <SHORT-NAME>PP_Bernd</SHORT-NAME>
                          <PROVIDED-INTERFACE-TREF DEST="SENDER-RECEIVER-
                            INTERFACE"/>/AUTOSAR/CONC_670/SwcBernd/
                            PortInterfaces/IF_Bernd</PROVIDED-INTERFACE-
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Listing A.2: DOC_SwCluC_SwcBernd_SWCD.xml

A.3 DOC_SwCluC_SwcHugo_SWCD.xml

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Listing A.3: DOC_SwCluC_SwcHugo_SWCD.arxml

A.4 DOC_SwCluC_SwcCeline_SWCD.arxml

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A.5 DOC_SwCluC_SwcClaus_SWCD.arxml

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Listing A.5: DOC_SwCluC_SwcClaus_SWCD.arxml

A.6 DOC_SwCluC_SwcCompoAHB_SWCD.arxml

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Listing A.6: DOC_SwCluC_SwcCompoAHB_SWCD.arxml

A.7 DOC_SwCluC_SwcCompoHost_SWCD.arxml

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                <IMPLEMENTATION-DATA-TYPE-REF DEST="
                    IMPLEMENTATION-DATA-TYPE">/AUTOSAR_Platform/
                    ImplementationDataTypes/uint16</
                    IMPLEMENTATION-DATA-TYPE-REF>
            </SW-DATA-DEF-PROPS-CONDITIONAL>
        </SW-DATA-DEF-PROPS-VARIANTS>
    </SW-DATA-DEF-PROPS>
</IMPLEMENTATION-DATA-TYPE>
<IMPLEMENTATION-DATA-TYPE>
    <SHORT-NAME>Type_Hugo</SHORT-NAME>
    <CATEGORY>TYPE_REFERENCE</CATEGORY>
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        <SW-DATA-DEF-PROPS-VARIANTS>
            <SW-DATA-DEF-PROPS-CONDITIONAL>
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                    IMPLEMENTATION-DATA-TYPE">/AUTOSAR_Platform/
                    ImplementationDataTypes/uint32</
                    IMPLEMENTATION-DATA-TYPE-REF>
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        </SW-DATA-DEF-PROPS-VARIANTS>
    </SW-DATA-DEF-PROPS>
</IMPLEMENTATION-DATA-TYPE>
</ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
    <SHORT-NAME>PortInterfaces</SHORT-NAME>
    <ELEMENTS>
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            <SHORT-NAME>IF_Claus</SHORT-NAME>
            <IS-SERVICE>>false</IS-SERVICE>
            <SERVICE-KIND>VENDOR-SPECIFIC</SERVICE-KIND>
            <DATA-ELEMENTS>
                <VARIABLE-DATA-PROTOTYPE>
                    <SHORT-NAME>Claus</SHORT-NAME>
                    <CATEGORY>VALUE</CATEGORY>
                    <SW-DATA-DEF-PROPS>
                        <SW-DATA-DEF-PROPS-VARIANTS>
                            <SW-DATA-DEF-PROPS-CONDITIONAL>
                                <SW-CALIBRATION-ACCESS>READ-ONLY</SW-
                                    CALIBRATION-ACCESS>
                            </SW-DATA-DEF-PROPS-CONDITIONAL>
                        </SW-DATA-DEF-PROPS-VARIANTS>
                    </SW-DATA-DEF-PROPS>
                    <TYPE-TREF DEST="APPLICATION-PRIMITIVE-DATA-TYPE"
                        >/AUTOSAR/CONC_670/SwcCompoHost/
                        ApplicationDataTypes/Type_Claus</TYPE-TREF>
                </VARIABLE-DATA-PROTOTYPE>
            </DATA-ELEMENTS>
        </SENDER-RECEIVER-INTERFACE>
    </ELEMENTS>
</AR-PACKAGE>

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        </VARIABLE-DATA-PROTOTYPE>
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<SENDER-RECEIVER-INTERFACE>
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    <IS-SERVICE>>false</IS-SERVICE>
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    <DATA-ELEMENTS>
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            <CATEGORY>VALUE</CATEGORY>
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                    <SW-DATA-DEF-PROPS-CONDITIONAL>
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                            CALIBRATION-ACCESS>
                    </SW-DATA-DEF-PROPS-CONDITIONAL>
                </SW-DATA-DEF-PROPS-VARIANTS>
            </SW-DATA-DEF-PROPS>
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                >/AUTOSAR/CONC_670/SwcCompoHost/
                ApplicationDataTypes/Type_Bernd</TYPE-TREF>
        </VARIABLE-DATA-PROTOTYPE>
    </DATA-ELEMENTS>
</SENDER-RECEIVER-INTERFACE>
<SENDER-RECEIVER-INTERFACE>
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    <IS-SERVICE>>false</IS-SERVICE>
    <SERVICE-KIND>VENDOR-SPECIFIC</SERVICE-KIND>
    <DATA-ELEMENTS>
        <VARIABLE-DATA-PROTOTYPE>
            <SHORT-NAME>Celine</SHORT-NAME>
            <CATEGORY>VALUE</CATEGORY>
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                <SW-DATA-DEF-PROPS-VARIANTS>
                    <SW-DATA-DEF-PROPS-CONDITIONAL>
                        <SW-CALIBRATION-ACCESS>READ-ONLY</SW-
                            CALIBRATION-ACCESS>
                    </SW-DATA-DEF-PROPS-CONDITIONAL>
                </SW-DATA-DEF-PROPS-VARIANTS>
            </SW-DATA-DEF-PROPS>
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                >/AUTOSAR/CONC_670/SwcCompoHost/
                ApplicationDataTypes/Type_Celine</TYPE-TREF>
        </VARIABLE-DATA-PROTOTYPE>
    </DATA-ELEMENTS>
</SENDER-RECEIVER-INTERFACE>
<CLIENT-SERVER-INTERFACE>
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    <IS-SERVICE>>false</IS-SERVICE>
    <OPERATIONS>
        <CLIENT-SERVER-OPERATION>
            <SHORT-NAME>OpClaus</SHORT-NAME>
            <ARGUMENTS>
                <ARGUMENT-DATA-PROTOTYPE>
                    <SHORT-NAME>ArgIn_8</SHORT-NAME>

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```

        <TYPE-TREF DEST="IMPLEMENTATION-DATA-TYPE"/>
        AUTOSAR_Platform/ImplementationDataTypes/
        uint8</TYPE-TREF>
        <DIRECTION>IN</DIRECTION>
    </ARGUMENT-DATA-PROTOTYPE>
<ARGUMENT-DATA-PROTOTYPE>
    <SHORT-NAME>ArgIn_16</SHORT-NAME>
    <TYPE-TREF DEST="IMPLEMENTATION-DATA-TYPE"/>
    AUTOSAR_Platform/ImplementationDataTypes/
    uint16</TYPE-TREF>
    <DIRECTION>IN</DIRECTION>
</ARGUMENT-DATA-PROTOTYPE>
<ARGUMENT-DATA-PROTOTYPE>
    <SHORT-NAME>ArgOut_16</SHORT-NAME>
    <TYPE-TREF DEST="IMPLEMENTATION-DATA-TYPE"/>
    AUTOSAR_Platform/ImplementationDataTypes/
    uint16</TYPE-TREF>
    <DIRECTION>OUT</DIRECTION>
</ARGUMENT-DATA-PROTOTYPE>
</ARGUMENTS>
</CLIENT-SERVER-OPERATION>
</OPERATIONS>
</CLIENT-SERVER-INTERFACE>
<SENDER-RECEIVER-INTERFACE>
    <SHORT-NAME>IF_Hugo</SHORT-NAME>
    <IS-SERVICE>>false</IS-SERVICE>
    <SERVICE-KIND>VENDOR-SPECIFIC</SERVICE-KIND>
    <DATA-ELEMENTS>
        <VARIABLE-DATA-PROTOTYPE>
            <SHORT-NAME>Hugo</SHORT-NAME>
            <CATEGORY>VALUE</CATEGORY>
            <SW-DATA-DEF-PROPS>
                <SW-DATA-DEF-PROPS-VARIANTS>
                    <SW-DATA-DEF-PROPS-CONDITIONAL>
                        <SW-CALIBRATION-ACCESS>READ-ONLY</SW-
                            CALIBRATION-ACCESS>
                    </SW-DATA-DEF-PROPS-CONDITIONAL>
                </SW-DATA-DEF-PROPS-VARIANTS>
            </SW-DATA-DEF-PROPS>
            <TYPE-TREF DEST="APPLICATION-PRIMITIVE-DATA-TYPE"
                >/AUTOSAR/CONC_670/SwcHugo/
                ApplicationDataTypes/Type_Hugo</TYPE-TREF>
        </VARIABLE-DATA-PROTOTYPE>
    </DATA-ELEMENTS>
</SENDER-RECEIVER-INTERFACE>
</ELEMENTS>
</AR-PACKAGE>
<AR-PACKAGE>
    <SHORT-NAME>Units</SHORT-NAME>
    <ELEMENTS>
        <UNIT>
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            <FACTOR-SI-TO-UNIT>1.0</FACTOR-SI-TO-UNIT>
            <OFFSET-SI-TO-UNIT>0.0</OFFSET-SI-TO-UNIT>
        </UNIT>
    </ELEMENTS>

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```

        </AR-PACKAGE>
      </AR-PACKAGES>
    </AR-PACKAGE>
  </AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.7: DOC_SwCluC_SwcCompoHost_SWCD.arxml

A.8 DOC_SwCluC_Sys_TopLvl_SWCD.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00046.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>CONC_670</SHORT-NAME>
          <AR-PACKAGES>
            <AR-PACKAGE>
              <SHORT-NAME>PCT_TopLvl</SHORT-NAME>
              <AR-PACKAGES>
                <AR-PACKAGE>
                  <SHORT-NAME>SwComponentTypes</SHORT-NAME>
                  <ELEMENTS>
                    <COMPOSITION-SW-COMPONENT-TYPE>
                      <SHORT-NAME>TopLvl</SHORT-NAME>
                      <COMPONENTS>
                        <SW-COMPONENT-PROTOTYPE>
                          <SHORT-NAME>CPT_SwcCompoAHB</SHORT-NAME>
                          <TYPE-TREF DEST="COMPOSITION-SW-COMPONENT-TYPE"/>
                            AUTOSAR/CONC_670/SwcCompoAHB/SwComponentTypes/
                            SwcCompoAHB</TYPE-TREF>
                        </SW-COMPONENT-PROTOTYPE>
                        <SW-COMPONENT-PROTOTYPE>
                          <SHORT-NAME>CPT_SwcCompoHost</SHORT-NAME>
                          <TYPE-TREF DEST="COMPOSITION-SW-COMPONENT-TYPE"/>
                            AUTOSAR/CONC_670/SwcCompoHost/SwComponentTypes
                            /SwcCompoHost</TYPE-TREF>
                        </SW-COMPONENT-PROTOTYPE>
                      </COMPONENTS>
                    <CONNECTORS>
                      <ASSEMBLY-SW-CONNECTOR>
                        <SHORT-NAME>ASC_PP_Celine_RP_Celine</SHORT-NAME>
                        <PROVIDER-IREF>

```

```

<CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
  PROTOTYPE"/>/AUTOSAR/CONC_670/PCT_TopLvl/
  SwComponentTypes/TopLvl/CPT_SwcCompoHost</
  CONTEXT-COMPONENT-REF>
<TARGET-P-PORT-REF DEST="P-PORT-PROTOTYPE"/>/
  AUTOSAR/CONC_670/SwcCompoHost/
  SwComponentTypes/SwcCompoHost/PP_Celine</
  TARGET-P-PORT-REF>
</PROVIDER-IREF>
<REQUESTER-IREF>
  <CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
    PROTOTYPE"/>/AUTOSAR/CONC_670/PCT_TopLvl/
    SwComponentTypes/TopLvl/CPT_SwcCompoAHB</
    CONTEXT-COMPONENT-REF>
  <TARGET-R-PORT-REF DEST="R-PORT-PROTOTYPE"/>/
    AUTOSAR/CONC_670/SwcCompoAHB/
    SwComponentTypes/SwcCompoAHB/PP_Celine</
    TARGET-R-PORT-REF>
</REQUESTER-IREF>
</ASSEMBLY-SW-CONNECTOR>
<ASSEMBLY-SW-CONNECTOR>
  <SHORT-NAME>ASC_PP_Bernd_RP_Bernd</SHORT-NAME>
  <PROVIDER-IREF>
    <CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
      PROTOTYPE"/>/AUTOSAR/CONC_670/PCT_TopLvl/
      SwComponentTypes/TopLvl/CPT_SwcCompoAHB</
      CONTEXT-COMPONENT-REF>
    <TARGET-P-PORT-REF DEST="P-PORT-PROTOTYPE"/>/
      AUTOSAR/CONC_670/SwcCompoAHB/
      SwComponentTypes/SwcCompoAHB/PP_Bernd</
      TARGET-P-PORT-REF>
  </PROVIDER-IREF>
  <REQUESTER-IREF>
    <CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
      PROTOTYPE"/>/AUTOSAR/CONC_670/PCT_TopLvl/
      SwComponentTypes/TopLvl/CPT_SwcCompoHost</
      CONTEXT-COMPONENT-REF>
    <TARGET-R-PORT-REF DEST="R-PORT-PROTOTYPE"/>/
      AUTOSAR/CONC_670/SwcCompoHost/
      SwComponentTypes/SwcCompoHost/PP_Bernd</
      TARGET-R-PORT-REF>
  </REQUESTER-IREF>
</ASSEMBLY-SW-CONNECTOR>
</CONNECTORS>
</COMPOSITION-SW-COMPONENT-TYPE>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>

```

</AUTOSAR>

Listing A.8: DOC_SwCluC_Sys_TopLvl_SWCD.arxml

A.9 DOC_SwCluC_Sys_SwClusters.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
    "http://autosar.org/schema/r4.0_AUTOSAR_00049.xsd">
  <ADMIN-DATA>
    <USED-LANGUAGES></USED-LANGUAGES>
  </ADMIN-DATA>
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
    </AR-PACKAGE>
    <AR-PACKAGE>
      <SHORT-NAME>CONC_670</SHORT-NAME>
    </AR-PACKAGE>
    <AR-PACKAGE>
      <SHORT-NAME>PCFG_SYS</SHORT-NAME>
    </AR-PACKAGE>
    <AR-PACKAGE>
      <SHORT-NAME>CpSoftwareClusters</SHORT-NAME>
    </AR-PACKAGE>
    <ELEMENTS>
      <CP-SOFTWARE-CLUSTER>
        <SHORT-NAME>SwClu_Host</SHORT-NAME>
        <CATEGORY>HOST_SOFTWARE_CLUSTER</CATEGORY>
        <SW-COMPONENT-ASSIGNMENTS>
          <SW-COMPONENT-PROTOTYPE-ASSIGNMENT>
            <SW-COMPONENT-IREF>
              <CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
                COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670/
                PCFG_SYS/Systems/System/CPT_TopLvl</CONTEXT-
                COMPOSITION-REF>
              <TARGET-COMPONENT-REF DEST="SW-COMPONENT-
                PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
                SwComponentTypes/TopLvl/CPT_SwcCompoHost</
                TARGET-COMPONENT-REF>
            </SW-COMPONENT-IREF>
          </SW-COMPONENT-PROTOTYPE-ASSIGNMENT>
        </SW-COMPONENT-ASSIGNMENTS>
      </CP-SOFTWARE-CLUSTER>
      <CP-SOFTWARE-CLUSTER>
        <SHORT-NAME>SwClu_AHB</SHORT-NAME>
        <CATEGORY>APPLICATION_SOFTWARE_CLUSTER</CATEGORY>
      </SW-COMPONENT-ASSIGNMENTS>
        <SW-COMPONENT-PROTOTYPE-ASSIGNMENT>
          <SW-COMPONENT-IREF>

```

```

<CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670/
PCFG_SYS/Systems/System/CPT_TopLvl</CONTEXT-
COMPOSITION-REF>
<TARGET-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
SwComponentTypes/TopLvl/CPT_SwcCompoAHB</
TARGET-COMPONENT-REF>
</SW-COMPONENT-IREF>
</SW-COMPONENT-PROTOTYPE-ASSIGNMENT>
</SW-COMPONENT-ASSIGNMENTS>
</CP-SOFTWARE-CLUSTER>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.9: DOC_SwCluC_Sys_SwClusters.xml

A.10 DOC_SwCluC_Sys_Descr_TopLvl.xml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
schema/r4.0_AUTOSAR_00044.xsd">
<AR-PACKAGES>
<AR-PACKAGE>
<SHORT-NAME>AUTOSAR</SHORT-NAME>
<AR-PACKAGES>
<AR-PACKAGE>
<SHORT-NAME>CONC_670</SHORT-NAME>
<AR-PACKAGES>
<AR-PACKAGE>
<SHORT-NAME>PCT_TopLvl</SHORT-NAME>
<AR-PACKAGES>
<AR-PACKAGE>
<SHORT-NAME>Systems</SHORT-NAME>
<ELEMENTS>
<SYSTEM>
<SHORT-NAME>System_TopLvl</SHORT-NAME>
<CATEGORY>ECU_SYSTEM_DESCRIPTION</CATEGORY>
<MAPPINGS>
<SYSTEM-MAPPING>
<SHORT-NAME>Sys_TopLvl_Maps</SHORT-NAME>
<PORT-ELEMENT-TO-COM-RESOURCE-MAPPINGS>
<PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
>

```

```

<SHORT-NAME>Res_Map_DE_Anton</SHORT-NAME>
<COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE
-CLUSTER-COMMUNICATION-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
ComResourcePool/Anton</COMMUNICATION-
RESOURCE-REF>
<VARIABLE-DATA-PROTOTYPE-IREF>
<CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
SwComponentTypes/TopLvl/CPT_SwcCompoAHB<
/CONTEXT-COMPONENT-REF>
<CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670
/PCT_TopLvl/Systems/System_TopLvl/
Sys_TopLvl</CONTEXT-COMPOSITION-REF>
<CONTEXT-PORT-REF DEST="P-PORT-PROTOTYPE">/
AUTOSAR/CONC_670/SwcCompoAHB/
SwComponentTypes/SwcCompoAHB/PP_Anton</
CONTEXT-PORT-REF>
<TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
DATA-PROTOTYPE">/AUTOSAR/CONC_670/
SwcCompoAHB/PortInterfaces/IF_Anton/
Anton</TARGET-DATA-PROTOTYPE-REF>
</VARIABLE-DATA-PROTOTYPE-IREF>
</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
MAPPING>
<PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
>
<SHORT-NAME>Res_Map_DE_Bernd</SHORT-NAME>
<COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE
-CLUSTER-COMMUNICATION-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
ComResourcePool/Bernd</COMMUNICATION-
RESOURCE-REF>
<VARIABLE-DATA-PROTOTYPE-IREF>
<CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
SwComponentTypes/TopLvl/CPT_SwcCompoAHB<
/CONTEXT-COMPONENT-REF>
<CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670
/PCT_TopLvl/Systems/System_TopLvl/
Sys_TopLvl</CONTEXT-COMPOSITION-REF>
<CONTEXT-PORT-REF DEST="P-PORT-PROTOTYPE">/
AUTOSAR/CONC_670/SwcCompoAHB/
SwComponentTypes/SwcCompoAHB/PP_Bernd</
CONTEXT-PORT-REF>
<TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
DATA-PROTOTYPE">/AUTOSAR/CONC_670/
SwcCompoAHB/PortInterfaces/IF_Bernd/
Bernd</TARGET-DATA-PROTOTYPE-REF>
</VARIABLE-DATA-PROTOTYPE-IREF>
</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
MAPPING>

```

```

<PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
>
<SHORT-NAME>Res_Map_DE_Celine</SHORT-NAME>
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CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
ComResourcePool/Celine</COMMUNICATION-
RESOURCE-REF>
<VARIABLE-DATA-PROTOTYPE-IREF>
<CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
SwComponentTypes/TopLvl/CPT_SwcCompoHost
</CONTEXT-COMPONENT-REF>
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Sys_TopLvl</CONTEXT-COMPOSITION-REF>
<CONTEXT-PORT-REF DEST="P-PORT-PROTOTYPE">/
AUTOSAR/CONC_670/SwcCompoHost/
SwComponentTypes/SwcCompoHost/PP_Celine<
/CONTEXT-PORT-REF>
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SwcCompoHost/PortInterfaces/IF_Celine/
Celine</TARGET-DATA-PROTOTYPE-REF>
</VARIABLE-DATA-PROTOTYPE-IREF>
</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
MAPPING>
<PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
>
<SHORT-NAME>Res_Map_DE_Hugo</SHORT-NAME>
<COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE
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CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
ComResourcePool/Celine</COMMUNICATION-
RESOURCE-REF>
<VARIABLE-DATA-PROTOTYPE-IREF>
<CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
SwComponentTypes/TopLvl/CPT_SwcCompoHost
</CONTEXT-COMPONENT-REF>
<CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670
/PCT_TopLvl/Systems/System_TopLvl/
Sys_TopLvl</CONTEXT-COMPOSITION-REF>
<CONTEXT-PORT-REF DEST="R-PORT-PROTOTYPE">/
AUTOSAR/CONC_670/SwcCompoHost/
SwComponentTypes/SwcCompoHost/RP_Hugo</
CONTEXT-PORT-REF>
<TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
DATA-PROTOTYPE">/AUTOSAR/CONC_670/
SwcCompoHost/PortInterfaces/IF_Hugo/Hugo
</TARGET-DATA-PROTOTYPE-REF>
</VARIABLE-DATA-PROTOTYPE-IREF>

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</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
MAPPING>
</PORT-ELEMENT-TO-COM-RESOURCE-MAPPINGS>
<SOFTWARE-CLUSTER-TO-RESOURCE-MAPPINGS>
  <CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
    <SHORT-NAME>Res_Map_BaseConfigCheck_AHB</SHORT-
NAME>
    <DESC>
      <L-2 L="EN">Software Cluster resource
mapping Base Config Check AHB for the
complete ECU</L-2>
    </DESC>
    <PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_Host</PROVIDER-
REF>
    <REQUESTER-REFS>
      <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_AHB</REQUESTER-
REF>
    </REQUESTER-REFS>
    <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
SwClusCResourcePool/BaseConfigCheck_AHB</
SERVICE-RESOURCE-REF>
  </CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
    <SHORT-NAME>Res_Map_XccBaseSocket_AHB</SHORT-
NAME>
    <DESC>
      <L-2 L="EN">Software Cluster resource
mapping Xcc Base Socket AHB for the
complete ECU</L-2>
    </DESC>
    <PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_Host</PROVIDER-
REF>
    <REQUESTER-REFS>
      <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_AHB</REQUESTER-
REF>
    </REQUESTER-REFS>
    <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
SwClusCResourcePool/XccBaseSocket_AHB</
SERVICE-RESOURCE-REF>
  </CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>

```



```

<SHORT-NAME>Res_Map_OsBaseSocket_AHB</SHORT-
NAME>
<DESC>
  <L-2 L="EN">Software Cluster resource
    mapping Xcc Base Socket AHB for the
    complete ECU</L-2>
</DESC>
<PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_Host</PROVIDER-
REF>
<REQUESTER-REFS>
  <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_AHB</REQUESTER-
REF>
</REQUESTER-REFS>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
OsResourcePool/OsBaseSocket_AHB</SERVICE-
RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>

<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_OsTask_50ms</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Software Cluster resource
      mapping OsTask_50ms for the complete ECU
    </L-2>
  </DESC>
  <PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_Host</PROVIDER-
REF>
  <REQUESTER-REFS>
    <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_AHB</REQUESTER-
REF>
  </REQUESTER-REFS>
  <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
OsResourcePool/OsTask_50ms</SERVICE-
RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>

<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_OsTask_10ms</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Software Cluster resource
      mapping OsTask_10ms for the complete ECU
    </L-2>
  </DESC>

```

```

<PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>
  AUTOSAR/CONC_670/PCFG_SYS/
  CpSoftwareClusters/SwClu_Host</PROVIDER-
  REF>
<REQUESTER-REFS>
  <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER"/>
  AUTOSAR/CONC_670/PCFG_SYS/
  CpSoftwareClusters/SwClu_AHB</REQUESTER-
  REF>
</REQUESTER-REFS>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
  CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
  CONC_670/SysResPool/
  CpSoftwareClusterResourcePools/
  OsResourcePool/OsTask_10ms</SERVICE-
  RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_Dispatch_50ms_Ph1</SHORT-NAME
  >
  <DESC>
    <L-2 L="EN">Software Cluster resource
    mapping Dispatch_50ms_Ph1 for the complete
    ECU</L-2>
  </DESC>
  <PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>
  AUTOSAR/CONC_670/PCFG_SYS/
  CpSoftwareClusters/SwClu_Host</PROVIDER-
  REF>
  <REQUESTER-REFS>
    <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER"/>
    AUTOSAR/CONC_670/PCFG_SYS/
    CpSoftwareClusters/SwClu_AHB</REQUESTER-
    REF>
  </REQUESTER-REFS>
  <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
  CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
  CONC_670/SysResPool/
  CpSoftwareClusterResourcePools/
  OsResourcePool/Dispatch_50ms_Ph1</SERVICE-
  RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_Dispatch_10ms_Ph1</SHORT-NAME
  >
  <DESC>
    <L-2 L="EN">Software Cluster resource
    mapping Dispatch_50ms_Ph1 for the complete
    ECU</L-2>
  </DESC>
  <PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>
  AUTOSAR/CONC_670/PCFG_SYS/
  CpSoftwareClusters/SwClu_Host</PROVIDER-
  REF>
  <REQUESTER-REFS>

```

```

<REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_AHB</REQUESTER-
REF>
</REQUESTER-REFS>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
OsResourcePool/Disp_10ms_Ph1</SERVICE-
RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
</SOFTWARE-CLUSTER-TO-RESOURCE-MAPPINGS>
<SW-MAPPINGS>
<SWC-TO-ECU-MAPPING>
<SHORT-NAME>SWC_TopLvl_Map</SHORT-NAME>
<COMPONENT-IREFS>
<COMPONENT-IREF>
<CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
COMPOSITION-PROTOTYPE">/AUTOSAR/
CONC_670/PCT_TopLvl/Systems/
System_TopLvl/Sys_TopLvl</CONTEXT-
COMPOSITION-REF>
<TARGET-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/
PCT_TopLvl/SwComponentTypes/TopLvl/
CPT_SwcCompoHost</TARGET-COMPONENT-REF
>
</COMPONENT-IREF>
<COMPONENT-IREF>
<CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
COMPOSITION-PROTOTYPE">/AUTOSAR/
CONC_670/PCT_TopLvl/Systems/
System_TopLvl/Sys_TopLvl</CONTEXT-
COMPOSITION-REF>
<TARGET-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/
PCT_TopLvl/SwComponentTypes/TopLvl/
CPT_SwcCompoAHB</TARGET-COMPONENT-REF>
</COMPONENT-IREF>
</COMPONENT-IREFS>
<ECU-INSTANCE-REF DEST="ECU-INSTANCE">/
AUTOSAR/CONC_670/PCFG_SYS/EcuInstances/
Machine_Host_AHB</ECU-INSTANCE-REF>
</SWC-TO-ECU-MAPPING>
</SW-MAPPINGS>
</SYSTEM-MAPPING>
</MAPPINGS>
<ROOT-SOFTWARE-COMPOSITIONS>
<ROOT-SW-COMPOSITION-PROTOTYPE>
<SHORT-NAME>Sys_TopLvl</SHORT-NAME>
<SOFTWARE-COMPOSITION-TREF DEST="COMPOSITION-SW-
COMPONENT-TYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
SwComponentTypes/TopLvl</SOFTWARE-COMPOSITION-
TREF>
</ROOT-SW-COMPOSITION-PROTOTYPE>

```

```

</ROOT-SOFTWARE-COMPOSITIONS>
<SW-CLUSTERS>
  <CP-SOFTWARE-CLUSTER-REF-CONDITIONAL>
    <CP-SOFTWARE-CLUSTER-REF DEST="CP-SOFTWARE-
      CLUSTER"/>/AUTOSAR/CONC_670/PCFG_SYS/
      CpSoftwareClusters/SwClu_Host</CP-SOFTWARE-
      CLUSTER-REF>
    </CP-SOFTWARE-CLUSTER-REF-CONDITIONAL>
    <CP-SOFTWARE-CLUSTER-REF-CONDITIONAL>
      <CP-SOFTWARE-CLUSTER-REF DEST="CP-SOFTWARE-
        CLUSTER"/>/AUTOSAR/CONC_670/PCFG_SYS/
        CpSoftwareClusters/SwClu_AHB</CP-SOFTWARE-
        CLUSTER-REF>
      </CP-SOFTWARE-CLUSTER-REF-CONDITIONAL>
    </SW-CLUSTERS>
    <SYSTEM-VERSION>1.0.0</SYSTEM-VERSION>
  </SYSTEM>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.10: DOC_SwCluC_Sys_Descr_TopLvl.arxml

A.11 DOC_SwCluC_Sys_HWT.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00046.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
    <AR-PACKAGES>
      <AR-PACKAGE>
        <SHORT-NAME>CONC_670</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>PCFG_SYS</SHORT-NAME>
        <AR-PACKAGES>
          <AR-PACKAGE>
            <SHORT-NAME>EcuInstances</SHORT-NAME>
          <ELEMENTS>
            <ECU-INSTANCE>
              <SHORT-NAME>Machine_Host_AHB</SHORT-NAME>
            </ECU-INSTANCE>
          </ELEMENTS>

```

```

        </AR-PACKAGE>
      </AR-PACKAGES>
    </AR-PACKAGE>
  </AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.11: DOC_SwCluC_Sys_HWT.arxml

A.12 DOC_SwCluC_Sys_ResPoolCommunicationResources.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00049.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>CONC_670</SHORT-NAME>
          <AR-PACKAGES>
            <AR-PACKAGE>
              <SHORT-NAME>SysResPool</SHORT-NAME>
              <AR-PACKAGES>
                <AR-PACKAGE>
                  <SHORT-NAME>CpSoftwareClusterResourcePools</SHORT-NAME>
                  <ELEMENTS>
                    <CP-SOFTWARE-CLUSTER-RESOURCE-POOL>
                      <SHORT-NAME>ComResourcePool</SHORT-NAME>
                      <RESOURCES>
                        <CP-SOFTWARE-CLUSTER-COMMUNICATION-RESOURCE>
                          <SHORT-NAME>Anton</SHORT-NAME>
                          <GLOBAL-RESOURCE-ID>0xda1a0001</GLOBAL-RESOURCE-
                            ID>
                          <IS-MANDATORY>>false</IS-MANDATORY>
                          <COM-PROPS>
                            <SEND-INDICATION>NONE</SEND-INDICATION>
                          </COM-PROPS>
                        </CP-SOFTWARE-CLUSTER-COMMUNICATION-RESOURCE>
                        <CP-SOFTWARE-CLUSTER-COMMUNICATION-RESOURCE>
                          <SHORT-NAME>Bernd</SHORT-NAME>
                          <GLOBAL-RESOURCE-ID>0xda1a0002</GLOBAL-RESOURCE-
                            ID>
                          <IS-MANDATORY>>false</IS-MANDATORY>
                          <COM-PROPS>
                            <SEND-INDICATION>NONE</SEND-INDICATION>
                          </COM-PROPS>
                        </CP-SOFTWARE-CLUSTER-COMMUNICATION-RESOURCE>
                      </CP-SOFTWARE-CLUSTER-COMMUNICATION-RESOURCE>
                    </ELEMENTS>
                  </AR-PACKAGES>
                </AR-PACKAGE>
              </AR-PACKAGES>
            </AR-PACKAGE>
          </AR-PACKAGES>
        </AR-PACKAGE>
      </AR-PACKAGES>
    </AR-PACKAGE>
  </AR-PACKAGES>
</AUTOSAR>

```

```

    <SHORT-NAME>Celine</SHORT-NAME>
    <GLOBAL-RESOURCE-ID>0xda1a0003</GLOBAL-RESOURCE-
        ID>
    <IS-MANDATORY>>false</IS-MANDATORY>
    <COM-PROPS>
        <SEND-INDICATION>NONE</SEND-INDICATION>
    </COM-PROPS>
</CP-SOFTWARE-CLUSTER-COMMUNICATION-RESOURCE>
<CP-SOFTWARE-CLUSTER-COMMUNICATION-RESOURCE>
    <SHORT-NAME>Hugo</SHORT-NAME>
    <GLOBAL-RESOURCE-ID>0xda1a0004</GLOBAL-RESOURCE-
        ID>
    <IS-MANDATORY>>false</IS-MANDATORY>
    <COM-PROPS>
        <SEND-INDICATION>NONE</SEND-INDICATION>
    </COM-PROPS>
    </CP-SOFTWARE-CLUSTER-COMMUNICATION-RESOURCE>
</RESOURCES>
</CP-SOFTWARE-CLUSTER-RESOURCE-POOL>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.12: DOC_SwCluC_Sys_ResPoolCommunicationResources.arxml

A.13 DOC_SwCluC_Sys_ResPoolServiceResources.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
    org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
    schema/r4.0_AUTOSAR_00049.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
    </AR-PACKAGE>
    <AR-PACKAGES>
      <AR-PACKAGE>
        <SHORT-NAME>CONC_670</SHORT-NAME>
      </AR-PACKAGE>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>SysResPool</SHORT-NAME>
        </AR-PACKAGE>
        <AR-PACKAGES>
          <AR-PACKAGE>
            <SHORT-NAME>CpSoftwareClusterResourcePools</SHORT-NAME>
          </AR-PACKAGE>
          <ELEMENTS>
            <CP-SOFTWARE-CLUSTER-RESOURCE-POOL>
              <SHORT-NAME>OsResourcePool</SHORT-NAME>
            </CP-SOFTWARE-CLUSTER-RESOURCE-POOL>
          </ELEMENTS>
        </AR-PACKAGES>
      </AR-PACKAGES>
    </AR-PACKAGES>
  </AR-PACKAGES>
</AUTOSAR>

```

```

<RESOURCES>
  <CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
    <SHORT-NAME>OsBaseSocket_AHB</SHORT-NAME>
    <DESC>
      <L-2 L="EN">OsTask resource according
        SWS_SwCluC_90002</L-2>
    </DESC>
    <CATEGORY>SWCLUSTER_RES_OS_BASE_SOCKET</CATEGORY>
    <GLOBAL-RESOURCE-ID>0x05000000</GLOBAL-RESOURCE-
      ID>
    <IS-MANDATORY>>true</IS-MANDATORY>
  </CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
    <SHORT-NAME>OsTask_1ms</SHORT-NAME>
    <DESC>
      <L-2 L="EN">OsTask resource according
        SWS_SwCluC_90004</L-2>
    </DESC>
    <CATEGORY>SWCLUSTER_RES_OS_TASK</CATEGORY>
    <GLOBAL-RESOURCE-ID>0x05000001</GLOBAL-RESOURCE-
      ID>
    <IS-MANDATORY>>true</IS-MANDATORY>
    <RESOURCE-NEEDS-REFS>
      <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
        >/AUTOSAR/CONC_670/SysResPool/
        EcucModuleConfigurationValuess/
        OsResourceNeeds/OsTask_1ms</RESOURCE-NEEDS-
        REF>
    </RESOURCE-NEEDS-REFS>
  </CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
    <SHORT-NAME>OsTask_5ms</SHORT-NAME>
    <DESC>
      <L-2 L="EN">OsTask resource according
        SWS_SwCluC_90004</L-2>
    </DESC>
    <CATEGORY>SWCLUSTER_RES_OS_TASK</CATEGORY>
    <GLOBAL-RESOURCE-ID>0x05000002</GLOBAL-RESOURCE-
      ID>
    <IS-MANDATORY>>true</IS-MANDATORY>
    <RESOURCE-NEEDS-REFS>
      <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
        >/AUTOSAR/CONC_670/SysResPool/
        EcucModuleConfigurationValuess/
        OsResourceNeeds/OsTask_5ms</RESOURCE-NEEDS-
        REF>
    </RESOURCE-NEEDS-REFS>
  </CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
    <SHORT-NAME>OsTask_50ms</SHORT-NAME>
    <DESC>
      <L-2 L="EN">OsTask resource according
        SWS_SwCluC_90004</L-2>
    </DESC>
    <CATEGORY>SWCLUSTER_RES_OS_TASK</CATEGORY>

```

```

<GLOBAL-RESOURCE-ID>0x05000003</GLOBAL-RESOURCE-
  ID>
<IS-MANDATORY>>true</IS-MANDATORY>
<RESOURCE-NEEDS-REFS>
  <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
    >/AUTOSAR/CONC_670/SysResPool/
    EcucModuleConfigurationValuess/
    OsResourceNeeds/OsTask_50ms</RESOURCE-NEEDS-
  REF>
</RESOURCE-NEEDS-REFS>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>OsTask_10ms</SHORT-NAME>
  <DESC>
    <L-2 L="EN">OsTask resource according
      SWS_SwCluC_90004</L-2>
  </DESC>
  <CATEGORY>SWCLUSTER_RES_OS_TASK</CATEGORY>
  <GLOBAL-RESOURCE-ID>0x05000004</GLOBAL-RESOURCE-
    ID>
  <IS-MANDATORY>>true</IS-MANDATORY>
  <RESOURCE-NEEDS-REFS>
    <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
      >/AUTOSAR/CONC_670/SysResPool/
      EcucModuleConfigurationValuess/
      OsResourceNeeds/OsTask_10ms</RESOURCE-NEEDS-
    REF>
  </RESOURCE-NEEDS-REFS>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>Disp_1ms_Ph1</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Task dispatcher resource according
      SWS_SwCluC_90007</L-2>
  </DESC>
  <CATEGORY>SWCLUSTER_RES_OS_TASK_DISPATCHER</
    CATEGORY>
  <GLOBAL-RESOURCE-ID>0x05000005</GLOBAL-RESOURCE-
    ID>
  <IS-MANDATORY>>true</IS-MANDATORY>
  <RESOURCE-NEEDS-REFS>
    <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
      >/AUTOSAR/CONC_670/SysResPool/
      EcucModuleConfigurationValuess/
      OsResourceNeeds/OsTask_1ms</RESOURCE-NEEDS-
    REF>
  </RESOURCE-NEEDS-REFS>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>Disp_5ms_Ph1</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Task dispatcher resource according
      SWS_SwCluC_90007</L-2>
  </DESC>
  <CATEGORY>SWCLUSTER_RES_OS_TASK_DISPATCHER</
    CATEGORY>

```



```

<GLOBAL-RESOURCE-ID>0x05000006</GLOBAL-RESOURCE-
  ID>
<IS-MANDATORY>>true</IS-MANDATORY>
<RESOURCE-NEEDS-REFS>
  <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
    >/AUTOSAR/CONC_670/SysResPool/
    EcucModuleConfigurationValuess/
    OsResourceNeeds/OsTask_5ms</RESOURCE-NEEDS-
  REF>
</RESOURCE-NEEDS-REFS>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>Disp_5ms_Ph2</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Task dispatcher resource according
      SWS_SwCluC_90007</L-2>
  </DESC>
  <CATEGORY>SWCLUSTER_RES_OS_TASK_DISPATCHER</
    CATEGORY>
  <GLOBAL-RESOURCE-ID>0x05000007</GLOBAL-RESOURCE-
    ID>
  <IS-MANDATORY>>true</IS-MANDATORY>
  <RESOURCE-NEEDS-REFS>
    <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
      >/AUTOSAR/CONC_670/SysResPool/
      EcucModuleConfigurationValuess/
      OsResourceNeeds/OsTask_5ms</RESOURCE-NEEDS-
    REF>
  </RESOURCE-NEEDS-REFS>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>Disp_50ms_Ph1</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Task dispatcher resource according
      SWS_SwCluC_90007</L-2>
  </DESC>
  <CATEGORY>SWCLUSTER_RES_OS_TASK_DISPATCHER</
    CATEGORY>
  <GLOBAL-RESOURCE-ID>0x05000008</GLOBAL-RESOURCE-
    ID>
  <IS-MANDATORY>>true</IS-MANDATORY>
  <RESOURCE-NEEDS-REFS>
    <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
      >/AUTOSAR/CONC_670/SysResPool/
      EcucModuleConfigurationValuess/
      OsResourceNeeds/OsTask_50ms</RESOURCE-NEEDS-
    REF>
  </RESOURCE-NEEDS-REFS>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>Disp_50ms_Ph2</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Task dispatcher resource according
      SWS_SwCluC_90007</L-2>
  </DESC>

```

```

<CATEGORY>SWCLUSTER_RES_OS_TASK_DISPATCHER</
CATEGORY>
<GLOBAL-RESOURCE-ID>0x05000009</GLOBAL-RESOURCE-
ID>
<IS-MANDATORY>>true</IS-MANDATORY>
<RESOURCE-NEEDS-REFS>
  <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
  >/AUTOSAR/CONC_670/SysResPool/
  EcucModuleConfigurationValuess/
  OsResourceNeeds/OsTask_50ms</RESOURCE-NEEDS-
REF>
</RESOURCE-NEEDS-REFS>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>Disp_10ms_Ph1</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Task dispatcher resource according
    SWS_SwCluC_90007</L-2>
  </DESC>
  <CATEGORY>SWCLUSTER_RES_OS_TASK_DISPATCHER</
  CATEGORY>
  <GLOBAL-RESOURCE-ID>0x0500000a</GLOBAL-RESOURCE-
  ID>
  <IS-MANDATORY>>true</IS-MANDATORY>
  <RESOURCE-NEEDS-REFS>
    <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
    >/AUTOSAR/CONC_670/SysResPool/
    EcucModuleConfigurationValuess/
    OsResourceNeeds/OsTask_10ms</RESOURCE-NEEDS-
    REF>
  </RESOURCE-NEEDS-REFS>
  </CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
    <SHORT-NAME>Disp_10ms_Ph2</SHORT-NAME>
    <DESC>
      <L-2 L="EN">Task dispatcher resource according
      SWS_SwCluC_90007</L-2>
    </DESC>
    <CATEGORY>SWCLUSTER_RES_OS_TASK_DISPATCHER</
    CATEGORY>
    <GLOBAL-RESOURCE-ID>0x0500000b</GLOBAL-RESOURCE-
    ID>
    <IS-MANDATORY>>true</IS-MANDATORY>
    <RESOURCE-NEEDS-REFS>
      <RESOURCE-NEEDS-REF DEST="ECUC-CONTAINER-VALUE"
      >/AUTOSAR/CONC_670/SysResPool/
      EcucModuleConfigurationValuess/
      OsResourceNeeds/OsTask_10ms</RESOURCE-NEEDS-
      REF>
    </RESOURCE-NEEDS-REFS>
  </CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
</RESOURCES>
</CP-SOFTWARE-CLUSTER-RESOURCE-POOL>
<CP-SOFTWARE-CLUSTER-RESOURCE-POOL>
  <SHORT-NAME>SwCluCResourcePool</SHORT-NAME>
</RESOURCES>

```

```

<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>BaseConfigCheck_AHB</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Base Configuration Check for AHB
      according SWS_SwCluC_90000</L-2>
  </DESC>
  <CATEGORY>SWCLUSTER_RES_BASE_CNF</CATEGORY>
  <GLOBAL-RESOURCE-ID>0xba5e0001</GLOBAL-RESOURCE-
    ID>
  <IS-MANDATORY>true</IS-MANDATORY>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
<CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
  <SHORT-NAME>XccBaseSocket_AHB</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Xcc Base Socket for AHB according
      SWS_SwCluC_90008</L-2>
  </DESC>
  <CATEGORY>SWCLUSTER_RES_XCC_BASE_SOCKET</CATEGORY
    >
  <GLOBAL-RESOURCE-ID>0xba5e0002</GLOBAL-RESOURCE-
    ID>
  <IS-MANDATORY>true</IS-MANDATORY>
</CP-SOFTWARE-CLUSTER-SERVICE-RESOURCE>
</RESOURCES>
</CP-SOFTWARE-CLUSTER-RESOURCE-POOL>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.13: DOC_SwCluC_Sys_ResPoolServiceResources.arxml

A.14 DOC_SwCluC_Sys_ResPoolServiceResourceNeeds.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00044.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
    </AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>CONC_670</SHORT-NAME>
    </AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>SysResPool</SHORT-NAME>
    </AR-PACKAGES>
  </AR-PACKAGES>

```

```

<AR-PACKAGES>
  <AR-PACKAGE>
    <SHORT-NAME>EcucModuleConfigurationValues</SHORT-NAME>
    <ELEMENTS>
      <ECUC-MODULE-CONFIGURATION-VALUES>
        <SHORT-NAME>OsResourceNeeds</SHORT-NAME>
        <DEFINITION-REF DEST="ECUC-MODULE-DEF"/>/AUTOSAR/
          EcucDefs/Os</DEFINITION-REF>
        <ECUC-DEF-EDITION>1.0.0</ECUC-DEF-EDITION>
        <CONTAINERS>
          <ECUC-CONTAINER-VALUE>
            <SHORT-NAME>OsTask_1ms</SHORT-NAME>
            <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-
              DEF"/>/AUTOSAR/EcucDefs/Os/OsTask</DEFINITION-
              REF>
            <PARAMETER-VALUES>
              <ECUC-NUMERICAL-PARAM-VALUE>
                <DEFINITION-REF DEST="ECUC-INTEGGER-PARAM-DEF"
                  >/AUTOSAR/EcucDefs/Os/OsTask/
                    OsTaskPriority</DEFINITION-REF>
                <VALUE>1</VALUE>
              </ECUC-NUMERICAL-PARAM-VALUE>
              <ECUC-TEXTUAL-PARAM-VALUE>
                <DEFINITION-REF DEST="ECUC-ENUMERATION-PARAM-
                  DEF"/>/AUTOSAR/EcucDefs/Os/OsTask/
                    OsTaskSchedule</DEFINITION-REF>
                <VALUE>NON</VALUE>
              </ECUC-TEXTUAL-PARAM-VALUE>
            </PARAMETER-VALUES>
          </ECUC-CONTAINER-VALUE>
          <ECUC-CONTAINER-VALUE>
            <SHORT-NAME>OsTask_5ms</SHORT-NAME>
            <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-
              DEF"/>/AUTOSAR/EcucDefs/Os/OsTask</DEFINITION-
              REF>
            <PARAMETER-VALUES>
              <ECUC-NUMERICAL-PARAM-VALUE>
                <DEFINITION-REF DEST="ECUC-INTEGGER-PARAM-DEF"
                  >/AUTOSAR/EcucDefs/Os/OsTask/
                    OsTaskPriority</DEFINITION-REF>
                <VALUE>5</VALUE>
              </ECUC-NUMERICAL-PARAM-VALUE>
              <ECUC-TEXTUAL-PARAM-VALUE>
                <DEFINITION-REF DEST="ECUC-ENUMERATION-PARAM-
                  DEF"/>/AUTOSAR/EcucDefs/Os/OsTask/
                    OsTaskSchedule</DEFINITION-REF>
                <VALUE>FULL</VALUE>
              </ECUC-TEXTUAL-PARAM-VALUE>
            </PARAMETER-VALUES>
          </ECUC-CONTAINER-VALUE>
          <ECUC-CONTAINER-VALUE>
            <SHORT-NAME>OsTask_10ms</SHORT-NAME>
            <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-
              DEF"/>/AUTOSAR/EcucDefs/Os/OsTask</DEFINITION-
              REF>
            <PARAMETER-VALUES>

```

```

<ECUC-NUMERICAL-PARAM-VALUE>
  <DEFINITION-REF DEST="ECUC-INTEGGER-PARAM-DEF"
    >/AUTOSAR/EcucDefs/Os/OsTask/
    OsTaskPriority</DEFINITION-REF>
  <VALUE>10</VALUE>
</ECUC-NUMERICAL-PARAM-VALUE>
<ECUC-TEXTUAL-PARAM-VALUE>
  <DEFINITION-REF DEST="ECUC-ENUMERATION-PARAM-
    DEF">/AUTOSAR/EcucDefs/Os/OsTask/
    OsTaskSchedule</DEFINITION-REF>
  <VALUE>FULL</VALUE>
</ECUC-TEXTUAL-PARAM-VALUE>
</PARAMETER-VALUES>
</ECUC-CONTAINER-VALUE>
<ECUC-CONTAINER-VALUE>
  <SHORT-NAME>OsTask_50ms</SHORT-NAME>
  <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-
    DEF">/AUTOSAR/EcucDefs/Os/OsTask</DEFINITION-
    REF>
  <PARAMETER-VALUES>
    <ECUC-NUMERICAL-PARAM-VALUE>
      <DEFINITION-REF DEST="ECUC-INTEGGER-PARAM-DEF"
        >/AUTOSAR/EcucDefs/Os/OsTask/
        OsTaskPriority</DEFINITION-REF>
      <VALUE>50</VALUE>
    </ECUC-NUMERICAL-PARAM-VALUE>
    <ECUC-TEXTUAL-PARAM-VALUE>
      <DEFINITION-REF DEST="ECUC-ENUMERATION-PARAM-
        DEF">/AUTOSAR/EcucDefs/Os/OsTask/
        OsTaskSchedule</DEFINITION-REF>
      <VALUE>FULL</VALUE>
    </ECUC-TEXTUAL-PARAM-VALUE>
  </PARAMETER-VALUES>
</ECUC-CONTAINER-VALUE>
</CONTAINERS>
</ECUC-MODULE-CONFIGURATION-VALUES>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.14: DOC_SwCluC_Sys_ResPoolServiceResourceNeeds.arxml

A.15 DOC_SwCluC_Sys_Extr_Host.arxml

```
<AUTOSAR xmlns="http://autosar.org/schema/r4.0">
```

```

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
  "http://autosar.org/schema/r4.0_AUTOSAR_4-0-1.xsd">
<ADMIN-DATA>
  <USED-LANGUAGES></USED-LANGUAGES>
</ADMIN-DATA>
<AR-PACKAGES>
  <AR-PACKAGE>
    <SHORT-NAME>AUTOSAR</SHORT-NAME>
    <AR-PACKAGES>
      <AR-PACKAGE>
        <SHORT-NAME>CONC_670</SHORT-NAME>
        <AR-PACKAGES>
          <AR-PACKAGE>
            <SHORT-NAME>PCFG_SYS</SHORT-NAME>
            <AR-PACKAGES>
              <AR-PACKAGE>
                <SHORT-NAME>Systems</SHORT-NAME>
                <ELEMENTS>
                  <SYSTEM>
                    <SHORT-NAME>System_Host</SHORT-NAME>
                    <CATEGORY>SW_CLUSTER_SYSTEM_DESCRIPTION</CATEGORY>
                    <MAPPINGS>
                      <SYSTEM-MAPPING>
                        <SHORT-NAME>Sys_Host_Maps</SHORT-NAME>
                        <PORT-ELEMENT-TO-COM-RESOURCE-MAPPINGS>
                          <PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
                            >
                            <SHORT-NAME>Res_Map_DE_Bernd</SHORT-NAME>
                            <COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE
                              -CLUSTER-COMMUNICATION-RESOURCE">/AUTOSAR/
                              CONC_670/SysResPool/
                              CpSoftwareClusterResourcePools/
                              ComResourcePool/Bernd</COMMUNICATION-
                              RESOURCE-REF>
                            <VARIABLE-DATA-PROTOTYPE-IREF>
                              <CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
                                PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
                                SwComponentTypes/TopLvl/CPT_SwcCompoHost
                                </CONTEXT-COMPONENT-REF>
                              <CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
                                COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670
                                /PCFG_SYS/Systems/System_Host/
                                Sys_SWCluster_Host</CONTEXT-COMPOSITION-
                                REF>
                              <CONTEXT-PORT-REF DEST="R-PORT-PROTOTYPE">/
                                AUTOSAR/CONC_670/SwcCompoHost/
                                SwComponentTypes/SwcCompoHost/RP_Bernd</
                                CONTEXT-PORT-REF>
                              <TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
                                DATA-PROTOTYPE">/AUTOSAR/CONC_670/
                                SwCompoHost/PortInterfaces/IF_Bernd/
                                Bernd</TARGET-DATA-PROTOTYPE-REF>
                              </VARIABLE-DATA-PROTOTYPE-IREF>
                            </PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
                              MAPPING>
                        </SYSTEM-MAPPING>
                    </MAPPINGS>
                  </SYSTEM>
                </AR-PACKAGES>
              </AR-PACKAGE>
            </AR-PACKAGES>
          </AR-PACKAGE>
        </AR-PACKAGES>
      </AR-PACKAGE>
    </AR-PACKAGES>
  </AR-PACKAGE>
</AR-PACKAGES>

```

```

<PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
>
<SHORT-NAME>Res_Map_DE_Celine</SHORT-NAME>
<COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE
-CLUSTER-COMMUNICATION-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
ComResourcePool/Celine</COMMUNICATION-
RESOURCE-REF>
<VARIABLE-DATA-PROTOTYPE-IREF>
<CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
SwComponentTypes/TopLvl/CPT_SwcCompoHost
</CONTEXT-COMPONENT-REF>
<CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670
/PCFG_SYS/Systems/System_Host/
Sys_SWCluster_Host</CONTEXT-COMPOSITION-
REF>
<CONTEXT-PORT-REF DEST="P-PORT-PROTOTYPE">/
AUTOSAR/CONC_670/SwcCompoHost/
SwComponentTypes/SwcCompoHost/PP_Celine<
/CONTEXT-PORT-REF>
<TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
DATA-PROTOTYPE">/AUTOSAR/CONC_670/
SwCompoHost/PortInterfaces/IF_Celine/
Celine</TARGET-DATA-PROTOTYPE-REF>
</VARIABLE-DATA-PROTOTYPE-IREF>
</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
MAPPING>
<PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
>
<SHORT-NAME>Res_Map_DE_Hugo</SHORT-NAME>
<COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE
-CLUSTER-COMMUNICATION-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
ComResourcePool/Celine</COMMUNICATION-
RESOURCE-REF>
<VARIABLE-DATA-PROTOTYPE-IREF>
<CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
SwComponentTypes/TopLvl/CPT_SwcCompoHost
</CONTEXT-COMPONENT-REF>
<CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670
/PCFG_SYS/Systems/System_Host/
Sys_SWCluster_Host</CONTEXT-COMPOSITION-
REF>
<CONTEXT-PORT-REF DEST="R-PORT-PROTOTYPE">/
AUTOSAR/CONC_670/SwcCompoHost/
SwComponentTypes/SwcCompoHost/RP_Hugo</
CONTEXT-PORT-REF>

```

```

<TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
  DATA-PROTOTYPE"/>/AUTOSAR/CONC_670/
  SwCompoHost/PortInterfaces/IF_Hugo/Hugo
</TARGET-DATA-PROTOTYPE-REF>
</VARIABLE-DATA-PROTOTYPE-IREF>
</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
  MAPPING>
</PORT-ELEMENT-TO-COM-RESOURCE-MAPPINGS>
<SOFTWARE-CLUSTER-TO-RESOURCE-MAPPINGS>
  <CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
    <SHORT-NAME>Res_Map_BaseConfigCheck_AHB</
      SHORT-NAME>
    <DESC>
      <L-2 L="EN">Software Cluster resource
        mapping Base Config Check AHB for the
        complete ECU</L-2>
    </DESC>
    <PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>/
      AUTOSAR/CONC_670/PCFG_SYS/
      CpSoftwareClusters/SwClu_Host</PROVIDER-
        REF>
    <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
      CLUSTER-SERVICE-RESOURCE"/>/AUTOSAR/
      CONC_670/SysResPool/
      CpSoftwareClusterResourcePools/
      SwClusCResourcePool/BaseConfigCheck_AHB</
        SERVICE-RESOURCE-REF>
  </CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
    <SHORT-NAME>Res_Map_XccBaseSocket_AHB</SHORT-
      NAME>
    <DESC>
      <L-2 L="EN">Software Cluster resource
        mapping Xcc Base Socket AHB for the
        complete ECU</L-2>
    </DESC>
    <PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>/
      AUTOSAR/CONC_670/PCFG_SYS/
      CpSoftwareClusters/SwClu_Host</PROVIDER-
        REF>
    <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
      CLUSTER-SERVICE-RESOURCE"/>/AUTOSAR/
      CONC_670/SysResPool/
      CpSoftwareClusterResourcePools/
      SwClusCResourcePool/XccBaseSocket_AHB</
        SERVICE-RESOURCE-REF>
  </CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
    <SHORT-NAME>Res_Map_OsBaseSocket_AHB</SHORT-
      NAME>
    <DESC>
      <L-2 L="EN">Software Cluster resource
        mapping Xcc Base Socket AHB for the
        complete ECU</L-2>
    </DESC>

```



```

<PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_Host</PROVIDER-
REF>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
OsResourcePool/OsBaseSocket_AHB</SERVICE-
RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>

<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<SHORT-NAME>Res_Map_OsTask_50ms</SHORT-NAME>
<DESC>
<L-2 L="EN">Software Cluster resource
mapping OsTask_50ms for the complete ECU
</L-2>
</DESC>
<PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_Host</PROVIDER-
REF>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
OsResourcePool/OsTask_50ms</SERVICE-
RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<SHORT-NAME>Res_Map_OsTask_10ms</SHORT-NAME>
<DESC>
<L-2 L="EN">Software Cluster resource
mapping OsTask_10ms for the complete ECU
</L-2>
</DESC>
<PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>
AUTOSAR/CONC_670/PCFG_SYS/
CpSoftwareClusters/SwClu_Host</PROVIDER-
REF>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
OsResourcePool/OsTask_10ms</SERVICE-
RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<SHORT-NAME>Res_Map_Disp_50ms_Ph1</SHORT-NAME>
>
<DESC>
<L-2 L="EN">Software Cluster resource
mapping Disp_50ms_Ph1 for the complete
ECU</L-2>
</DESC>

```

```

<PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>
  AUTOSAR/CONC_670/PCFG_SYS/
  CpSoftwareClusters/SwClu_Host</PROVIDER-
  REF>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
  CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
  CONC_670/SysResPool/
  CpSoftwareClusterResourcePools/
  OsResourcePool/Disp_50ms_Ph1</SERVICE-
  RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_Disp_10ms_Ph1</SHORT-NAME
  >
  <DESC>
    <L-2 L="EN">Software Cluster resource
      mapping Disp_50ms_Ph1 for the complete
      ECU</L-2>
  </DESC>
  <PROVIDER-REF DEST="CP-SOFTWARE-CLUSTER"/>
    AUTOSAR/CONC_670/PCFG_SYS/
    CpSoftwareClusters/SwClu_Host</PROVIDER-
    REF>
  <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
    CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
    CONC_670/SysResPool/
    CpSoftwareClusterResourcePools/
    OsResourcePool/Disp_10ms_Ph1</SERVICE-
    RESOURCE-REF>
  </CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
</SOFTWARE-CLUSTER-TO-RESOURCE-MAPPINGS>
<SW-MAPPINGS>
  <SWC-TO-ECU-MAPPING>
    <SHORT-NAME>SWC_Host_Map</SHORT-NAME>
    <COMPONENT-IREFS>
      <COMPONENT-IREF>
        <CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
          COMPOSITION-PROTOTYPE"/>AUTOSAR/
          CONC_670/PCFG_SYS/Systems/System/
          CPT_TopLvl</CONTEXT-COMPOSITION-REF>
        <TARGET-COMPONENT-REF DEST="SW-COMPONENT-
          PROTOTYPE"/>AUTOSAR/CONC_670/
          PCT_TopLvl/SwComponentTypes/TopLvl/
          CPT_SwcCompoHost</TARGET-COMPONENT-REF
          >
      </COMPONENT-IREF>
    </COMPONENT-IREFS>
    <ECU-INSTANCE-REF DEST="ECU-INSTANCE"/>
      AUTOSAR/CONC_670/PCFG_SYS/EcuInstances/
      Machine_Host_AHB</ECU-INSTANCE-REF>
  </SWC-TO-ECU-MAPPING>
</SW-MAPPINGS>
</SYSTEM-MAPPING>
</MAPPINGS>
<ROOT-SOFTWARE-COMPOSITIONS>
  <ROOT-SW-COMPOSITION-PROTOTYPE>

```

```

    <SHORT-NAME>Sys_SWCluster_Host</SHORT-NAME>
    <SOFTWARE-COMPOSITION-TREF DEST="COMPOSITION-SW-
      COMPONENT-TYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
      SwComponentTypes/TopLvl</SOFTWARE-COMPOSITION-
      TREF>
    </ROOT-SW-COMPOSITION-PROTOTYPE>
  </ROOT-SOFTWARE-COMPOSITIONS>
<SW-CLUSTERS>
  <CP-SOFTWARE-CLUSTER-REF-CONDITIONAL>
    <CP-SOFTWARE-CLUSTER-REF DEST="CP-SOFTWARE-
      CLUSTER">/AUTOSAR/CONC_670/PCFG_SYS/
      CpSoftwareClusters/SwClu_Host</CP-SOFTWARE-
      CLUSTER-REF>
    </CP-SOFTWARE-CLUSTER-REF-CONDITIONAL>
  </SW-CLUSTERS>
</SYSTEM>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.15: DOC_SwCluC_Sys_Extr_Host.arxml

A.16 DOC_SwCluC_Sys_Extr_TopLvl_SWCD_Host.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00044.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>CONC_670</SHORT-NAME>
          <AR-PACKAGES>
            <AR-PACKAGE>
              <SHORT-NAME>PCT_TopLvl</SHORT-NAME>
              <AR-PACKAGES>
                <AR-PACKAGE>
                  <SHORT-NAME>SwComponentTypes</SHORT-NAME>
                  <ELEMENTS>
                    <COMPOSITION-SW-COMPONENT-TYPE>
                      <SHORT-NAME>TopLvl</SHORT-NAME>
                    <COMPONENTS>
                      <SW-COMPONENT-PROTOTYPE>
                        <SHORT-NAME>CPT_SwcCompoHost</SHORT-NAME>

```

```

        <TYPE-TREF DEST="COMPOSITION-SW-COMPONENT-TYPE"/>
        AUTOSAR/CONC_670/SwcCompoHost/SwComponentTypes
        /SwcCompoHost</TYPE-TREF>
    </SW-COMPONENT-PROTOTYPE>
</COMPONENTS>
</COMPOSITION-SW-COMPONENT-TYPE>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.16: DOC_SwCluC_Sys_Extr_TopLvl_SWCD_Host.arxml

A.17 DOC_SwCluC_Sys_Extr_AHB.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_4-0-1.xsd">
  <ADMIN-DATA>
    <USED-LANGUAGES/>
  </ADMIN-DATA>
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
    </AR-PACKAGE>
    <AR-PACKAGES>
      <AR-PACKAGE>
        <SHORT-NAME>CONC_670</SHORT-NAME>
      </AR-PACKAGES>
      <AR-PACKAGE>
        <SHORT-NAME>PCFG_SYS</SHORT-NAME>
      </AR-PACKAGES>
      <AR-PACKAGE>
        <SHORT-NAME>Systems</SHORT-NAME>
      </AR-PACKAGES>
      <ELEMENTS>
        <SYSTEM>
          <SHORT-NAME>System_AHB</SHORT-NAME>
          <CATEGORY>SW_CLUSTER_SYSTEM_DESCRIPTION</CATEGORY>
          <MAPPINGS>
            <SYSTEM-MAPPING>
              <SHORT-NAME>Sys_AHB_Maps</SHORT-NAME>
              <PORT-ELEMENT-TO-COM-RESOURCE-MAPPINGS>
                <PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
                  >
                <SHORT-NAME>Res_Map_DE_Anton</SHORT-NAME>
              </PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
            >
          </SYSTEM-MAPPING>
        </SYSTEM>
      </ELEMENTS>
    </AR-PACKAGE>
  </AR-PACKAGES>
</AUTOSAR>

```

```

<COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE
-CLUSTER-COMMUNICATION-RESOURCE"/>/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
ComResourcePool/Anton</COMMUNICATION-
RESOURCE-REF>
<VARIABLE-DATA-PROTOTYPE-IREF>
  <CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
  PROTOTYPE"/>/AUTOSAR/CONC_670/PCT_TopLvl/
  SwComponentTypes/TopLvl/CPT_SwcCompoAHB<
  /CONTEXT-COMPONENT-REF>
  <CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
  COMPOSITION-PROTOTYPE"/>/AUTOSAR/CONC_670
  /PCFG_SYS/Systems/System_AHB/
  Sys_SWCluster_AHB</CONTEXT-COMPOSITION-
  REF>
  <CONTEXT-PORT-REF DEST="P-PORT-PROTOTYPE"/>/
  AUTOSAR/CONC_670/SwcCompoAHB/
  SwComponentTypes/SwcCompoAHB/PP_Anton</
  CONTEXT-PORT-REF>
  <TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
  DATA-PROTOTYPE"/>/AUTOSAR/CONC_670/
  SwCompoAHB/PortInterfaces/IF_Anton/
  Anton</TARGET-DATA-PROTOTYPE-REF>
</VARIABLE-DATA-PROTOTYPE-IREF>
</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
MAPPING>
<PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
>
  <SHORT-NAME>Res_Map_DE_Bernd</SHORT-NAME>
  <COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE
  -CLUSTER-COMMUNICATION-RESOURCE"/>/AUTOSAR/
  CONC_670/SysResPool/
  CpSoftwareClusterResourcePools/
  ComResourcePool/Bernd</COMMUNICATION-
  RESOURCE-REF>
  <VARIABLE-DATA-PROTOTYPE-IREF>
    <CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
    PROTOTYPE"/>/AUTOSAR/CONC_670/PCT_TopLvl/
    SwComponentTypes/TopLvl/CPT_SwcCompoAHB<
    /CONTEXT-COMPONENT-REF>
    <CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
    COMPOSITION-PROTOTYPE"/>/AUTOSAR/CONC_670
    /PCFG_SYS/Systems/System_AHB/
    Sys_SWCluster_AHB</CONTEXT-COMPOSITION-
    REF>
    <CONTEXT-PORT-REF DEST="P-PORT-PROTOTYPE"/>/
    AUTOSAR/CONC_670/SwcCompoAHB/
    SwComponentTypes/SwcCompoAHB/PP_Bernd</
    CONTEXT-PORT-REF>
    <TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
    DATA-PROTOTYPE"/>/AUTOSAR/CONC_670/
    SwCompoAHB/PortInterfaces/IF_Bernd/
    Bernd</TARGET-DATA-PROTOTYPE-REF>
  </VARIABLE-DATA-PROTOTYPE-IREF>

```

```

</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
MAPPING>
<PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-MAPPING
>
  <SHORT-NAME>Res_Map_DE_Celine</SHORT-NAME>
  <COMMUNICATION-RESOURCE-REF DEST="CP-SOFTWARE-
  -CLUSTER-COMMUNICATION-RESOURCE">/AUTOSAR/
  CONC_670/SysResPool/
  CpSoftwareClusterResourcePools/
  ComResourcePool/Celine</COMMUNICATION-
  RESOURCE-REF>
  <VARIABLE-DATA-PROTOTYPE-IREF>
    <CONTEXT-COMPONENT-REF DEST="SW-COMPONENT-
    PROTOTYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
    SwComponentTypes/TopLvl/CPT_SwcCompoAHB<
    /CONTEXT-COMPONENT-REF>
    <CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
    COMPOSITION-PROTOTYPE">/AUTOSAR/CONC_670
    /PCFG_SYS/Systems/System_AHB/
    Sys_SWCluster_AHB</CONTEXT-COMPOSITION-
    REF>
    <CONTEXT-PORT-REF DEST="R-PORT-PROTOTYPE">/
    AUTOSAR/CONC_670/SwcCompoAHB/
    SwComponentTypes/SwcCompoAHB/CP_Celine</
    CONTEXT-PORT-REF>
    <TARGET-DATA-PROTOTYPE-REF DEST="VARIABLE-
    DATA-PROTOTYPE">/AUTOSAR/CONC_670/
    SwCompoAHB/PortInterfaces/IF_Celine/
    Celine</TARGET-DATA-PROTOTYPE-REF>
  </VARIABLE-DATA-PROTOTYPE-IREF>
</PORT-ELEMENT-TO-COMMUNICATION-RESOURCE-
MAPPING>
</PORT-ELEMENT-TO-COM-RESOURCE-MAPPINGS>
<SOFTWARE-CLUSTER-TO-RESOURCE-MAPPINGS>
  <CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
    <SHORT-NAME>Res_Map_BaseConfigCheck_AHB</
    SHORT-NAME>
    <DESC>
      <L-2 L="EN">Software Cluster resource
      mapping Base Config Check AHB for the
      complete ECU</L-2>
    </DESC>
    <REQUESTER-REFS>
      <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
      AUTOSAR/CONC_670/PCFG_SYS/
      CpSoftwareClusters/SwClu_AHB</REQUESTER-
      REF>
    </REQUESTER-REFS>
    <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
    CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
    CONC_670/SysResPool/
    CpSoftwareClusterResourcePools/
    SwClusCResourcePool/BaseConfigCheck_AHB</
    SERVICE-RESOURCE-REF>
  </CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>

```

```

<SHORT-NAME>Res_Map_XccBaseSocket_AHB</SHORT-
NAME>
<DESC>
  <L-2 L="EN">Software Cluster resource
    mapping Xcc Base Socket AHB for the
    complete ECU</L-2>
</DESC>
<REQUESTER-REFS>
  <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
    AUTOSAR/CONC_670/PCFG_SYS/
    CpSoftwareClusters/SwClu_AHB</REQUESTER-
    REF>
</REQUESTER-REFS>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
CONC_670/SysResPool/
CpSoftwareClusterResourcePools/
SwClusCResourcePool/XccBaseSocket_AHB</
SERVICE-RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_OsBaseSocket_AHB</SHORT-
  NAME>
  <DESC>
    <L-2 L="EN">Software Cluster resource
      mapping Xcc Base Socket AHB for the
      complete ECU</L-2>
  </DESC>
  <REQUESTER-REFS>
    <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
      AUTOSAR/CONC_670/PCFG_SYS/
      CpSoftwareClusters/SwClu_AHB</REQUESTER-
      REF>
  </REQUESTER-REFS>
  <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
  CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
  CONC_670/SysResPool/
  CpSoftwareClusterResourcePools/
  OsResourcePool/OsBaseSocket_AHB</SERVICE-
  RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_OsTask_50ms</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Software Cluster resource
      mapping OsTask_50ms for the complete ECU
    </L-2>
  </DESC>
  <REQUESTER-REFS>
    <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
      AUTOSAR/CONC_670/PCFG_SYS/
      CpSoftwareClusters/SwClu_AHB</REQUESTER-
      REF>
  </REQUESTER-REFS>

```

```

<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
  CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
  CONC_670/SysResPool/
  CpSoftwareClusterResourcePools/
  OsResourcePool/OsTask_50ms</SERVICE-
  RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_OsTask_10ms</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Software Cluster resource
      mapping OsTask_10ms for the complete ECU
    </L-2>
  </DESC>
  <REQUESTER-REFS>
    <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER"/>/
    AUTOSAR/CONC_670/PCFG_SYS/
    CpSoftwareClusters/SwClu_AHB</REQUESTER-
    REF>
  </REQUESTER-REFS>
  <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
    CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
    CONC_670/SysResPool/
    CpSoftwareClusterResourcePools/
    OsResourcePool/OsTask_10ms</SERVICE-
    RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_Disp_50ms_Ph1</SHORT-NAME
  >
  <DESC>
    <L-2 L="EN">Software Cluster resource
      mapping Disp_50ms_Ph1 for the complete
      ECU</L-2>
  </DESC>
  <REQUESTER-REFS>
    <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER"/>/
    AUTOSAR/CONC_670/PCFG_SYS/
    CpSoftwareClusters/SwClu_AHB</REQUESTER-
    REF>
  </REQUESTER-REFS>
  <SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
    CLUSTER-SERVICE-RESOURCE"/>AUTOSAR/
    CONC_670/SysResPool/
    CpSoftwareClusterResourcePools/
    OsResourcePool/Disp_50ms_Ph1</SERVICE-
    RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
<CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
  <SHORT-NAME>Res_Map_Disp_10ms_Ph1</SHORT-NAME
  >
  <DESC>
    <L-2 L="EN">Software Cluster resource
      mapping Disp_50ms_Ph1 for the complete
      ECU</L-2>
  </DESC>

```



```

<REQUESTER-REFS>
  <REQUESTER-REF DEST="CP-SOFTWARE-CLUSTER">/
    AUTOSAR/CONC_670/PCFG_SYS/
    CpSoftwareClusters/SwClu_AHB</REQUESTER-
      REF>
</REQUESTER-REFS>
<SERVICE-RESOURCE-REF DEST="CP-SOFTWARE-
  CLUSTER-SERVICE-RESOURCE">/AUTOSAR/
  CONC_670/SysResPool/
  CpSoftwareClusterResourcePools/
  OsResourcePool/Disp_10ms_Ph1</SERVICE-
    RESOURCE-REF>
</CP-SOFTWARE-CLUSTER-TO-RESOURCE-MAPPING>
</SOFTWARE-CLUSTER-TO-RESOURCE-MAPPINGS>
<SW-MAPPINGS>
  <SWC-TO-ECU-MAPPING>
    <SHORT-NAME>SWC_AHB_Map</SHORT-NAME>
    <COMPONENT-IREFS>
      <COMPONENT-IREF>
        <CONTEXT-COMPOSITION-REF DEST="ROOT-SW-
          COMPOSITION-PROTOTYPE">/AUTOSAR/
          CONC_670/PCFG_SYS/Systems/System/
          CPT_TopLvl</CONTEXT-COMPOSITION-REF>
        <TARGET-COMPONENT-REF DEST="SW-COMPONENT-
          PROTOTYPE">/AUTOSAR/CONC_670/
          PCT_TopLvl/SwComponentTypes/TopLvl/
          CPT_SwcCompoAHB</TARGET-COMPONENT-REF>
      </COMPONENT-IREF>
    </COMPONENT-IREFS>
    <ECU-INSTANCE-REF DEST="ECU-INSTANCE">/
      AUTOSAR/CONC_670/PCFG_SYS/EcuInstances/
      Machine_Host_AHB</ECU-INSTANCE-REF>
  </SWC-TO-ECU-MAPPING>
</SW-MAPPINGS>
</SYSTEM-MAPPING>
</MAPPINGS>
<ROOT-SOFTWARE-COMPOSITIONS>
  <ROOT-SW-COMPOSITION-PROTOTYPE>
    <SHORT-NAME>Sys_SWCluster_AHB</SHORT-NAME>
    <SOFTWARE-COMPOSITION-TREF DEST="COMPOSITION-SW-
      COMPONENT-TYPE">/AUTOSAR/CONC_670/PCT_TopLvl/
      SwComponentTypes/TopLvl</SOFTWARE-COMPOSITION-
        TREF>
  </ROOT-SW-COMPOSITION-PROTOTYPE>
</ROOT-SOFTWARE-COMPOSITIONS>
<SW-CLUSTERS>
  <CP-SOFTWARE-CLUSTER-REF-CONDITIONAL>
    <CP-SOFTWARE-CLUSTER-REF DEST="CP-SOFTWARE-
      CLUSTER">/AUTOSAR/CONC_670/PCFG_SYS/
      CpSoftwareClusters/SwClu_AHB</CP-SOFTWARE-
        CLUSTER-REF>
  </CP-SOFTWARE-CLUSTER-REF-CONDITIONAL>
</SW-CLUSTERS>
</SYSTEM>
</ELEMENTS>
</AR-PACKAGE>

```

```

        </AR-PACKAGES>
      </AR-PACKAGE>
    </AR-PACKAGES>
  </AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.17: DOC_SwCluC_Sys_Extr_AHB.arxml

A.18 DOC_SwCluC_Sys_Extr_TopLvl_SWCD_AHB.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00044.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>CONC_670</SHORT-NAME>
          <AR-PACKAGES>
            <AR-PACKAGE>
              <SHORT-NAME>PCT_TopLvl</SHORT-NAME>
              <AR-PACKAGES>
                <AR-PACKAGE>
                  <SHORT-NAME>SwComponentTypes</SHORT-NAME>
                  <ELEMENTS>
                    <COMPOSITION-SW-COMPONENT-TYPE>
                      <SHORT-NAME>TopLvl</SHORT-NAME>
                      <COMPONENTS>
                        <SW-COMPONENT-PROTOTYPE>
                          <SHORT-NAME>CPT_SwcCompoAHB</SHORT-NAME>
                          <TYPE-TREF DEST="COMPOSITION-SW-COMPONENT-TYPE"/>/
                            AUTOSAR/CONC_670/SwcCompoAHB/SwComponentTypes/
                              SwcCompoAHB</TYPE-TREF>
                        </SW-COMPONENT-PROTOTYPE>
                      </COMPONENTS>
                    </COMPOSITION-SW-COMPONENT-TYPE>
                  </ELEMENTS>
                </AR-PACKAGE>
              </AR-PACKAGES>
            </AR-PACKAGE>
          </AR-PACKAGES>
        </AR-PACKAGE>
      </AR-PACKAGES>
    </AR-PACKAGE>
  </AR-PACKAGES>
</AUTOSAR>

```

Listing A.18: DOC_SwCluC_Sys_Extr_TopLvl_SWCD_AHB.arxml

A.19 DOC_SwCluC_Ecuc_EcuC_AHB.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00044.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR_EcuC</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>EcucModuleConfigurationValues</SHORT-NAME>
          <ELEMENTS>
            <ECUC-MODULE-CONFIGURATION-VALUES>
              <SHORT-NAME>EcuC</SHORT-NAME>
              <DEFINITION-REF DEST="ECUC-MODULE-DEF"/>/AUTOSAR/EcucDefs/EcuC
                </DEFINITION-REF>
              <ECUC-DEF-EDITION>1.0.0</ECUC-DEF-EDITION>
              <CONTAINERS>
                <ECUC-CONTAINER-VALUE>
                  <SHORT-NAME>EcucPartitionCollection</SHORT-NAME>
                  <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF"/>/
                    AUTOSAR/EcucDefs/EcuC/EcucPartitionCollection</
                      DEFINITION-REF>
                  <SUB-CONTAINERS>
                    <ECUC-CONTAINER-VALUE>
                      <SHORT-NAME>PartitionCore1QM</SHORT-NAME>
                      <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF"/>
                        /AUTOSAR/EcucDefs/EcuC/EcucPartitionCollection/
                          EcucPartition</DEFINITION-REF>
                    <PARAMETER-VALUES>
                      <ECUC-NUMERICAL-PARAM-VALUE>
                        <DEFINITION-REF DEST="ECUC-BOOLEAN-PARAM-DEF"/>/
                          AUTOSAR/EcucDefs/EcuC/EcucPartitionCollection/
                            EcucPartition/PartitionCanBeRestarted</
                              DEFINITION-REF>
                        <VALUE>>false</VALUE>
                      </ECUC-NUMERICAL-PARAM-VALUE>
                      <ECUC-NUMERICAL-PARAM-VALUE>
                        <DEFINITION-REF DEST="ECUC-BOOLEAN-PARAM-DEF"/>/
                          AUTOSAR/EcucDefs/EcuC/EcucPartitionCollection/
                            EcucPartition/EcucDefaultBswPartition</
                              DEFINITION-REF>
                        <VALUE>>true</VALUE>
                      </ECUC-NUMERICAL-PARAM-VALUE>
                    </PARAMETER-VALUES>
                  </ECUC-CONTAINER-VALUE>
                </SUB-CONTAINERS>
              </ECUC-CONTAINER-VALUE>
            </CONTAINERS>
          </ECUC-MODULE-CONFIGURATION-VALUES>
        </ELEMENTS>
      </AR-PACKAGE>
    </AR-PACKAGES>
  </AR-PACKAGE>

```

```
</AR-PACKAGES>
</AUTOSAR>
```

Listing A.19: DOC_SwCluC_Ecuc_EcuC_AHB.arxml

A.20 DOC_SwCluC_Ecuc_Os_AHB.arxml

```
<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00044.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR_Os</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>EcucModuleConfigurationValues</SHORT-NAME>
          <ELEMENTS>
            <ECUC-MODULE-CONFIGURATION-VALUES>
              <SHORT-NAME>Os</SHORT-NAME>
              <DEFINITION-REF DEST="ECUC-MODULE-DEF"/>/AUTOSAR/EcucDefs/Os</
                DEFINITION-REF>
              <ECUC-DEF-EDITION>1.0.0</ECUC-DEF-EDITION>
              <CONTAINERS>
                <ECUC-CONTAINER-VALUE>
                  <SHORT-NAME>Core1QM</SHORT-NAME>
                  <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF"/>/
                    AUTOSAR/EcucDefs/Os/OsApplication</DEFINITION-REF>
                  <REFERENCE-VALUES>
                    <ECUC-REFERENCE-VALUE>
                      <DEFINITION-REF DEST="ECUC-REFERENCE-DEF"/>/AUTOSAR/
                        EcucDefs/Os/OsApplication/OsAppTaskRef</DEFINITION
                          -REF>
                      <VALUE-REF DEST="ECUC-CONTAINER-VALUE"/>/AUTOSAR_Os/
                        EcucModuleConfigurationValues/Os/ProxyT_10ms</
                          VALUE-REF>
                    </ECUC-REFERENCE-VALUE>
                    <ECUC-REFERENCE-VALUE>
                      <DEFINITION-REF DEST="ECUC-REFERENCE-DEF"/>/AUTOSAR/
                        EcucDefs/Os/OsApplication/OsAppTaskRef</DEFINITION
                          -REF>
                      <VALUE-REF DEST="ECUC-CONTAINER-VALUE"/>/AUTOSAR_Os/
                        EcucModuleConfigurationValues/Os/ProxyT_50ms</
                          VALUE-REF>
                    </ECUC-REFERENCE-VALUE>
                  </REFERENCE-VALUES>
                </ECUC-CONTAINER-VALUE>
                <ECUC-CONTAINER-VALUE>
                  <SHORT-NAME>ProxyT_10ms</SHORT-NAME>
                  <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF"/>/
                    AUTOSAR/EcucDefs/Os/OsTask</DEFINITION-REF>
                  <PARAMETER-VALUES>
                    <ECUC-NUMERICAL-PARAM-VALUE>
```

```

<DEFINITION-REF DEST="ECUC-INTEGER-PARAM-DEF"/>
  AUTOSAR/EcucDefs/Os/OsTask/OsTaskPriority</
  DEFINITION-REF>
  <VALUE>10</VALUE>
</ECUC-NUMERICAL-PARAM-VALUE>
<ECUC-NUMERICAL-PARAM-VALUE>
  <DEFINITION-REF DEST="ECUC-FLOAT-PARAM-DEF"/>AUTOSAR/
  EcucDefs/Os/OsTask/OsTaskPeriod</DEFINITION-REF>
  <VALUE>0.01</VALUE>
</ECUC-NUMERICAL-PARAM-VALUE>
<ECUC-TEXTUAL-PARAM-VALUE>
  <DEFINITION-REF DEST="ECUC-ENUMERATION-PARAM-DEF"/>
  AUTOSAR/EcucDefs/Os/OsTask/OsTaskSchedule</
  DEFINITION-REF>
  <VALUE>FULL</VALUE>
</ECUC-TEXTUAL-PARAM-VALUE>
<ECUC-NUMERICAL-PARAM-VALUE>
  <DEFINITION-REF DEST="ECUC-INTEGER-PARAM-DEF"/>
  AUTOSAR/EcucDefs/Os/OsTask/OsTaskActivation</
  DEFINITION-REF>
  <VALUE>1</VALUE>
</ECUC-NUMERICAL-PARAM-VALUE>
</PARAMETER-VALUES>
</ECUC-CONTAINER-VALUE>
<ECUC-CONTAINER-VALUE>
  <SHORT-NAME>ProxyT_50ms</SHORT-NAME>
  <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF"/>
  AUTOSAR/EcucDefs/Os/OsTask</DEFINITION-REF>
<PARAMETER-VALUES>
  <ECUC-NUMERICAL-PARAM-VALUE>
    <DEFINITION-REF DEST="ECUC-INTEGER-PARAM-DEF"/>
    AUTOSAR/EcucDefs/Os/OsTask/OsTaskPriority</
    DEFINITION-REF>
    <VALUE>50</VALUE>
  </ECUC-NUMERICAL-PARAM-VALUE>
  <ECUC-NUMERICAL-PARAM-VALUE>
    <DEFINITION-REF DEST="ECUC-FLOAT-PARAM-DEF"/>AUTOSAR/
    EcucDefs/Os/OsTask/OsTaskPeriod</DEFINITION-REF>
    <VALUE>0.05</VALUE>
  </ECUC-NUMERICAL-PARAM-VALUE>
  <ECUC-TEXTUAL-PARAM-VALUE>
    <DEFINITION-REF DEST="ECUC-ENUMERATION-PARAM-DEF"/>
    AUTOSAR/EcucDefs/Os/OsTask/OsTaskSchedule</
    DEFINITION-REF>
    <VALUE>FULL</VALUE>
  </ECUC-TEXTUAL-PARAM-VALUE>
  <ECUC-NUMERICAL-PARAM-VALUE>
    <DEFINITION-REF DEST="ECUC-INTEGER-PARAM-DEF"/>
    AUTOSAR/EcucDefs/Os/OsTask/OsTaskActivation</
    DEFINITION-REF>
    <VALUE>1</VALUE>
  </ECUC-NUMERICAL-PARAM-VALUE>
</PARAMETER-VALUES>
</ECUC-CONTAINER-VALUE>
</CONTAINERS>
</ECUC-MODULE-CONFIGURATION-VALUES>

```

```

    </ELEMENTS>
  </AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
</AR-PACKAGES>
</AUTOSAR>

```

Listing A.20: DOC_SwCluC_Ecuc_Os_AHB.arxml

A.21 DOC_SwCluC_Ecuc_SwCluC_AHB.arxml

```

<AUTOSAR xmlns="http://autosar.org/schema/r4.0" xmlns:xsi="http://www.w3.
  org/2001/XMLSchema-instance" xsi:schemaLocation="http://autosar.org/
  schema/r4.0_AUTOSAR_00044.xsd">
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>AUTOSAR_SwCluC</SHORT-NAME>
      <AR-PACKAGES>
        <AR-PACKAGE>
          <SHORT-NAME>EcucModuleConfigurationValues</SHORT-NAME>
          <ELEMENTS>
            <ECUC-MODULE-CONFIGURATION-VALUES>
              <SHORT-NAME>SwCluC</SHORT-NAME>
              <DEFINITION-REF DEST="ECUC-MODULE-DEF">/AUTOSAR/EcucDefs/
                SwCluC</DEFINITION-REF>
              <ECUC-DEF-EDITION>1.0.0</ECUC-DEF-EDITION>
              <CONTAINERS>
                <ECUC-CONTAINER-VALUE>
                  <SHORT-NAME>SwCluCDefinitionSet</SHORT-NAME>
                  <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF">/
                    AUTOSAR/EcucDefs/SwCluC/SwCluCDefinitionSet</
                    DEFINITION-REF>
                  <SUB-CONTAINERS>
                    <ECUC-CONTAINER-VALUE>
                      <SHORT-NAME>ClusterHost</SHORT-NAME>
                      <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF">
                        /AUTOSAR/EcucDefs/SwCluC/SwCluCDefinitionSet/
                        SwCluCDefinition</DEFINITION-REF>
                      <PARAMETER-VALUES>
                        <ECUC-TEXTUAL-PARAM-VALUE>
                          <DEFINITION-REF DEST="ECUC-ENUMERATION-PARAM-DEF"
                            >/AUTOSAR/EcucDefs/SwCluC/SwCluCDefinitionSet/
                            SwCluCBManifDescriptorTreatment</DEFINITION-
                            REF>
                          <VALUE>EMBED_DESCRIPTOR</VALUE>
                        </ECUC-TEXTUAL-PARAM-VALUE>
                      <ECUC-TEXTUAL-PARAM-VALUE>

```



```

<DEFINITION-REF DEST="ECUC-INTEGGER-PARAM-DEF"/>
  AUTOSAR/EcucDefs/SwCluC/SwCluCDefinitionSet/
  SwCluCDefinition/SwCluCMachineId</DEFINITION-
  REF>
<VALUE>0</VALUE>
</ECUC-NUMERICAL-PARAM-VALUE>
<ECUC-NUMERICAL-PARAM-VALUE>
  <DEFINITION-REF DEST="ECUC-INTEGGER-PARAM-DEF"/>
  AUTOSAR/EcucDefs/SwCluC/SwCluCDefinitionSet/
  SwCluCDefinition/SwCluCSoftwareClusterId</
  DEFINITION-REF>
  <VALUE>1</VALUE>
</ECUC-NUMERICAL-PARAM-VALUE>
<ECUC-TEXTUAL-PARAM-VALUE>
  <DEFINITION-REF DEST="ECUC-ENUMERATION-PARAM-DEF"
  >/AUTOSAR/EcucDefs/SwCluC/SwCluCDefinitionSet/
  SwCluCDefinition/SwCluCSoftwareClusterType</
  DEFINITION-REF>
  <VALUE>APPLICATION_SW_CLUSTER</VALUE>
</ECUC-TEXTUAL-PARAM-VALUE>
</PARAMETER-VALUES>
</ECUC-CONTAINER-VALUE>
</SUB-CONTAINERS>
</ECUC-CONTAINER-VALUE>
<ECUC-CONTAINER-VALUE>
  <SHORT-NAME>SwCluCGeneral</SHORT-NAME>
  <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF"/>
  AUTOSAR/EcucDefs/SwCluC/SwCluCGeneral</DEFINITION-REF>
  <REFERENCE-VALUES>
    <ECUC-REFERENCE-VALUE>
      <DEFINITION-REF DEST="ECUC-REFERENCE-DEF"/>AUTOSAR/
      EcucDefs/SwCluC/SwCluCGeneral/
      SwCluCDefinitionSelection</DEFINITION-REF>
      <VALUE-REF DEST="ECUC-CONTAINER-VALUE"/>
      AUTOSAR_SwCluC/EcucModuleConfigurationValuess/
      SwCluC/SwCluCDefinitionSet/ClusterAHB</VALUE-REF>
    </ECUC-REFERENCE-VALUE>
  </REFERENCE-VALUES>
</ECUC-CONTAINER-VALUE>
<ECUC-CONTAINER-VALUE>
  <SHORT-NAME>SwCluCBaseConfigurationCheck</SHORT-NAME>
  <DEFINITION-REF DEST="ECUC-PARAM-CONF-CONTAINER-DEF"/>
  AUTOSAR/EcucDefs/SwCluC/SwCluCBaseConfigurationCheck</
  DEFINITION-REF>
  <PARAMETER-VALUES>
    <ECUC-TEXTUAL-PARAM-VALUE>
      <DEFINITION-REF DEST="ECUC-MULTILINE-STRING-PARAM-DEF
      ">/AUTOSAR/EcucDefs/SwCluC/
      SwCluCBaseConfigurationCheck/
      SwClUCAutoBaseConfigDescriptor</DEFINITION-REF>
      <VALUE>compiler flags= -O3 -w -std=c99</VALUE>
    </ECUC-TEXTUAL-PARAM-VALUE>
  </ECUC-TEXTUAL-PARAM-VALUE>
  <ECUC-TEXTUAL-PARAM-VALUE>

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SwCluCBManifNotifierHandle/
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Listing A.21: DOC_SwCluC_Ecuc_SwCluC_AHB.arxml

B Referenced Meta Classes

Class	AbstractAccessPoint (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::AccessCount			
Note	Abstract class indicating an access point from an ExecutableEntity.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	AsynchronousServerCallResultPoint, ExternalTriggeringPointIdent, InternalTriggeringPoint, ModeAccessPointIdent, ModeSwitchPoint , ParameterAccess , ServerCallPoint , VariableAccess			
Aggregated by	AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
returnValue Provision	RteApiReturnValue ProvisionEnum	0..1	attr	This attribute controls the provision of return values for RTE APIs that correspond to the enclosing access point.

Table B.1: AbstractAccessPoint

Class	BswExternalTriggerOccurredEvent			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswBehavior			
Note	A BswEvent resulting from a trigger released by another module or cluster.			
Base	ARObject, AbstractEvent, BswEvent, BswScheduleEvent, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	BswInternalBehavior.event			
Attribute	Type	Mult.	Kind	Note
trigger	Trigger	0..1	ref	The trigger associated with this event. The trigger is external to this module.

Table B.2: BswExternalTriggerOccurredEvent

Class	BswInternalTriggerOccurredEvent			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswBehavior			
Note	A BswEvent, which can happen sporadically. The event is activated by explicit calls from the module to the BSW Scheduler. The main purpose for such an event is to cause a context switch, e.g. from an ISR context into a task context. Activation and switching are handled within the same module or cluster only.			
Base	ARObject, AbstractEvent, BswEvent, BswScheduleEvent, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	BswInternalBehavior.event			
Attribute	Type	Mult.	Kind	Note
eventSource	BswInternalTriggeringPoint	0..1	ref	The activation point is the source of this event.

Table B.3: BswInternalTriggerOccurredEvent

Class	BswModeSwitchEvent			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswBehavior			
Note	A BswEvent resulting from a mode switch.			
Base	ARObject, AbstractEvent, BswEvent, BswScheduleEvent, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	BswInternalBehavior.event			
Attribute	Type	Mult.	Kind	Note





Class	BswModeSwitchEvent			
activation	ModeActivationKind	0..1	attr	Kind of activation w.r.t. to the referred mode.
mode (ordered)	ModeDeclaration	0..2	iref	Reference to one or two Modes that initiate the Mode Switch Event. InstanceRef implemented by: ModeInBswModule DescriptionInstanceRef

Table B.4: BswModeSwitchEvent

Class	BswModuleDescription			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswOverview			
Note	Root element for the description of a single BSW module or BSW cluster. In case it describes a BSW module, the short name of this element equals the name of the BSW module. Tags: atp.recommendedPackage=BswModuleDescriptions			
Base	<i>ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpFeature, AtpStructureElement, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable</i>			
Aggregated by	ARPackage.element, AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
bswModule Dependency	BswModuleDependency	*	aggr	Describes the dependency to another BSW module. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=bswModuleDependency.shortName, bsw ModuleDependency.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=20
bswModule Documentation	SwComponent Documentation	0..1	aggr	This adds a documentation to the BSW module. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=bswModuleDocumentation, bswModule Documentation.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=6
expectedEntry	BswModuleEntry	*	ref	Indicates an entry which is required by this module. Replacement of outgoingCallback / requiredEntry. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=expectedEntry.bswModuleEntry, expected Entry.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
implemented Entry	BswModuleEntry	*	ref	Specifies an entry provided by this module which can be called by other modules. This includes "main" functions, interrupt routines, and callbacks. Replacement of providedEntry / expectedCallback. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=implementedEntry.bswModuleEntry, implementedEntry.variationPoint.shortLabel vh.latestBindingTime=preCompileTime





Class	BswModuleDescription			
internalBehavior	BswInternalBehavior	*	aggr	<p>The various BswInternalBehaviors associated with a Bsw ModuleDescription can be distributed over several physical files. Therefore the aggregation is <<atp Splitable>>.</p> <p>Stereotypes: atpSplitable Tags: atp.Splitkey=internalBehavior.shortName xml.sequenceOffset=65</p>
moduleId	PositiveInteger	0..1	attr	<p>Refers to the BSW Module Identifier defined by the AUTOSAR standard. For non-standardized modules, a proprietary identifier can be optionally chosen.</p> <p>Tags:xml.sequenceOffset=5</p>
providedClient ServerEntry	BswModuleClientServer Entry	*	aggr	<p>Specifies that this module provides a client server entry which can be called from another partition or core. This entry is declared locally to this context and will be connected to the requiredClientServerEntry of another or the same module via the configuration of the BSW Scheduler.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=providedClientServerEntry.shortName, providedClientServerEntry.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=45</p>
providedData	VariableDataPrototype	*	aggr	<p>Specifies a data prototype provided by this module in order to be read from another partition or core. The providedData is declared locally to this context and will be connected to the requiredData of another or the same module via the configuration of the BSW Scheduler.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=providedData.shortName, provided Data.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=55</p>
providedMode Group	ModeDeclarationGroup Prototype	*	aggr	<p>A set of modes which is owned and provided by this module or cluster. It can be connected to the required ModeGroups of other modules or clusters via the configuration of the BswScheduler. It can also be synchronized with modes provided via ports by an associated ServiceSwComponentType, EcuAbstraction SwComponentType or ComplexDeviceDriverSw ComponentType.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=providedModeGroup.shortName, provided ModeGroup.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=25</p>





Class	BswModuleDescription			
releasedTrigger	Trigger	*	aggr	<p>A Trigger released by this module or cluster. It can be connected to the requiredTriggers of other modules or clusters via the configuration of the BswScheduler. It can also be synchronized with Triggers provided via ports by an associated ServiceSwComponentType, Ecu AbstractionSwComponentType or ComplexDeviceDriver SwComponentType.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=releasedTrigger.shortName, releasedTrigger.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=35</p>
requiredClientServerEntry	BswModuleClientServerEntry	*	aggr	<p>Specifies that this module requires a client server entry which can be implemented on another partition or core.This entry is declared locally to this context and will be connected to the providedClientServerEntry of another or the same module via the configuration of the BSW Scheduler.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=requiredClientServerEntry.shortName, requiredClientServerEntry.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=50</p>
requiredData	VariableDataPrototype	*	aggr	<p>Specifies a data prototype required by this module in order to be provided from another partition or core.The required Data is declared locally to this context and will be connected to the providedData of another or the same module via the configuration of the BswScheduler.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=requiredData.shortName, requiredData.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=60</p>
requiredModeGroup	ModeDeclarationGroup Prototype	*	aggr	<p>Specifies that this module or cluster depends on a certain mode group. The requiredModeGroup is local to this context and will be connected to the providedModeGroup of another module or cluster via the configuration of the BswScheduler.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=requiredModeGroup.shortName, requiredModeGroup.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=30</p>
requiredTrigger	Trigger	*	aggr	<p>Specifies that this module or cluster reacts upon an external trigger.This requiredTrigger is declared locally to this context and will be connected to the providedTrigger of another module or cluster via the configuration of the BswScheduler.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=requiredTrigger.shortName, requiredTrigger.variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=40</p>

Table B.5: BswModuleDescription

Class	BswModuleEntity (abstract)			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswBehavior			
Note	Specifies the smallest code fragment which can be described for a BSW module or cluster within AUTOSAR.			
Base	AObject, ExecutableEntity, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	BswCalledEntity, BswInterruptEntity, BswSchedulableEntity			
Aggregated by	BswInternalBehavior.entity			
Attribute	Type	Mult.	Kind	Note
accessedMode Group	ModeDeclarationGroup Prototype	*	ref	A mode group which is accessed via API call by this entity. It shall be a ModeDeclarationGroupPrototype required by this module or cluster. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=accessedModeGroup.modeDeclarationGroupPrototype, accessedModeGroup.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
activationPoint	BswInternalTriggering Point	*	ref	Activation point used by the module entity to activate one or more internal triggers. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=activationPoint.bswInternalTriggeringPoint, activationPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
callPoint	BswModuleCallPoint	*	aggr	A call point used in the code of this entity. The variability of this association is especially targeted at debug scenarios: It is possible to have one variant calling into the AUTOSAR debug module and another one which doesn't. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=callPoint.shortName, callPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
dataReceive Point	BswVariableAccess	*	aggr	The data is received via the BSW Scheduler. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataReceivePoint.shortName, dataReceivePoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
dataSendPoint	BswVariableAccess	*	aggr	The data is sent via the BSW Scheduler. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataSendPoint.shortName, dataSendPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
implemented Entry	BswModuleEntry	0..1	ref	The entry which is implemented by this module entity.
issuedTrigger	Trigger	*	ref	A trigger issued by this entity via BSW Scheduler API call. It shall be a BswTrigger released (i.e. owned) by this module or cluster. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=issuedTrigger.trigger, issuedTrigger.variationPoint.shortLabel vh.latestBindingTime=preCompileTime





Class		BswModuleEntity (abstract)		
managedMode Group	ModeDeclarationGroup Prototype	*	ref	A mode group which is managed by this entity. It shall be a ModeDeclarationGroupPrototype provided by this module or cluster. Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=managedModeGroup.modeDeclarationGroupPrototype, managedModeGroup.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
schedulerName Prefix	BswSchedulerName Prefix	0..1	ref	A prefix to be used in generated names for the BswModuleScheduler in the context of this BswModuleEntity, for example entry point prototypes, macros for dealing with exclusive areas, header file names. Details are defined in the SWS RTE. The prefix supersedes default rules for the prefix of those names.

Table B.6: BswModuleEntity

Class		BswSchedulableEntity		
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswBehavior			
Note	BSW module entity, which is designed for control by the BSW Scheduler. It may for example implement a so-called "main" function.			
Base	<i>ARObject, BswModuleEntity, ExecutableEntity, Identifiable, MultilanguageReferrable, Referrable</i>			
Aggregated by	BswInternalBehavior.entity			
Attribute	Type	Mult.	Kind	Note
–	–	–	–	–

Table B.7: BswSchedulableEntity

Class		BswVariableAccess		
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswBehavior			
Note	The presence of a BswVariableAccess implies that a BswModuleEntity needs access to a VariableDataPrototype via the BSW Scheduler. The kind of access is specified by the role in which the class is used.			
Base	<i>ARObject, Referrable</i>			
Aggregated by	BswModuleEntity.dataReceivePoint , BswModuleEntity.dataSendPoint			
Attribute	Type	Mult.	Kind	Note
accessed Variable	VariableDataPrototype	0..1	ref	The data accessed via the BSW Scheduler.
context Limitation	BswDistinguished Partition	*	ref	The existence of this reference indicates that the variable is received resp. sent only in the context of the referred BswDistinguishedPartitions.

Table B.8: BswVariableAccess

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
operation	ClientServerOperation	*	aggr	ClientServerOperation(s) of this ClientServerInterface. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=operation.shortName, operation.variation Point.shortLabel vh.latestBindingTime=blueprintDerivationTime
possibleError	ApplicationError	*	aggr	Application errors that are defined as part of this interface.

Table B.9: ClientServerInterface

Class	CompositionSwComponentType			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Composition			
Note	A CompositionSwComponentType aggregates SwComponentPrototypes (that in turn are typed by Sw ComponentTypes) 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
component	SwComponent Prototype	*	aggr	The instantiated components that are part of this composition. The aggregation of SwComponentPrototype is subject to variability with the purpose to support the conditional existence of a SwComponentPrototype. Please be aware: if the conditional existence of Sw ComponentPrototypes is resolved post-build the deselected SwComponentPrototypes are still contained in the ECUs build but the instances are inactive in that they are not scheduled by the RTE. The aggregation is marked as atpSplitable in order to allow the addition of service components to the ECU extract during the ECU integration. The use case for having 0 components owned by the CompositionSwComponentType could be to deliver an empty CompositionSwComponentType to e.g. a supplier for filling the internal structure. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=component.shortName, component.variation Point.shortLabel vh.latestBindingTime=postBuild





Class	CompositionSwComponentType			
connector	SwConnector	*	aggr	<p>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.</p> <p>The aggregation of SwConnectors is subject to variability with the purpose to support variant data flow.</p> <p>The aggregation is marked as atpSplitable in order to allow the extension of the ECU extract with AssemblySw Connectors between ApplicationSwComponentTypes and ServiceSwComponentTypes during the ECU integration.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=connector.shortName, connector.variationPoint.shortLabel vh.latestBindingTime=postBuild</p>
constantValue Mapping	ConstantSpecification MappingSet	*	ref	<p>Reference to the ConstantSpecificationMapping to be applied for initValues of PPortComSpecs and RPortCom Spec.</p> <p>Stereotypes: atpSplitable Tags:atp.Splitkey=constantValueMapping</p>
dataType Mapping	DataTypeMappingSet	*	ref	<p>Reference to the DataTypeMapping to be applied for the used ApplicationDataTypes in PortInterfaces.</p> <p>Background: when developing subsystems it may happen that ApplicationDataTypes are used on the surface of CompositionSwComponentTypes. In this case it would be reasonable to be able to also provide the intended mapping to the ImplementationDataTypes. However, this mapping shall be informal and not technically binding for the implementors mainly because the RTE generator is not concerned about the CompositionSwComponent Types.</p> <p>Rationale: if the mapping of ApplicationDataTypes on the delegated and inner PortPrototype matches then the mapping to ImplementationDataTypes is not impacting compatibility.</p> <p>Stereotypes: atpSplitable Tags:atp.Splitkey=dataTypeMapping</p>
instantiation RTEEventProps	InstantiationRTEEvent Props	*	aggr	<p>This allows to define instantiation specific properties for RTE Events, in particular for instance specific scheduling.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=instantiationRTEEventProps.shortLabel, instantiationRTEEventProps.variationPoint.shortLabel vh.latestBindingTime=codeGenerationTime</p>

Table B.10: CompositionSwComponentType

Class	CpSoftwareCluster			
Package	M2::AUTOSARTemplates::SystemTemplate::SoftwareCluster			
Note	<p>This meta class provides the ability to define a CP Software Cluster. Each CP Software Cluster can be integrated and build individually. It defines the sub-set of hierarchical tree(s) of Software Components belonging to this CP Software Cluster. Resources required or provided by this CP Software Cluster are given in the according mappings.</p> <p>Tags: atp.Status=draft atp.recommendedPackage=CpSoftwareClusters</p>			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note
softwareClusterId	PositiveInteger	0..1	attr	This attribute represents the value of the id of the corresponding CP software cluster.
swComponentAssignment	SwComponentPrototypeAssignment	*	aggr	<p>This is the collection of SwComponentPrototype Assignments</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=swComponentAssignment, swComponentAssignment.variationPoint.shortLabel atp.Status=draft vh.latestBindingTime=postBuild</p>
swComposition	CompositionSwComponentType	*	ref	<p>Software Components in the context of a CompositionSwComponentType belonging to this CP Software Cluster. This reference can be used to describe the belonging SWCs when the CP Software Cluster is described out of the context of a System, e.g. reusable CP Software Cluster.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=swComposition.compositionSwComponentType, swComposition.variationPoint.shortLabel atp.Status=draft vh.latestBindingTime=systemDesignTime</p>

Table B.11: CpSoftwareCluster

Class	CpSoftwareClusterCommunicationResource			
Package	M2::AUTOSARTemplates::SystemTemplate::SoftwareCluster			
Note	<p>Represents a single resource required or provided by a CP Software Cluster which relates to the port based communication on VFB level.</p> <p>Tags:atp.Status=draft</p>			
Base	ARObject, CpSoftwareClusterResource , Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	CpSoftwareClusterResourcePool.resource			
Attribute	Type	Mult.	Kind	Note
communicationResourceProps	CpSoftwareClusterCommunicationResourceProps	0..1	aggr	This aggregation supports the further qualification of the enclosing CpSoftwareClusterCommunicationResource by means of additional attributes depending on the nature of the CpSoftwareClusterCommunicationResource.

Table B.12: CpSoftwareClusterCommunicationResource

Class	CpSoftwareClusterResource (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::SoftwareCluster			
Note	Represents a single resource required or provided by a CP Software Cluster. Tags: atp.Status=draft atp.recommendedPackage=Resources			
Base	<i>ARObject, Identifiable, MultilanguageReferrable, Referrable</i>			
Subclasses	CpSoftwareClusterCommunicationResource , CpSoftwareClusterServiceResource			
Aggregated by	CpSoftwareClusterResourcePool.resource			
Attribute	Type	Mult.	Kind	Note
dependentResource	RoleBasedResourceDependency	*	aggr	Link to a resource which depends on this resource to implement them. Tags: atp.Status=draft
globalResourceId	PositiveInteger	0..1	attr	A unique identifiers per resource used for the connection process. The identifier is required to be unique in the scope of a single machine. If software clusters are designed to be reused on multiple machines the uniqueness requirements applies for all the intended machines. Tags: atp.Status=draft
isMandatory	Boolean	0..1	attr	This attribute indicates, that the resource is mandatory to operate the Software Cluster. If the resource is not provided on the machine the connection process of any Software Cluster requiring this resource gets aborted. Tags: atp.Status=draft

Table B.13: CpSoftwareClusterResource

Class	DataMapping (abstract)			
Package	M2::AUTOSARTemplates::SystemTemplate::DataMapping			
Note	Mapping of port elements (data elements and parameters) to frames and signals.			
Base	<i>ARObject</i>			
Subclasses	ClientServerToSignalMapping , SenderReceiverCompositeElementToSignalMapping , SenderReceiverToSignalGroupMapping , SenderReceiverToSignalMapping , TriggerToSignalMapping			
Aggregated by	SystemMapping.dataMapping			
Attribute	Type	Mult.	Kind	Note
introduction	DocumentationBlock	0..1	aggr	This represents introductory documentation about the data mapping.

Table B.14: DataMapping

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, CollectableElement, FibexElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable</i>			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	EcuInstance			
associatedComIPduGroup	ISignalIPduGroup	*	ref	<p>With this reference it is possible to identify which ISignalIPduGroups are applicable for which Communication Connector/ ECU.</p> <p>Only top level ISignalIPduGroups shall be referenced by an EcuInstance. If an ISignalIPduGroup contains other ISignalIPduGroups than these contained ISignalIPdu Groups shall not be referenced by the EcuInstance. Contained ISignalIPduGroups are associated to an Ecu Instance via the top level ISignalIPduGroup.</p>
associatedConsumedProvidedServiceInstanceGroup	ConsumedProvidedServiceInstanceGroup	*	ref	<p>With this reference it is possible to identify which ConsumedProvidedServiceInstanceGroups are applicable for which ECUInstance.</p> <p>Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=associatedConsumedProvidedServiceInstanceGroup.consumedProvidedServiceInstanceGroup, associatedConsumedProvidedServiceInstanceGroup.variationPoint.shortLabel vh.latestBindingTime=postBuild</p>
associatedPdurIPduGroup	PdurIPduGroup	*	ref	<p>With this reference it is possible to identify which PdurIPdu Groups are applicable for which Communication Connector/ ECU.</p>
clientIdRange	ClientIdRange	0..1	aggr	<p>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.</p>
comConfigurationGwTimeBase	TimeValue	0..1	attr	<p>The period between successive calls to Com_Main FunctionRouteSignals of the AUTOSAR COM module in seconds.</p>
comConfigurationRxTimeBase	TimeValue	0..1	attr	<p>The period between successive calls to Com_Main FunctionRx of the AUTOSAR COM module in seconds.</p>
comConfigurationTxTimeBase	TimeValue	0..1	attr	<p>The period between successive calls to Com_Main FunctionTx of the AUTOSAR COM module in seconds.</p>
comEnableMDTForCyclicTransmission	Boolean	0..1	attr	<p>Enables for the Com module of this EcuInstance the minimum delay time monitoring for cyclic and repeated transmissions (TransmissionModeTiming has cyclic Timing assigned or eventControlledTiming with numberOfRepetitions > 0).</p>
commController	CommunicationController	1..*	aggr	<p>CommunicationControllers of the ECU.</p> <p>Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=commController.shortName, commController.variationPoint.shortLabel vh.latestBindingTime=postBuild</p>
connector	CommunicationConnector	*	aggr	<p>All channels controlled by a single controller.</p> <p>Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=connector.shortName, connector.variationPoint.shortLabel vh.latestBindingTime=postBuild</p>
dltConfig	DltConfig	0..1	aggr	<p>Describes the Dlt configuration on this EcuInstance.</p>
dolpConfig	DolpConfig	0..1	aggr	<p>Dolp configuration on this EcuInstance.</p> <p>Tags:atp.Status=draft</p>





Class	EcuInstance			
ecuTaskProxy	OsTaskProxy	*	ref	Reference to OsTaskProxies assigned to the Ecu Instance. Stereotypes: atpSplittable Tags: atp.Splitkey=ecuTaskProxy
ethSwitchPort Group Derivation	Boolean	0..1	attr	Defines whether the derivation of SwitchPortGroups based on VLAN and/or CouplingPort.pncMapping shall be performed for this EcuInstance. If not defined the derivation shall not be done.
partition	EcuPartition	*	aggr	Optional definition of Partitions within an Ecu.
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.
pncPrepare SleepTimer	TimeValue	0..1	attr	Time in seconds the PNC state machine shall wait in PNC_PREPARE_SLEEP.
pnc Synchronous Wakeup	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.
sleepMode Supported	Boolean	1	attr	Specifies whether the ECU instance may be put to a "low power mode" <ul style="list-style-type: none">• true: sleep mode is supported• false: sleep mode is not supported Note: This flag may only be set to "true" if the feature is supported by both hardware and basic software.
tcplpcmpProps	EthTcplpcmpProps	0..1	ref	EcuInstance specific ICMP (Internet Control Message Protocol) attributes
tcplpProps	EthTcplpProps	0..1	ref	EcuInstance specific Tcplp Stack attributes.
v2xSupported	V2xSupportEnum	0..1	attr	This attribute is used to control the existence of the V2X stack on the given EcuInstance.
wakeUpOver BusSupported	Boolean	1	attr	Driver support for wakeup over Bus.

Table B.15: EcuInstance

Class	ExecutableEntity (abstract)			
Package	M2::AUTOSARTemplates::CommonStructure::InternalBehavior			
Note	Abstraction of executable code.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	BswModuleEntity, RunnableEntity			
Attribute	Type	Mult.	Kind	Note
activation Reason	ExecutableEntity ActivationReason	*	aggr	If the ExecutableEntity provides at least one activation Reason element the RTE resp. BSW Scheduler shall provide means to read the activation vector of this executable entity execution. If no activationReason element is provided the feature of being able to determine the activating RTEEvent is disabled for this ExecutableEntity.





Class	ExecutableEntity (abstract)			
canEnter	ExclusiveArea	*	ref	This means that the executable entity can enter/leave the referenced exclusive area through explicit API calls. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=canEnter.exclusiveArea, canEnter.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
exclusiveAreaNestingOrder	ExclusiveAreaNestingOrder	*	ref	This represents the set of ExclusiveAreaNestingOrders recognized by this ExecutableEntity.
minimumStartInterval	TimeValue	0..1	attr	Specifies the time in seconds by which two consecutive starts of an ExecutableEntity are guaranteed to be separated.
reentrancyLevel	ReentrancyLevelEnum	0..1	attr	The reentrancy level of this ExecutableEntity. See the documentation of the enumeration type ReentrancyLevelEnum for details. Please note that nonReentrant interfaces can have also reentrant or multicoreReentrant implementations, and reentrant interfaces can also have multicoreReentrant implementations.
runsInside	ExclusiveArea	*	ref	The executable entity runs completely inside the referenced exclusive area. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=runsInside.exclusiveArea, runsInside.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
swAddrMethod	SwAddrMethod	0..1	ref	Addressing method related to this code entity. Via an association to the same SwAddrMethod, it can be specified that several code entities (even of different modules or components) shall be located in the same memory without already specifying the memory section itself.

Table B.16: ExecutableEntity

Class	ExternalTriggerOccurredEvent			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::RTEEvents			
Note	This event is raised when the referenced Trigger has occurred.			
Base	ARObject, AbstractEvent, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, RTEEvent, Referrable			
Aggregated by	AtpClassifier.atpFeature, SwcInternalBehavior.event			
Attribute	Type	Mult.	Kind	Note
trigger	Trigger	0..1	iref	The referenced Trigger raises this ExternalTriggerOccurredEvent. InstanceRef implemented by: RTriggerInAtomicSwc InstanceRef

Table B.17: ExternalTriggerOccurredEvent

Class	ExternalTriggeringPoint			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::Trigger			
Note	If a RunnableEntity owns an ExternalTriggeringPoint it is entitled to raise an ExternalTriggerOccurredEvent.			





Class	ExternalTriggeringPoint			
Base	ARObject			
Aggregated by	RunnableEntity.externalTriggeringPoint			
Attribute	Type	Mult.	Kind	Note
ident	ExternalTriggeringPoint Ident	0..1	aggr	<p>The aggregation in the role ident provides the ability to make the ExternalTriggeringPoint identifiable.</p> <p>From the semantical point of view, the ExternalTriggering Point is considered a first-class Identifiable and therefore the aggregation in the role ident shall always exist (until it may be possible to let ModeAccessPoint directly inherit from Identifiable).</p> <p>Stereotypes: atpIdentityContributor Tags:xml.sequenceOffset=-100</p>
trigger	Trigger	0..1	iref	<p>The trigger taken for the ExternalTriggeringPoint.</p> <p>Tags: xml.namePlural=TRIGGER-IREF xml.roleElement=false xml.roleWrapperElement=true xml.typeElement=true xml.typeWrapperElement=false InstanceRef implemented by:PTriggerInAtomicSwcType InstanceRef</p>

Table B.18: ExternalTriggeringPoint

Class	InternalBehavior (abstract)			
Package	M2::AUTOSARTemplates::CommonStructure::InternalBehavior			
Note	Common base class (abstract) for the internal behavior of both software components and basic software modules/clusters.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	BswInternalBehavior, SwcInternalBehavior			
Aggregated by	AtpClassifier.atpFeature			
Attribute	Type	Mult.	Kind	Note
constant Memory	ParameterData Prototype	*	aggr	<p>Describes a read only memory object containing characteristic value(s) implemented by this Internal Behavior.</p> <p>The shortName of ParameterDataPrototype has to be equal to the 'C' identifier of the described constant.</p> <p>The characteristic value(s) might be shared between SwComponentPrototypes of the same SwComponentType.</p> <p>The aggregation of constantMemory is subject to variability with the purpose to support variability in the software component or module implementations. Typically different algorithms in the implementation are requiring different number of memory objects.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=constantMemory.shortName, constantMemory.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>





Class	InternalBehavior (abstract)			
constantValue Mapping	ConstantSpecification MappingSet	*	ref	Reference to the ConstantSpecificationMapping to be applied for the particular InternalBehavior Stereotypes: atpSplitable Tags: atp.Splitkey=constantValueMapping
data Type Mapping	DataTypeMappingSet	*	ref	Reference to the DataTypeMapping to be applied for the particular InternalBehavior Stereotypes: atpSplitable Tags: atp.Splitkey=dataTypeMapping
exclusiveArea	ExclusiveArea	*	aggr	This specifies an ExclusiveArea for this InternalBehavior. The exclusiveArea is local to the component resp. module. The aggregation of ExclusiveAreas is subject to variability. Note: the number of ExclusiveAreas might vary due to the conditional existence of RunnableEntities or BswModuleEntities. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=exclusiveArea.shortName, exclusiveArea.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
exclusiveArea NestingOrder	ExclusiveAreaNesting Order	*	aggr	This represents the set of ExclusiveAreaNestingOrder owned by the InternalBehavior. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=exclusiveAreaNestingOrder.shortName, exclusiveAreaNestingOrder.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
staticMemory	VariableDataPrototype	*	aggr	Describes a read and writeable static memory object representing measurement variables implemented by this software component. The term "static" is used in the meaning of "non-temporary" and does not necessarily specify a linker encapsulation. This kind of memory is only supported if supportsMultipleInstantiation is FALSE. The shortName of the VariableDataPrototype has to be equal with the "C" identifier of the described variable. The aggregation of staticMemory is subject to variability with the purpose to support variability in the software component's implementations. Typically different algorithms in the implementation are requiring different number of memory objects. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=staticMemory.shortName, staticMemory.variationPoint.shortLabel vh.latestBindingTime=preCompileTime

Table B.19: InternalBehavior

Class	InternalTriggerOccurredEvent			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::RTEEvents			
Note	This event is raised when the referenced InternalTriggeringPoint has occurred.			
Base	ARObject, AbstractEvent, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, Multilanguage Referrable, RTEEvent, Referrable			
Aggregated by	AtpClassifier.atpFeature, SwcInternalBehavior.event			
Attribute	Type	Mult.	Kind	Note
eventSource	InternalTriggeringPoint	0..1	ref	The referenced InternalTriggeringPoint raises this Internal TriggerOccurredEvent.

Table B.20: InternalTriggerOccurredEvent

Class	ModeAccessPoint			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::ModeDeclarationGroup			
Note	A ModeAccessPoint is required by a RunnableEntity owned by a Mode Manager or Mode User. Its semantics implies the ability to access the current mode (provided by the RTE) of a ModeDeclaration GroupPrototype's ModeDeclarationGroup.			
Base	ARObject			
Aggregated by	RunnableEntity.modeAccessPoint			
Attribute	Type	Mult.	Kind	Note
ident	ModeAccessPointIdent	0..1	aggr	The aggregation in the role ident provides the ability to make the ModeAccessPoint identifiable. From the semantical point of view, the ModeAccessPoint is considered a first-class Identifiable and therefore the aggregation in the role ident shall always exist (until it may be possible to let ModeAccessPoint directly inherit from Identifiable). Stereotypes: atpIdentifyContributor Tags: xml.sequenceOffset=-100
modeGroup	ModeDeclarationGroup Prototype	0..1	iref	The mode declaration group that is accessed by this runnable. Tags: xml.typeElement=true InstanceRef implemented by: ModeGroupInAtomicSwc InstanceRef

Table B.21: ModeAccessPoint

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.required ModeGroup, FirewallStateSwitchInterface.firewallStateMachine, FunctionGroupSet.functionGroup, Mode SwitchInterface.modeGroup, Process.processStateMachine, StateManagementStateNotification.state Machine			
Attribute	Type	Mult.	Kind	Note
swCalibration Access	SwCalibrationAccess Enum	0..1	attr	This allows for specifying whether or not the enclosing ModeDeclarationGroupPrototype can be measured at run-time.





Class		ModeDeclarationGroupPrototype		
type	ModeDeclarationGroup	0..1	tref	The "collection of ModeDeclarations" (= ModeDeclaration Group) supported by a component Stereotypes: isOfType

Table B.22: ModeDeclarationGroupPrototype

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	ModeDeclarationGroup Prototype	0..1	aggr	The ModeDeclarationGroupPrototype of this mode interface.

Table B.23: ModeSwitchInterface

Class		ModeSwitchPoint		
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::ModeDeclarationGroup			
Note	A ModeSwitchPoint is required by a RunnableEntity owned a Mode Manager. Its semantics implies the ability to initiate a mode switch.			
Base	ARObject, AbstractAccessPoint , AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	AtpClassifier.atpFeature, RunnableEntity.modeSwitchPoint			
Attribute	Type	Mult.	Kind	Note
modeGroup	ModeDeclarationGroup Prototype	0..1	iref	The mode declaration group that is switched by this runnable. InstanceRef implemented by: PModeGroupInAtomic SwcInstanceRef

Table B.24: ModeSwitchPoint

Class		NonqueuedSenderComSpec		
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Communication attributes for non-queued sender/receiver communication (sender side)			
Base	ARObject, PPortComSpec, SenderComSpec			
Aggregated by	AbstractProvidedPortPrototype.providedComSpec, PortPrototypeBlueprint.providedComSpec			
Attribute	Type	Mult.	Kind	Note
dataFilter	DataFilter	0..1	aggr	The applicable filter algorithm for filtering the value of the corresponding dataElement.
initValue	ValueSpecification	0..1	aggr	Initial value to be sent if sender component is not yet fully initialized, but receiver needs data already.

Table B.25: NonqueuedSenderComSpec

Class	PPortPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	Component port providing a certain port interface.			
Base	<i>ARObject, AbstractProvidedPortPrototype, AtpBlueprintable, AtpFeature, AtpPrototype, Identifiable, MultilanguageReferrable, PortPrototype, Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature, SwComponentType.port</i>			
Attribute	Type	Mult.	Kind	Note
provided Interface	PortInterface	0..1	tref	The interface that this port provides. Stereotypes: isOfType

Table B.26: PPortPrototype

Class	ParameterAccess			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::DataElements			
Note	The presence of a ParameterAccess implies that a RunnableEntity needs access to a ParameterData Prototype.			
Base	<i>ARObject, AbstractAccessPoint, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature, RunnableEntity.parameterAccess</i>			
Attribute	Type	Mult.	Kind	Note
accessed Parameter	AutosarParameterRef	0..1	aggr	Reference to the accessed calibration parameter.
swDataDef Props	SwDataDefProps	0..1	aggr	This allows denote instance and access specific properties, mainly input values and common axis. Stereotypes: atpSplitable Tags: atp.Splitkey=swDataDefProps

Table B.27: ParameterAccess

Class	ParameterDataPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::DataPrototypes			
Note	A ParameterDataPrototype represents a formalized generic piece of information that is typically immutable by the application software layer, but mutable by measurement and calibration tools. ParameterDataPrototype is used in various contexts and the specific context gives the otherwise generic ParameterDataPrototype a dedicated semantics.			
Base	<i>ARObject, AtpFeature, AtpPrototype, AutosarDataPrototype, DataPrototype, Identifiable, Multilanguage Referrable, Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature, BswInternalBehavior.perInstanceParameter, InternalBehavior.constant Memory, NvBlockDescriptor.romBlock, ParameterInterface.parameter, SwcInternalBehavior.perInstance Parameter, SwcInternalBehavior.sharedParameter</i>			
Attribute	Type	Mult.	Kind	Note
initValue	ValueSpecification	0..1	aggr	Specifies initial value(s) of the ParameterDataPrototype

Table B.28: ParameterDataPrototype

Class	PortElementToCommunicationResourceMapping			
Package	M2::AUTOSARTemplates::SystemTemplate			
Note	This meta class maps a communication resource to CP Software Clusters. In this case the kind of Port Prototype specified whether the Software Cluster has to provide or to require the resource. Tags: atp.Status=draft			





Class	PortElementToCommunicationResourceMapping			
Base	<i>ARObject, Identifiable, MultilanguageReferrable, Referrable</i>			
Aggregated by	CpSoftwareClusterMappingSet.portElementToComResourceMapping, SystemMapping.portElementToComResourceMapping			
Attribute	Type	Mult.	Kind	Note
clientServer Operation	ClientServerOperation	0..1	iref	ClientServerOperation instance qualifying the communication resource Tags: atp.Status=draft InstanceRef implemented by: OperationInSystemInstanceRef
communication Resource	CpSoftwareClusterCommunicationResource	0..1	ref	Communication resource for which the mapping applies. Tags: atp.Status=draft
mode Declaration GroupPrototype	ModeDeclarationGroupPrototype	0..1	iref	ModeDeclarationGroupPrototype instance qualifying the communication resource Tags: atp.Status=draft InstanceRef implemented by: ModeDeclarationGroupPrototypeInSystemInstanceRef
parameterData Prototype	ParameterDataPrototype	0..1	iref	ParameterDataPrototype instance qualifying the communication resource. Tags: atp.Status=draft InstanceRef implemented by: ParameterDataPrototypeInSystemInstanceRef
trigger	Trigger	0..1	iref	Trigger instance qualifying the communication resource. Tags: atp.Status=draft InstanceRef implemented by: TriggerInSystemInstanceRef
variableData Prototype	VariableDataPrototype	0..1	iref	VariableDataPrototype instance qualifying the communication resource Tags: atp.Status=draft InstanceRef implemented by: VariableDataPrototypeInSystemInstanceRef

Table B.29: PortElementToCommunicationResourceMapping

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	<i>ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable</i>			
Subclasses	ClientServerInterface , DataInterface , ModeSwitchInterface , TriggerInterface			
Aggregated by	ARPackage.element			
Attribute	Type	Mult.	Kind	Note





Class	PortInterface (abstract)			
isService	Boolean	0..1	attr	<p>This flag is set if the PortInterface is to be used for communication between an</p> <ul style="list-style-type: none"> • ApplicationSwComponentType or • ServiceProxySwComponentType or • SensorActuatorSwComponentType or • ComplexDeviceDriverSwComponentType • ServiceSwComponentType • EcuAbstractionSwComponentType <p>and a ServiceSwComponentType (namely an AUTOSAR Service) located on the same ECU. Otherwise the flag is not set.</p> <p>Stereotypes: atpVariation Tags:vh.latestBindingTime=blueprintDerivationTime</p>
serviceKind	ServiceProviderEnum	0..1	attr	<p>This attribute provides further details about the nature of the applied service.</p>

Table B.30: PortInterface

Class	PortPrototype (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	ARObject, AtpBlueprintable, AtpFeature, AtpPrototype, Identifiable, MultilanguageReferrable, Referrable			
Subclasses	AbstractProvidedPortPrototype, AbstractRequiredPortPrototype			
Aggregated by	AtpClassifier.atpFeature, SwComponentType.port			
Attribute	Type	Mult.	Kind	Note
clientServer Annotation	ClientServerAnnotation	*	aggr	Annotation of this PortPrototype with respect to client/ server communication.
delegatedPort Annotation	DelegatedPort Annotation	0..1	aggr	Annotations on this delegated port.
ioHwAbstraction Server 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.
senderReceiver Annotation	SenderReceiver Annotation	*	aggr	Collection of annotations of this ports sender/receiver communication.
triggerPort Annotation	TriggerPortAnnotation	*	aggr	Annotations on this trigger port.

Table B.31: PortPrototype

Class	RunnableEntity			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior			
Note	A RunnableEntity represents the smallest code-fragment that is provided by an AtomicSwComponent Type and are executed under control of the RTE. RunnableEntities are for instance set up to respond to data reception or operation invocation on a server.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, ExecutableEntity, Identifiable, Multilanguage Referrable, Referrable			
Aggregated by	AtpClassifier.atpFeature, SwcInternalBehavior.runnable			
Attribute	Type	Mult.	Kind	Note
argument (ordered)	RunnableEntity Argument	*	aggr	This represents the formal definition of a an argument to a RunnableEntity.
asynchronous ServerCall ResultPoint	AsynchronousServerCallResultPoint	*	aggr	The server call result point admits a runnable to fetch the result of an asynchronous server call. The aggregation of AsynchronousServerCallResultPoint is subject to variability with the purpose to support the conditional existence of client server PortPrototypes and the variant existence of server call result points in the implementation. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=asynchronousServerCallResultPoint.shortName, asynchronousServerCallResultPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
canBelInvoked Concurrently	Boolean	0..1	attr	If the value of this attribute is set to "true" the enclosing RunnableEntity can be invoked concurrently (even for one instance of the corresponding AtomicSwComponent Type). This implies that it is the responsibility of the implementation of the RunnableEntity to take care of this form of concurrency.
dataRead Access	VariableAccess	*	aggr	RunnableEntity has implicit read access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype. The aggregation of dataReadAccess is subject to variability with the purpose to support the conditional existence of sender receiver ports or the variant existence of dataReadAccess in the implementation. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataReadAccess.shortName, dataReadAccess.variationPoint.shortLabel vh.latestBindingTime=preCompileTime
dataReceive PointBy Argument	VariableAccess	*	aggr	RunnableEntity has explicit read access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype. The result is passed back to the application by means of an argument in the function signature. The aggregation of dataReceivePointByArgument is subject to variability with the purpose to support the conditional existence of sender receiver PortPrototype or the variant existence of data receive points in the implementation. Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataReceivePointByArgument.shortName, dataReceivePointByArgument.variationPoint.shortLabel vh.latestBindingTime=preCompileTime





Class	RunnableEntity			
dataReceivePointByValue	VariableAccess	*	aggr	<p>RunnableEntity has explicit read access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype.</p> <p>The result is passed back to the application by means of the return value. The aggregation of dataReceivePointByValue is subject to variability with the purpose to support the conditional existence of sender receiver ports or the variant existence of data receive points in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataReceivePointByValue.shortName, dataReceivePointByValue.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>
dataSendPoint	VariableAccess	*	aggr	<p>RunnableEntity has explicit write access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype.</p> <p>The aggregation of dataSendPoint is subject to variability with the purpose to support the conditional existence of sender receiver PortPrototype or the variant existence of data send points in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataSendPoint.shortName, dataSendPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>
dataWriteAccess	VariableAccess	*	aggr	<p>RunnableEntity has implicit write access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype.</p> <p>The aggregation of dataWriteAccess is subject to variability with the purpose to support the conditional existence of sender receiver ports or the variant existence of dataWriteAccess in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=dataWriteAccess.shortName, dataWriteAccess.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>
externalTriggeringPoint	ExternalTriggeringPoint	*	aggr	<p>The aggregation of ExternalTriggeringPoint is subject to variability with the purpose to support the conditional existence of trigger ports or the variant existence of external triggering points in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=externalTriggeringPoint.ident.shortName, externalTriggeringPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>
internalTriggeringPoint	InternalTriggeringPoint	*	aggr	<p>The aggregation of InternalTriggeringPoint is subject to variability with the purpose to support the variant existence of internal triggering points in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=internalTriggeringPoint.shortName, internalTriggeringPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>





Class	RunnableEntity			
modeAccess Point	ModeAccessPoint	*	aggr	<p>The runnable has a mode access point. The aggregation of ModeAccessPoint is subject to variability with the purpose to support the conditional existence of mode ports or the variant existence of mode access points in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=modeAccessPoint.ident.shortName, modeAccessPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>
modeSwitch Point	ModeSwitchPoint	*	aggr	<p>The runnable has a mode switch point. The aggregation of ModeSwitchPoint is subject to variability with the purpose to support the conditional existence of mode ports or the variant existence of mode switch points in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=modeSwitchPoint.shortName, modeSwitchPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>
parameter Access	ParameterAccess	*	aggr	<p>The presence of a ParameterAccess implies that a RunnableEntity needs read only access to a ParameterDataPrototype which may either be local or within a PortPrototype.</p> <p>The aggregation of ParameterAccess is subject to variability with the purpose to support the conditional existence of parameter ports and component local parameters as well as the variant existence of ParameterAccess (points) in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=parameterAccess.shortName, parameterAccess.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>
readLocal Variable	VariableAccess	*	aggr	<p>The presence of a readLocalVariable implies that a RunnableEntity needs read access to a VariableDataPrototype in the role of implicitInterRunnableVariable or explicitInterRunnableVariable.</p> <p>The aggregation of readLocalVariable is subject to variability with the purpose to support the conditional existence of implicitInterRunnableVariable and explicitInterRunnableVariable or the variant existence of readLocalVariable (points) in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=readLocalVariable.shortName, readLocalVariable.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>
serverCallPoint	ServerCallPoint	*	aggr	<p>The RunnableEntity has a ServerCallPoint. The aggregation of ServerCallPoint is subject to variability with the purpose to support the conditional existence of client server PortPrototypes or the variant existence of server call points in the implementation.</p> <p>Stereotypes: atpSplitable; atpVariation Tags: atp.Splitkey=serverCallPoint.shortName, serverCallPoint.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>





Class	RunnableEntity			
symbol	CIdentifier	0..1	attr	The symbol describing this RunnableEntity's entry point. This is considered the API of the RunnableEntity and is required during the RTE contract phase.
waitPoint	WaitPoint	*	aggr	The WaitPoint associated with the RunnableEntity.
writtenLocal Variable	VariableAccess	*	aggr	<p>The presence of a writtenLocalVariable implies that a RunnableEntity needs write access to a VariableData Prototype in the role of implicitInterRunnableVariable or explicitInterRunnableVariable.</p> <p>The aggregation of writtenLocalVariable is subject to variability with the purpose to support the conditional existence of implicitInterRunnableVariable and explicitInterRunnableVariable or the variant existence of writtenLocalVariable (points) in the implementation.</p> <p>Stereotypes: atpSplittable; atpVariation Tags: atp.Splitkey=writtenLocalVariable.shortName, writtenLocalVariable.variationPoint.shortLabel vh.latestBindingTime=preCompileTime</p>

Table B.32: RunnableEntity

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, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, CollectableElement, DataInterface, Identifiable, MultilanguageReferrable, PackageableElement, PortInterface, Referrable</i>			
Aggregated by	ARPackage.element			
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 B.33: SenderReceiverInterface

Class	ServerCallPoint (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::ServerCall			
Note	If a RunnableEntity owns a ServerCallPoint it is entitled to invoke a particular ClientServerOperation of a specific RPortPrototype of the corresponding AtomicSwComponentType			
Base	<i>ARObject, AbstractAccessPoint, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable</i>			
Subclasses	AsynchronousServerCallPoint, SynchronousServerCallPoint			
Aggregated by	<i>AtpClassifier.atpFeature, RunnableEntity.serverCallPoint</i>			
Attribute	Type	Mult.	Kind	Note
operation	ClientServerOperation	0..1	iref	<p>The operation that is called by this runnable.</p> <p>InstanceRef implemented by:ROperationInAtomicSwc InstanceRef</p>





Class	ServerCallPoint (abstract)			
timeout	TimeValue	0..1	attr	Time in seconds before the server call times out and returns with an error message. It depends on the call type (synchronous or asynchronous) how this is reported.

Table B.34: ServerCallPoint

Class	SwcModeSwitchEvent			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::RTEEvents			
Note	This event is raised when the specified mode change occurs.			
Base	ARObject, AbstractEvent, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, Multilanguage Referrable, RTEEvent, Referrable			
Aggregated by	AtpClassifier.atpFeature, SwcInternalBehavior.event			
Attribute	Type	Mult.	Kind	Note
activation	ModeActivationKind	0..1	attr	Specifies if the event is raised on entering or exiting a specific mode or is raised on the transition between two modes.
mode (ordered)	ModeDeclaration	0..2	iref	The referenced mode or the transition between two modes raises this SwcModeSwitchEvent. InstanceRef implemented by: RModelInAtomicSwc InstanceRef

Table B.35: SwcModeSwitchEvent

Class	Trigger			
Package	M2::AUTOSARTemplates::CommonStructure::TriggerDeclaration			
Note	A trigger which is provided (i.e. released) or required (i.e. used to activate something) in the given context.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable			
Aggregated by	AtpClassifier.atpFeature, BswModuleDescription.releasedTrigger, BswModuleDescription.required Trigger, ServiceInterface.trigger, TriggerInterface.trigger			
Attribute	Type	Mult.	Kind	Note
swImplPolicy	SwImplPolicyEnum	0..1	attr	This attribute, when set to value queued, allows for a queued processing of Triggers.
triggerPeriod	MultidimensionalTime	0..1	aggr	Optional definition of a period in case of a periodically (time or angle) driven external trigger.

Table B.36: Trigger

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 B.37: TriggerInterface

Class	VariableAccess			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::DataElements			
Note	The presence of a VariableAccess implies that a RunnableEntity needs access to a VariableData Prototype. The kind of access is specified by the role in which the class is used.			
Base	<i>ARObject, AbstractAccessPoint, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable</i>			
Aggregated by	<i>AtpClassifier.atpFeature, ReceiverComSpec.replaceWith, RunnableEntity.dataReadAccess, RunnableEntity.dataReceivePointByArgument, RunnableEntity.dataReceivePointByValue, RunnableEntity.dataSendPoint, RunnableEntity.dataWriteAccess, RunnableEntity.readLocalVariable, RunnableEntity.writtenLocalVariable</i>			
Attribute	Type	Mult.	Kind	Note
accessed Variable	AutosarVariableRef	0..1	aggr	This denotes the accessed variable.
scope	VariableAccessScope Enum	0..1	attr	This attribute allows for constraining the scope of the corresponding communication. For example, it possible to express whether the communication is intended to cross the boundary of an ECU or whether it is intended not to cross the boundary of a single partition.

Table B.38: VariableAccess

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, MultilanguageReferrable, Referrable</i>			
Aggregated by	<i>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</i>			
Attribute	Type	Mult.	Kind	Note
initValue	ValueSpecification	0..1	aggr	Specifies initial value(s) of the VariableDataPrototype

Table B.39: VariableDataPrototype

C Referenced ECUC Configuration Parameters

C.1 BswM

C.1.1 BswMRule

SWS Item	[ECUC_BswM_00806]		
Container Name	BswMRule		
Parent Container	BswMArbitration		
Description	Each instance of this container describes a BswM arbitration rule. The rule either consists of a simple mode condition or a more complex logical expression. This container also references the action lists that shall be invoked when the rule is evaluated to True or False.		
Post-Build Variant Multiplicity	true		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Configuration Parameters			

SWS Item	[ECUC_BswM_00935]		
Parameter Name	BswMNestedExecutionOnly		
Parent Container	BswMRule		
Description	<p>This parameter defines for its related Rule if the Rule is an Independent rule or a Subordinate rule;</p> <p>false: an Independent rule, i.e. to be evaluated each time applicable (both as standalone Rule driven by its own BswMModeRequestSource and when referenced by another Rule).</p> <p>true: a Subordinated rule, to be evaluated ONLY as a result of being referenced in one or more Action Lists.</p>		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

SWS Item	[ECUC_BswM_00888]		
Parameter Name	BswMRuleInitState		
Parent Container	BswMRule		





Description	<p>This parameter is a part of the reset/initialization behavior of BswM. Action lists are executed when the result of a rule evaluation have changed since the last evaluation. This parameter defines the "previous evaluation result" of a rule to be used after initialization of the BswM.</p> <p>If this parameter is set to BSWM_UNDEFINED, the evaluation result is always treated as changed at the first evaluation of the rule after initialization.</p> <p>If this parameter is set to BSWM_TRUE, the evaluation result is treated as changed if the rule is evaluated to false.</p> <p>If this parameter is set to BSWM_FALSE, the evaluation result is treated as changed if the rule is evaluated to true.</p>		
Multiplicity	1		
Type	EcucEnumerationParamDef		
Range	BSWM_FALSE	–	
	BSWM_TRUE	–	
	BSWM_UNDEFINED	–	
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

SWS Item	[ECUC_BswM_00819]		
Parameter Name	BswMRuleExpressionRef		
Parent Container	BswMRule		
Description	This is a reference to the logical expression that is evaluated for each rule.		
Multiplicity	1		
Type	Reference to BswMLogicalExpression		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

SWS Item	[ECUC_BswM_00818]		
Parameter Name	BswMRuleFalseActionList		
Parent Container	BswMRule		
Description	This is a reference to the action list that shall be executed when the rule is evaluated to False		
Multiplicity	0..1		
Type	Reference to BswMActionList		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME





	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	[ECUC_BswM_00817]		
Parameter Name	BswMRuleTrueActionList		
Parent Container	BswMRule		
Description	This is a reference to the action list that shall be executed when the rule is evaluated to True		
Multiplicity	0..1		
Type	Reference to BswMActionList		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

C.1.2 BswMLogicalExpression

SWS Item	[ECUC_BswM_00808]		
Container Name	BswMLogicalExpression		
Parent Container	BswMArbitration		
Description	This container describes the logical expressions that can be used for the mode arbitration. The logical expressions are built of a set of arguments and a logical operator. Each argument can either be a mode condition or a sub-expression to allow definition of more complex logical expressions. There may be an unlimited number of arguments in each logical expression. Note that the order of evaluation of the expressions is not defined.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE, VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Link time	–	
	Post-build time	–	
Configuration Parameters			

SWS Item	[ECUC_BswM_00814]		
Parameter Name	BswMLogicalOperator		
Parent Container	BswMLogicalExpression		
Description	This parameter specifies the logical operator to be used in the logical expression. If the logical operator is set to something other than BSWM_NOT, and the expression only consists of a single condition, then this parameter will have no effect.		





Multiplicity	0..1		
Type	EcucEnumerationParamDef		
Range	BSWM_AND	–	
	BSWM_NAND	–	
	BSWM_NOT	–	
	BSWM_OR	–	
	BSWM_XOR	–	
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

SWS Item	[ECUC_BswM_00820]		
Parameter Name	BswMArgumentRef		
Parent Container	BswMLogicalExpression		
Description	<p>This is a choice reference either to a mode condition or a sub-expression.</p> <p>In case the BswMLogicalExpression.BswMLogicalOperator equals BSWM_NAND only two operands are supported. In case the BswMLogicalExpression.BswMLogicalOperator equals BSWM_NOT only one operand is supported.</p>		
Multiplicity	1..*		
Type	Choice reference to [BswMLogicalExpression , BswMModeCondition]		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

No Included Containers

C.1.3 BswMModeRequestPort

SWS Item	[ECUC_BswM_00805]		
Container Name	BswMModeRequestPort		
Parent Container	BswMArbitration		
Description	<p>Each instance of this container defines a mode request interface that is used to requests or indicate modes from/to the BswM. These interfaces are implemented as ports or as ordinary C-functions based upon if the request is made by an SW-C or a BSW module. There are different types of mode requests: 1. Mode requests from the SW-C:s 2. Mode Requests from other BSW modules such as the DCM. 3. State/mode indications from the RTE or other BSW modules such as the bus specific State Managers.</p> <p>Note that the BswM treats all request and indications in the exact same way.</p>		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE, VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Link time	–	
	Post-build time	–	
Configuration Parameters			

SWS Item	[ECUC_BswM_00822]		
Parameter Name	BswMRequestProcessing		
Parent Container	BswMModeRequestPort		
Description	This parameter defines if the processing of the mode arbitration shall be done immediately when a mode request is received or if it shall be deferred to the processing of the main function of BswM.		
Multiplicity	1		
Type	EcucEnumerationParamDef		
Range	BSWM_DEFERRED	–	
	BSWM_IMMEDIATE	–	
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

Included Containers		
Container Name	Multiplicity	Scope / Dependency
BswMModelInitValue	0..1	This container defines the initial mode value that is used by Bsw M for the corresponding mode request after initialization. The initial mode value is defined by configuring either BswMBsw ModelInitValue or BswMCompuScaleModeValue. This container is optional.
BswMModeRequestSource	1	This choice container specifies the source of the mode request or state/mode indication. The requester of a mode can be both SW-C:s and other BSW Modules, such as the bus specific State Managers.

C.1.4 BswMActionList

SWS Item	[ECUC_BswM_00809]		
Container Name	BswMActionList		
Parent Container	BswMModeControl		
Description	Each instance of this container defines an action list that is invoked based on the BswM Rules. An action list contains a list of numbered action items to be processed. An action list can also include other action lists.		
Post-Build Variant Multiplicity	true		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Configuration Parameters			

SWS Item	[ECUC_BswM_00894]		
Parameter Name	BswMActionListExecution		
Parent Container	BswMActionList		
Description	This parameter controls if the corresponding action list shall be executed every time the rule is evaluated or only when the result of the evaluation changes. This parameter does not have an effect when this action list is executed within another action list.		
Multiplicity	1		
Type	EcucEnumerationParamDef		
Range	BSWM_CONDITION	Action list shall be executed every time the rule is evaluated.	
	BSWM_TRIGGER	Action list shall be executed every time the result of the evaluation changes.	
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

SWS Item	[ECUC_BswM_01076]		
Parameter Name	BswMActionListPriority		
Parent Container	BswMActionList		
Description	This controls the order of execution, in the case when multiple action lists are executed during a single mode control cycle. Highest priority action list will be executed first. Zero (0) is lowest priority, and 255 is highest priority.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 255		
Default value	0		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

Included Containers		
Container Name	Multiplicity	Scope / Dependency
BswMActionListItem	1..*	This container defines an item in an action list.

C.1.5 BswMAction

SWS Item	[ECUC_BswM_00810]		
Container Name	BswMAction		
Parent Container	BswMModeControl		
Description	Each container of this type defines an action. These actions can be part of one or several action lists.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE, VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Containers		
Container Name	Multiplicity	Scope / Dependency
BswMAvailableActions	1	Choice container including the available actions to be used in the action lists.

C.1.6 BswMSwitchPort

SWS Item	[ECUC_BswM_00950]		
Container Name	BswMSwitchPort		
Parent Container	BswMModeControl		
Description	Represents an output mode-switch port to be generated by the BswM. If BswMModeSwitchInterfaceRef is configured then a PPortPrototype is generated in the SWCD. If BswMSchMModeDeclarationGroupRef is configured then a ModeDeclarationGroupPrototype is generated in the ProvidedModeGroups of the BSWMD. If both BswMModeSwitchInterfaceRef and BswMSchMModeDeclarationGroupRef are configured then an SwcBswSynchronizedModeGroupPrototype is also generated in the BSWMD (see Chapter 6.11 of the BSW Module Description Template SWS and EXP ModemanagementGuide)..		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE, VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Link time	–	
	Post-build time	–	
Configuration Parameters			

SWS Item	[ECUC_BswM_00951]		
Parameter Name	BswMModeSwitchInterfaceRef		
Parent Container	BswMSwitchPort		
Description	Reference to the ModeSwitchInterface from which the BswM will generate a PPort Prototype.		
Multiplicity	0..1		
Type	Foreign reference to MODE-SWITCH-INTERFACE		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

SWS Item	[ECUC_BswM_01031]		
Parameter Name	BswMSchMModeDeclarationGroupRef		
Parent Container	BswMSwitchPort		
Description	Reference to the ModeDeclarationGroup from which the BswM will generate a Mode DeclarationGroupPrototype.		
Multiplicity	0..1		
Type	Foreign reference to MODE-DECLARATION-GROUP		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	–	
Scope / Dependency	scope: local		

No Included Containers
