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△

|            |        |                            |   |
|------------|--------|----------------------------|---|
| 2019-11-28 | R19-11 | AUTOSAR Release Management | <ul style="list-style-type: none"> <li>• Removed Class LogManager. Moved <code>remoteClientState()</code> to Chapter 8.2 Function definitions (logging.h)</li> <li>• Added Functional Cluster shutdown behavior. Added Functional Cluster initialization via <code>ara::core::Initialize()</code></li> <li>• Removed TSYNC related spec items from Chapter 7.4</li> <li>• Refactoring and editorial changes</li> <li>• Changed Document Status from Final to published</li> </ul> |
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| 2017-10-27 | 17-10  | AUTOSAR Release Management | <ul style="list-style-type: none"> <li>• No content changes</li> </ul>  |
| 2017-03-31 | 17-03  | AUTOSAR Release Management | <ul style="list-style-type: none"> <li>• Initial release</li> </ul>   |

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## References

- [1] Log and Trace Protocol Specification  
AUTOSAR\_FO\_PRS\_LogAndTraceProtocol
- [2] Glossary  
AUTOSAR\_FO\_TR\_Glossary
- [3] Specification of Manifest  
AUTOSAR\_AP\_TPS\_ManifestSpecification
- [4] General Requirements specific to Adaptive Platform  
AUTOSAR\_AP\_RS\_General
- [5] Specification of Adaptive Platform Core  
AUTOSAR\_AP\_SWS\_Core
- [6] Explanation of Adaptive Platform Software Architecture  
AUTOSAR\_AP\_EXP\_SWArchitecture
- [7] Requirements on Log and Trace  
AUTOSAR\_FO\_RS\_LogAndTrace
- [8] Specification of Time Synchronization  
AUTOSAR\_AP\_SWS\_TimeSynchronization

[9] Specification of Operating System Interface  
AUTOSAR\_AP\_SWS\_OperatingSystemInterface

# 1 Introduction and functional overview

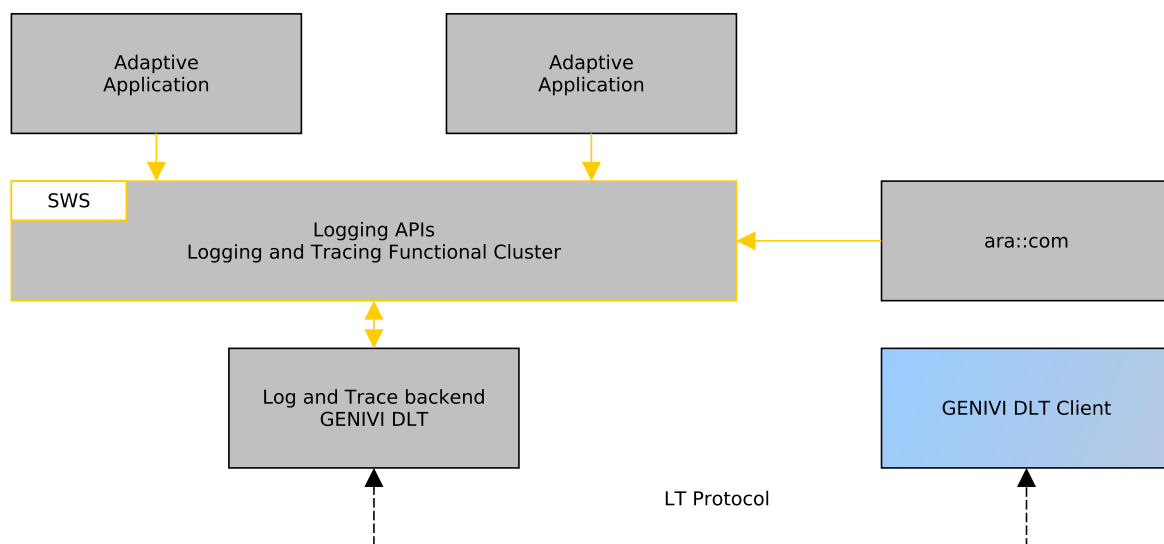
This specification specifies the functionality of the [AUTOSAR Adaptive Platform Log and Trace](#).

The [Log and Trace](#) provides interfaces for [Adaptive Applications](#) to forward logging information onto the communication bus, the console, to the file system or to ARTI-trace. Each of the provided logging information has its own severity level. For each severity level, a separate method is provided to be used by applications or [Adaptive Platform Services](#), e.g. `ara::com`. In addition, utility methods are provided to convert decimal values into the hexadecimal numeral system, or into the binary numeral system.

To pack the provided logging information into a standardized delivery and presentation format, a protocol is needed. For this purpose, the [LT protocol](#) can be used, which is standardized within the AUTOSAR consortium.

The [LT protocol](#) can add additional information to the provided logging information. This information can be used by a [Logging client](#) to relate, sort or filter the received logging frames.

Detailed information regarding the use cases and the [LT protocol](#) itself are provided by the PRS Log and Trace protocol specification. For more information regarding the [LT protocol](#) refer to [1].



**Figure 1.1: Architecture overview**

The [ARTI-trace](#) methods are integrated in the `ara::log` Functional Cluster. The support of [ARTI-trace](#) functionality of non AUTOSAR applications or services is handled by adapters (i.e. "[OS/ara::log Adapter](#)").

Furthermore, this document introduces additional specification extensions for the [AUTOSAR Adaptive Platform Log and Trace](#).



## 2 Acronyms and Abbreviations

The following table contains the list of terms and abbreviations used in the scope of this document which are not already defined in [2, AUTOSAR glossary]. along with the spelled-out meaning of each of the abbreviations.

| Abbreviation / Acronym:            | Description:  |
|------------------------------------|---|
| Log and Trace                      | The official <a href="#">Functional Cluster</a> name that manages the logging   |
| L&T                                | Acronym for <a href="#">Log and Trace</a>   |
| LT protocol                        | Original name of the protocol itself (Log and Trace), specified in the PRS document [1]   |
| Logging API                        | The main logging interface towards user applications as a library   |
| Logging back-end                   | Implementation of the <a href="#">LT protocol</a> , e.g. <a href="#">DLT</a>  |
| Logging Client                     | An external tool which can remotely interact with the <a href="#">Logging framework</a>   |
| Logging framework                  | Implementation of the software solution used for logging purposes   |
| Logging instance                   | The class that enables the logging functionality and handles a single logging context   |
| Log message                        | Log message, including message header(s)  |
| Log severity level                 | Meta information about the severity of a passed logging information   |
| DLT                                | Diagnostics Log and Trace - a GENIVI Log and Trace daemon implementation of the <a href="#">LT protocol</a>   |
| Application process                | An executable instance (process) that is running on a <a href="#">Machine</a>   |
| ara::log Modeled Message Generator | A workflow tool (e.g. a script) with the purpose to read-parse an ARXML model of data types in an Adaptive Platform Interface and generate a corresponding modeled message specific representation thereof. |
| ARTI-trace                         | Trace capabilities that are provided by the system, i.e. LTTNG (Linux Trace Toolkit Next Generation) or hardware tracer, see also <a href="#">ARTI</a>  |

The following technical terms used throughout this document are defined in the official [2] AUTOSAR Glossary or [3] TPS Manifest Specification – they are repeated here for tracing purposes.

| Term                         | Description              |
|------------------------------|--------------------------|
| Adaptive Application         | see [2] AUTOSAR Glossary |
| Application                  | see [2] AUTOSAR Glossary |
| AUTOSAR Adaptive Platform    | see [2] AUTOSAR Glossary |
| Adaptive Platform Foundation | see [2] AUTOSAR Glossary |
| Manifest                     | see [2] AUTOSAR Glossary |
| Executable                   | see [2] AUTOSAR Glossary |
| Functional Cluster           | see [2] AUTOSAR Glossary |
| Adaptive Platform Service    | see [2] AUTOSAR Glossary |
| Machine                      | see [2] AUTOSAR Glossary |
| Service                      | see [2] AUTOSAR Glossary |
| Service Interface            | see [2] AUTOSAR Glossary |
| Service Discovery            | see [2] AUTOSAR Glossary |
| ARTI                         | see [2] AUTOSAR Glossary |

**Table 2.1: Glossary-defined Technical Terms**

## 3 Input documents & related standards and norms

### 3.1 Input documents

NOTE: [4, RS-RSGeneral] is listed here as an input document because it applies to SWS LogAndTrace as well as to all SWS documents of the Adaptive Platform. Since it includes only non-functional requirements the tracing is not necessary.

### 3.2 Further applicable specification

AUTOSAR provides a core specification [5] which is also applicable for [Log and Trace](#). The chapter “General requirements for all Functional Clusters” of this specification shall be considered as an additional and required specification for implementation of [Log and Trace](#).

## 4 Constraints and assumptions

### 4.1 Known limitations

The provided [Logging framework](#) API is designed to be independent from the underlying [Logging back-end](#) implementation and as such doesn't impose limitations.

### 4.2 Applicability to car domains

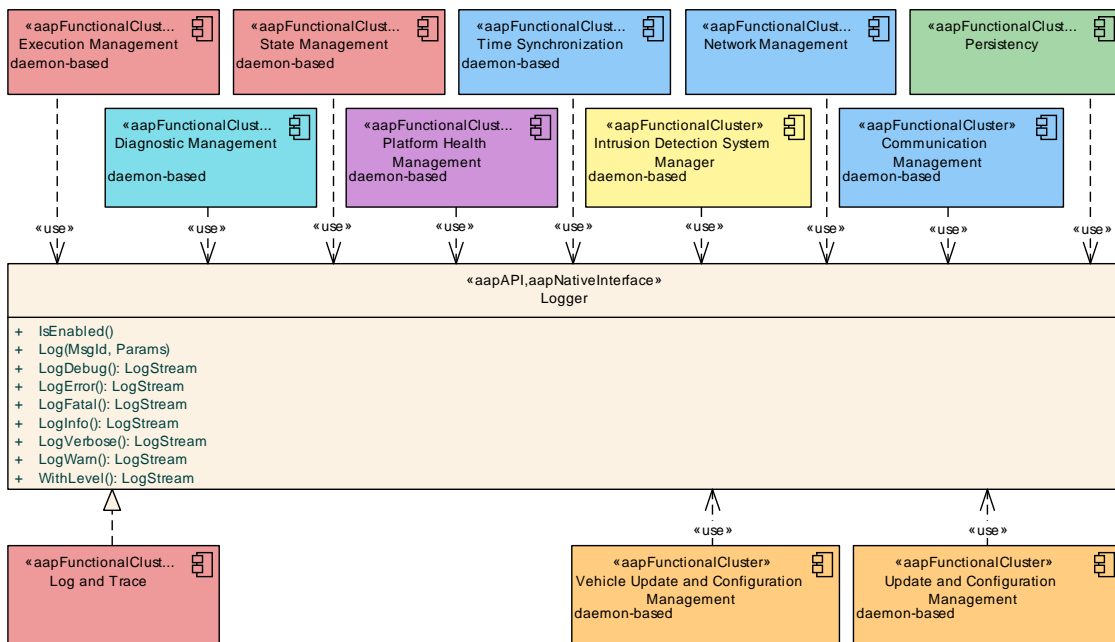
No restrictions to applicability.

## 5 Dependencies to other Functional Clusters

This chapter provides an overview of the dependencies to other Functional Clusters in the AUTOSAR Adaptive Platform. Section 5.1 “Provided Interfaces” lists the interfaces provided by Log and Trace to other Functional Clusters. Section 5.2 “Required Interfaces” lists the interfaces required by Log and Trace.

A detailed technical architecture documentation of the AUTOSAR Adaptive Platform is provided in [6].

### 5.1 Provided Interfaces



**Figure 5.1: Interfaces provided by Log and Trace to other Functional Clusters**

Figure 5.1 shows the interfaces provided by Log and Trace to other Functional Clusters within the AUTOSAR Adaptive Platform. Table 5.1 provides a complete list of interfaces provided to other Functional Clusters within the AUTOSAR Adaptive Platform.

| Interface | Functional Cluster                 | Purpose  |
|-----------|------------------------------------|--|
| Logger    | Communication Management           | Communication Management shall use this interface to log standardized messages.                    |
|           | Diagnostic Management              | Diagnostic Management shall use this interface to log standardized messages.                       |
|           | Execution Management               | Execution Management shall use this interface to log standardized messages.                        |
|           | Intrusion Detection System Manager | Adaptive Intrusion Detection System Manager shall use this interface to log standardized messages. |

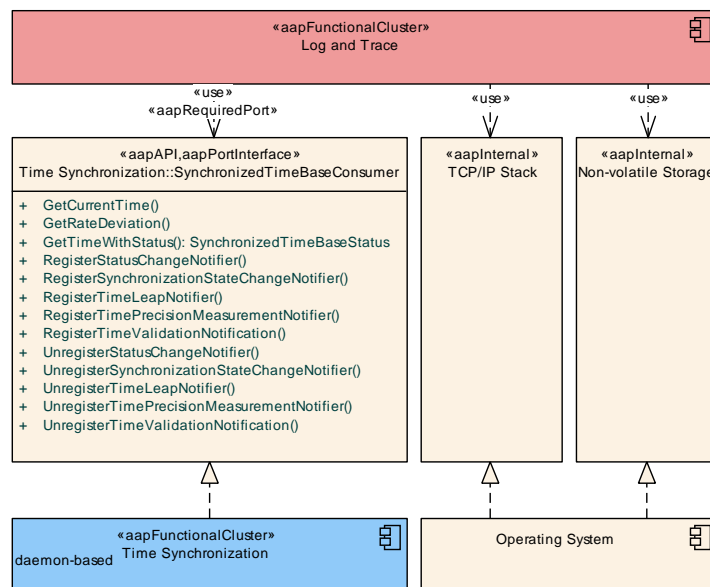




| Interface | Functional Cluster                          | Purpose  |
|-----------|---|--|
|           | Network Management                          | Network Management shall use this interface to log standardized messages.                          |
|           | Persistency                                 | Persistency shall use this interface to log standardized messages.                                 |
|           | Platform Health Management                  | Platform Health Management shall use this interface to log standardized messages.                  |
|           | Raw Data Stream                             | Raw Data Stream uses this interface to log standardized messages.                                  |
|           | State Management                            | State Management shall use this interface to log standardized messages.                            |
|           | Time Synchronization                        | Time Synchronization shall use this interface to log standardized messages.                        |
|           | Update and Configuration Management         | Update and Configuration Management shall use this interface to log standardized messages.         |
|           | Vehicle Update and Configuration Management | Vehicle Update and Configuration Management shall use this interface to log standardized messages. |

**Table 5.1: Interfaces provided to other Functional Clusters**

## 5.2 Required Interfaces



**Figure 5.2: Interfaces required by Log and Trace from other Functional Clusters**

Figure 5.2 shows the interfaces required by Log and Trace from other Functional Clusters within the AUTOSAR Adaptive Platform. Table 5.2 provides a complete list of required interfaces from other Functional Clusters within the AUTOSAR Adaptive Platform.

| <i>Functional Cluster</i> | <i>Interface</i>             | <i>Purpose</i>  |
|---------------------------|------------------------------|---|
| Time Synchronization      | SynchronizedTimeBaseConsumer | Log and Trace shall use this interface to determine the timestamps that are associated with log messages. |

**Table 5.2: Interfaces required from other Functional Clusters**

## 6 Requirements Tracing

The following table references the requirements specified in RS Log And Trace [7] and links to the fulfillment of these. Please note that if column “Satisfied by” is empty for a specific requirement this means that this requirement is not fulfilled by this document.

| Requirement   | Description | Satisfied by  |
|---------------|-------------|---|
| [RS_LT_00002] |             | [SWS_LOG_00227] [SWS_LOG_00228]<br>[SWS_LOG_00229] [SWS_LOG_00230]<br>[SWS_LOG_00231] [SWS_LOG_00232]<br>[SWS_LOG_00233] [SWS_LOG_00234]<br>[SWS_LOG_00235] [SWS_LOG_00236]<br>[SWS_LOG_00237] [SWS_LOG_00238]  |
| [RS_LT_00003] |             | [SWS_LOG_00001] [SWS_LOG_00002]<br>[SWS_LOG_00004] [SWS_LOG_00005]<br>[SWS_LOG_00006] [SWS_LOG_00007]<br>[SWS_LOG_00008] [SWS_LOG_00009]<br>[SWS_LOG_00010] [SWS_LOG_00011]<br>[SWS_LOG_00012] [SWS_LOG_00013]<br>[SWS_LOG_00018] [SWS_LOG_00021]<br>[SWS_LOG_00039] [SWS_LOG_00040]<br>[SWS_LOG_00041] [SWS_LOG_00042]<br>[SWS_LOG_00043] [SWS_LOG_00044]<br>[SWS_LOG_00045] [SWS_LOG_00046]<br>[SWS_LOG_00047] [SWS_LOG_00048]<br>[SWS_LOG_00049] [SWS_LOG_00050]<br>[SWS_LOG_00051] [SWS_LOG_00062]<br>[SWS_LOG_00063] [SWS_LOG_00064]<br>[SWS_LOG_00065] [SWS_LOG_00066]<br>[SWS_LOG_00067] [SWS_LOG_00068]<br>[SWS_LOG_00069] [SWS_LOG_00070]<br>[SWS_LOG_00082] [SWS_LOG_00083]<br>[SWS_LOG_00091] [SWS_LOG_00095]<br>[SWS_LOG_00098] [SWS_LOG_00123]<br>[SWS_LOG_00124] [SWS_LOG_00128]<br>[SWS_LOG_00129] [SWS_LOG_00130]<br>[SWS_LOG_00131] [SWS_LOG_00132]<br>[SWS_LOG_00133] [SWS_LOG_00172]<br>[SWS_LOG_00173] [SWS_LOG_00201]<br>[SWS_LOG_00203] [SWS_LOG_00204]<br>[SWS_LOG_00205] [SWS_LOG_00240]<br>[SWS_LOG_00241] [SWS_LOG_00242]<br>[SWS_LOG_00244] [SWS_LOG_00245]<br>[SWS_LOG_00246] [SWS_LOG_00247]<br>[SWS_LOG_00248] [SWS_LOG_00249]<br>[SWS_LOG_00250] [SWS_LOG_00251]<br>[SWS_LOG_00253] [SWS_LOG_00254]<br>[SWS_LOG_00256] [SWS_LOG_00257]<br>[SWS_LOG_00258] [SWS_LOG_00261]<br>[SWS_LOG_00263] [SWS_LOG_20000] |
| [RS_LT_00017] |             | [SWS_LOG_00083]   |
| [RS_LT_00025] |             | [SWS_LOG_00236]   |
| [RS_LT_00030] |             | [SWS_LOG_00095]   |
| [RS_LT_00045] |             | [SWS_LOG_00007]   |





| Requirement   | Description   | Satisfied by   |
|---------------|---|--|
| [RS_LT_00046] |   | [SWS_LOG_00206] [SWS_LOG_00207]<br>[SWS_LOG_00208] [SWS_LOG_00209]<br>[SWS_LOG_00210] [SWS_LOG_00211]<br>[SWS_LOG_00212] [SWS_LOG_00213]<br>[SWS_LOG_00214] [SWS_LOG_00215]<br>[SWS_LOG_00216] [SWS_LOG_00217]<br>[SWS_LOG_00218] [SWS_LOG_00219]<br>[SWS_LOG_00220] [SWS_LOG_00221]<br>[SWS_LOG_00222] [SWS_LOG_00223]<br>[SWS_LOG_00224] [SWS_LOG_00225]<br>[SWS_LOG_00226]                                    |
| [RS_LT_00047] |   | [SWS_LOG_00004]  |
| [RS_LT_00048] |   | [SWS_LOG_00004]  |
| [RS_LT_00049] |   | [SWS_LOG_00008] [SWS_LOG_00009]<br>[SWS_LOG_00010] [SWS_LOG_00011]<br>[SWS_LOG_00012] [SWS_LOG_00013]<br>[SWS_LOG_00125] [SWS_LOG_00126]<br>[SWS_LOG_00127] [SWS_LOG_00130]<br>[SWS_LOG_00240] [SWS_LOG_00241]<br>[SWS_LOG_00242] [SWS_LOG_00244]<br>[SWS_LOG_00245] [SWS_LOG_00246]<br>[SWS_LOG_00247] [SWS_LOG_00248]<br>[SWS_LOG_00249] [SWS_LOG_00250]<br>[SWS_LOG_00251] [SWS_LOG_00255]<br>[SWS_LOG_00257] |
| [RS_LT_00050] |   | [SWS_LOG_00005] [SWS_LOG_00006]<br>[SWS_LOG_00253] [SWS_LOG_00254]   |
| [RS_LT_00052] |   | [SWS_LOG_00001]  |
| [RS_LT_00056] |   | [SWS_LOG_00229]  |
| [RS_LT_00059] | LT shall provide an interface for trace points                          | [SWS_LOG_20001] [SWS_LOG_20002]<br>[SWS_LOG_20003] [SWS_LOG_20004]<br>[SWS_LOG_20005]  |
| [RS_LT_00060] | LT shall send modeled trace messages                                    | [SWS_LOG_20001] [SWS_LOG_20002]<br>[SWS_LOG_20003] [SWS_LOG_20004]<br>[SWS_LOG_20005]  |
| [RS_LT_00061] | Tracing shall be configurable at compile time                           | [SWS_LOG_20001] [SWS_LOG_20002]<br>[SWS_LOG_20003] [SWS_LOG_20004]<br>[SWS_LOG_20005]  |
| [RS_LT_00062] | LT shall be configurable to use ARTI to process the tracing information | [SWS_LOG_20001] [SWS_LOG_20002]<br>[SWS_LOG_20003] [SWS_LOG_20004]<br>[SWS_LOG_20005]  |

**Table 6.1: RequirementsTracing**



## 7 Functional specification

This specification defines the usage of the defined C++ [Logging API](#) for the [Log and Trace](#). [Adaptive Applications](#) can use these functions to forward [Log messages](#) to various sinks, for example the network, a serial bus, the console or the file system.

The following functionalities are provided:

- 1) Methods for initializing the [Logging framework](#) (see [7.2.6](#))
- 2) Utility methods to convert decimal values into hexadecimal or binary values (see [7.3.1.2](#))
- 3) Automatic timestamping of [Log messages](#) (see [7.5](#))
- 4) Log and trace network bandwidth limitation (see chapter [7.6](#))

[Adaptive Applications](#) and [Functional Clusters](#) can startup (see [7.1.1](#)) and shutdown (see [7.1.2](#)) all [Functional Clusters](#) with direct ARA interfaces (e.g. the [Logging framework](#)), by calling `ara::core::Initialize()` or `ara::core::Deinitialize()`.

### 7.1 Functional Cluster Lifecycle

#### 7.1.1 Startup

In order to initialize the [Logging framework](#), mandatory information needs to be provided to the [Logging framework](#). These information are extracted from the application execution manifest and the AUTOSAR Meta-Model. The execution manifest parameter `Executable.loggingBehavior` defines if the logging functionality should be initialized. Initialization of the [Logging framework](#) (via `ara::core::Initialize()`) is mandatory before usage of any `ara::log` API. Failure to do so will result in undefined behavior.

**[SWS\_LOG\_00001]** [Log message logged before the [Logging framework](#) is able to process them (e.g. daemon communication is not established) shall be queued. The queue size is defined by `LogAndTraceInstantiation.queueSize`. If this size is exceeded the oldest entries shall be discarded.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00052](#))

#### 7.1.2 Shutdown

**Note:** after `ara::core::Deinitialize()` is called, the application has to stop using the logging api. It also means that no further messages can be logged anymore.

[SWS\_LOG\_00123]{DRAFT} [When `ara::core::Deinitialize()` is called, the `Logging framework` shall pass all queued messages to configured log sinks.] ([RS-LT\\_00003](#))

## 7.2 Necessary Parameters and Initialization

The concept of identifying the user application:

To be able to distinguish the logs of different application instances within a system (e.g. an ECU or even the whole vehicle), every `Application process`, in that system, has to get a particular ID and a description.

The concept of log contexts:

In order to be able to distinguish the logs from different logical groups within an `Application process`, for every context within an `Application process` a particular ID and a description has to be assigned. Every `Application process` can have an arbitrary number of contexts.

`Machine`-specific configuration settings for the Log and Trace functional cluster are collected in `LogAndTraceInstantiation`. The `Application processes` using the `Logging framework` need to supply the following configuration through the application execution manifest:

- Application ID
- Application description
- The default log level, if not set through the manifest a default predefined value is set
- The log mode
- The log file path, in case of a specific log mode that indicates logging to a file

The `Application process` using the `Logging framework` creates a `Logging instance` per context. The context is defined at creation of the `Logging instance` and the following information should be provided:

- Context ID
- Context description
- The default log level, if not set through the manifest a default predefined value is set

### 7.2.1 Application ID

The Application ID is an identifier that allows to associate generated logging information with its user application. The Application ID is passed as a string value. Depending on the `Logging framework` actual implementation, i.e. `Logging back-end`,

the length of the Application ID might be limited. To be able to unambiguously associate the received logging information to the origin, it is recommended to assign unique Application IDs within one ECU. There is no need for uniqueness of Application IDs across ECUs as the ECU ID will be the differentiator. The system integrator has the overall responsibility to ensure that each `Application process` instance has a unique Application ID. By having this value defined in the manifest the integrator is able to perform consistency checks. The `applicationId` in the `DltApplication` identifies the application instance and is put as `ApplicationId` into the log and trace message.

**Note:**

The Application IDs are unique IDs per `Application process`, meaning if the same `Application process` is started multiple times it shall have an own ID per instance.

The length limits of the Application ID apply only to version-1 of the PRS LogAndTraceProtocol.

### 7.2.1.1 Application Description

Since the length of the Application ID can be quite short, an additional descriptive text can be provided. This description is passed as a string and the maximum length is implementation dependent. The `applicationDescription` in the `DltApplication` is an optional setting that allows to describe the `applicationId` as descriptive text.

### 7.2.2 Default Log Level

The `Log severity level` represents the severity of the log messages. Severity levels are defined in chapter 7.3. `defaultLogThreshold` in the `DltLogSink` defines the initial log reporting level for the application instance.

Each initiated log message is qualified with such a severity level. The default `Log severity level` is set through the application configuration per `Application process`. The `Log severity level` acts as a reporting filter. Only log messages having a higher or the same severity will be processed by the `Logging framework`, while the others are ignored.

The default `Log severity level` is the initially configured log reporting level for a certain `Application process`, though it can be overridden per context.

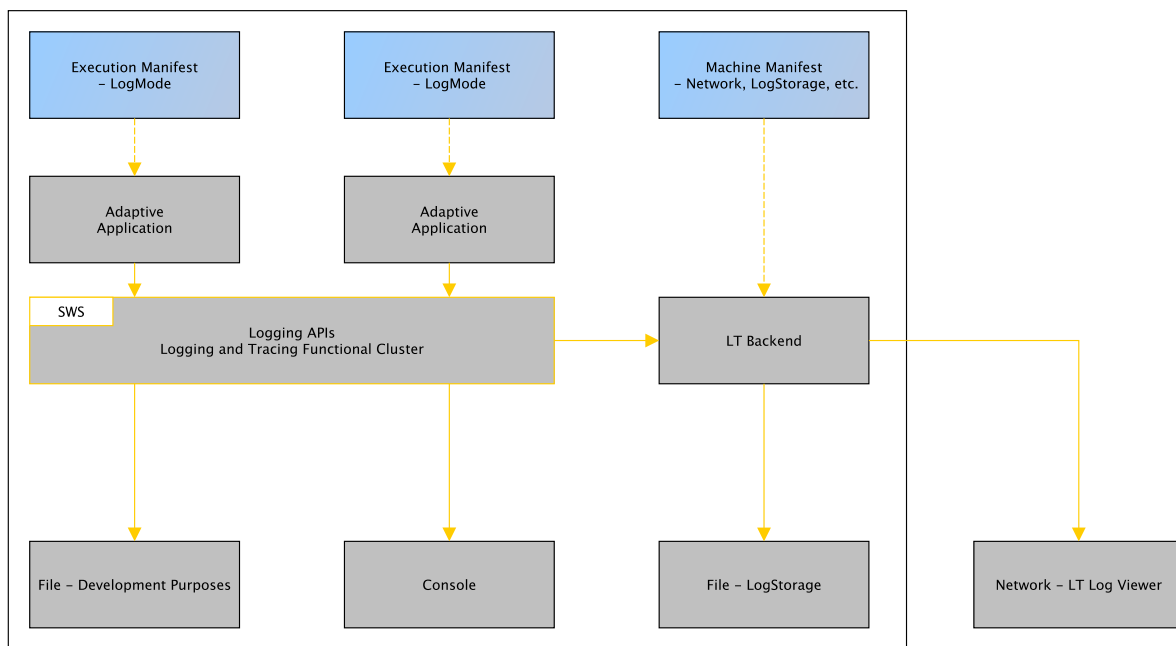
The `Application process` wide log reporting level shall be adjustable during runtime. The realization is an implementation detail of the underlying back-end. E.g. remotely via a `Logging client` for example DLT Viewer. The same applies for the context reporting level.

The design rationale for providing an initial default `Log severity level` application wide against having per context default `Log severity levels` is the following:

- It simplifies the API usage. Otherwise the user will have to define a context default `Log severity level` for each group before using the API.
- The context separation of `Log messages` is possible during runtime.

### 7.2.3 Log Mode

Depending on the `Logging framework` implementation, the passed logging information can be processed in different ways. The destination (the `Log message sink`) can be the console output, a file on the file system or the communication bus. The system integrator is responsible to populate this information in the machine manifest. A direct API for dynamically changing this value for development purposes is provided. In the AUTOSAR Meta-Model the `category` of `DltLogSink` is equivalent to the log mode described here, for more information see [3]. The `category` of `DltLogSink` defines the destination to which the log messages will be forwarded.



**Figure 7.1: Log mode**

As shown in the diagram, once the log mode is set to use the `Logging back-end` the configuration is of that back-end is centralized in the `Machine` manifest configuration. For example, the `Logging back-end` can be configured to store the logging information locally and that configuration would be kept in the `Machine`-specific manifest. Furthermore, the output channel on Ethernet for `Log messages` is configured with the `PlatformModuleEthernetEndpointConfiguration` that is referenced by `DltLogSink` in the role `endpointConfiguration`.

### 7.2.3.1 Log File Path

In case the log mode is set to log to a file, a destination directory path needs to be provided. `path` in the `DltLogSink` defines the destination file to which the logging information is passed. This option is provided for development, integration and prototyping purposes and is not suitable for production.

### 7.2.4 Context ID

The Context ID is an identifier that is used to logically group logging information within the scope of an `Application process`. The Context ID is passed as a string value. Depending on the actual implementation of the `Logging back-end`, the length of the Context ID might be limited. Context ID is unique in the scope of an `Application process` and as such the developer is responsible for assigning it and this information is not modeled in the manifest. There is no need for uniqueness of Context IDs across multiple different `Application processes` as the Application ID will be the differentiator.

#### Note:

Special attention should be paid to library components. The libraries are meant to be used by `Application processes` and therefore are running within the `Application process`' scope. Logging executed from those libraries will end up inside the scope of the parent `Application process`. In order to distinguish the internal library logs from the `Application process` logs or from other library logs within same process, each library might need to reserve its own Context IDs system wide – at least when it shall be used by more than one `Application process`.

The length limits of the Context ID apply only to version-1 of the PRS LogAndTraceProtocol.

### 7.2.5 Context Description

Since the length of the Context ID can be quite short, an additional descriptive text must be provided. This Context description is passed as a string. The maximum length of the Context description is implementation dependent.

### 7.2.6 Initialization of the Logging framework

The Application ID and description are used to identify and to associate the provided logging information with the exact process. The log mode and sink information defines where the logging information is routed. Possible destinations are the console, the file system or the communication bus.

From the *Application process*' perspective, the *Logging framework* is initialized and a logger instance is created when an *Application process* decides to register a logging context. These contexts are used to logically cluster logging information.

**[SWS\_LOG\_00002]{DRAFT}** [In case of any errors occurring inside the *Logging framework* or underlying system, it is intended to not bother the *Application process* and silently discard the function calls. For this purpose, the relevant interfaces neither specify return values nor throw exceptions.](*RS\_LT\_00003*)

**[SWS\_LOG\_00004]{DRAFT}** [The *Logging framework* shall be initialized if the Executable has a *PortPrototype* that is typed by a *LogAndTraceInterface*.](*RS\_LT\_00003*, *RS\_LT\_00047*, *RS\_LT\_00048*)

**[SWS\_LOG\_00005]** [The function `ara::log::CreateLogger` shall create a `ara::log::Logger` instance internally inside the *Logging framework* and return it as reference to the using application. Before a *Log message* can be processed, at least one `ara::log::Logger` shall be available.](*RS\_LT\_00003*, *RS\_LT\_00050*)

**Note:**

This strong ownership relationship of contexts to the *Logging framework* ensure correct housekeeping of the involved resources. The design rationale is, once a context is registered against the *Logging back-end*, its lifetime must be ensured until the end of the *Application process*.

**[SWS\_LOG\_00006]** [The call to `ara::log::CreateLogger` shall create a `ara::log::Logger` instance with the given context ID, context description, and log level threshold.](*RS\_LT\_00003*, *RS\_LT\_00050*)

**[SWS\_LOG\_00253]** [The call to `ara::log::CreateLogger` shall create a `ara::log::Logger` instance with the given context ID and context description, and a log level threshold that is taken from `DltLogSink.defaultLogThreshold` in the Manifest for the *DltLogSink* that corresponds to the given context ID. If no such entry exists in the Manifest, then `LogLevel::kWarn` shall be used.](*RS\_LT\_00003*, *RS\_LT\_00050*)

**[SWS\_LOG\_00254]** [The call to `ara::log::Logger::SetThreshold` shall set the loglevel threshold for the `ara::log::Logger` instance to the given level.](*RS\_LT\_00003*, *RS\_LT\_00050*)

**[SWS\_LOG\_00007]** [*Application processes* should be able to check if a desired *Log severity level* is configured through the function `ara::log::Logger::IsEnabled`. This mechanism conserves CPU and memory resources that are used during preparation of logging information, as this logging information is filtered by the *Logging framework* later on.](*RS\_LT\_00003*, *RS\_LT\_00045*)

### 7.3 Log Messages

Log messages can generally be output to different targets. The Log and Trace Functional Cluster supports these logging targets:

- the console
- a file on a local file system
- a network

Most of the discussion in this section assumes that messages are being output to a network, as this use case requires the additional consideration of minimizing network load.

The Log And Trace Functional Cluster offers two principal “classes” of log messages: *Modeled* and *Non-Modeled* messages. Both these support adding one or more “arguments” to a log message. A log message without any arguments serves no purpose and is discarded.

*Non-Modeled* messages are the traditional way of composing log messages: All arguments of the message are added to an internal message buffer and then eventually serialized for output, either to a console/file, or via network. All parts of the messages will be sent via network. In the DLT protocol, these messages are called “verbose” messages.

*Modeled* messages are designed to reduce traffic on the network, by omitting certain static (i.e. unchanging) parts of a message from the network. As the name suggests, these parts are instead added to the application ARXML model. In the DLT protocol, these messages are called “non-verbose” messages. A log message viewer application is able to display the full message by combining the static parts from the model with the dynamic parts from the received message.

Non-modeled messages are mainly used during development, as the information required for the modeled messages may not be available at that time. However, non-modeled messages can impose a high load on the network, making modeled messages usually the preferred choice in production systems.

The `ara::log` Functional Cluster supports defining and using both modeled and non-modeled messages in a single application at the same time.

**Exception safety:** All `Log*()` interfaces are designed to guarantee no-throw behavior. This applies for the whole [Logging API](#).

### 7.3.1 Non-modeled messages

The `ara::log` Functional Cluster defines a “Builder”-pattern inspired set of APIs for constructing non-modeled messages. The `ara::log::Logger::WithLevel` member function is used for creating a `ara::log::LogStream` object which is then subsequently filled with message content (i.e. message arguments). Alternatively to `ara::log::Logger::WithLevel`, there are also separate member functions for creating a `ara::log::LogStream` object, one per supported log level.

Arguments are added to a verbose message by calling an appropriate `operator<<` overload for the desired argument:

```
logger.WithLevel(LogLevel::kInfo) << "text" << 4.2;
```

The `ara::log` Functional Cluster defines such `operator<<` overloads for all C++ arithmetic types, for `bool`, for string types, and for a number of `ara::core` types. Application-defined data types can be logged as well, by providing suitable `operator<<` overloads for them.

Please note that there is no `operator<<` overload for `char`, as it might conflict with the overloads for `std::uint8_t` or `std::int8_t`. The behavior of logging a single `char` is therefore implementation-defined and will often, but not necessarily, output the ordinal value of the `char` as an integral value.

As a workaround, the `operator<<` overload for `ara::core::StringView` can be used in order to log a single-char string.

As the application model allows “annotating” arguments with attributes, the `ara::log` API for non-modeled messages also supports this. Arguments of certain types can be annotated with a “name” and possibly also a “unit” attribute. For instance:

```
1 logger.WithLevel(LogLevel::kInfo)
2   << Arg("text", "identifier")
3   << Arg(4.2, "velocity", "m/s");
```

The string argument “text” is annotated with a “name” attribute called “identifier”. The double argument 4.2 is annotated with a “name” attribute “velocity” and a “unit” of “m/s”. These attributes can only be set for some of the built-in types that the `ara::log` API supports, i.e. all arithmetic types, `bool`, strings, and raw data blobs.

Non-modeled messages can also contain information about the location of the log message call in source code. For this purpose, the member function `ara::log::LogStream::WithLocation` is called with the filename and line number of the call site. These should usually come from the compiler-defined `__FILE__` and `__LINE__` symbols:

```
1 logger
2   .WithLevel(LogLevel::kInfo)
3   .WithLocation(__FILE__, __LINE__) << ...;
```

These are easiest set via a macro-based frontend for `ara::log`, but no such macro has yet been defined in the Adaptive Platform.



**[SWS\_LOG\_00008]{DRAFT}** [To initiate a [Log message](#) with the Log level `Fatal`, the API `ara::log::Logger::LogFatal` shall be called. This API returns a `ara::log::LogStream` object that has to be used by passing arguments via the insert stream operator<<.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00009]{DRAFT}** [To initiate a [Log message](#) with the Log level `Error`, the API `ara::log::Logger::LogError` shall be called. This API returns a `ara::log::LogStream` object that has to be used by passing arguments via the insert stream operator<<.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00010]{DRAFT}** [To initiate a [Log message](#) with the Log level `Warning`, the API `ara::log::Logger::LogWarn` shall be called. This API returns a `ara::log::LogStream` object that has to be used by passing arguments via the insert stream operator<<.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00011]{DRAFT}** [To initiate a [Log message](#) with the Log level `Info`, the API `ara::log::Logger::LogInfo` shall be called. This API returns a `ara::log::LogStream` object that has to be used by passing arguments via the insert stream operator<<.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00012]{DRAFT}** [To initiate a [Log message](#) with the Log level `Debug`, the API `ara::log::Logger::LogDebug` shall be called. This API returns a `ara::log::LogStream` object that has to be used by passing arguments via the insert stream operator<<.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00013]{DRAFT}** [To initiate a [Log message](#) with the Log level `Verbose`, the API `ara::log::Logger::LogVerbose` shall be called. This API returns a `ara::log::LogStream` object that has to be used by passing arguments via the insert stream operator<<.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00130]{DRAFT}** [To write a Log message with a programmatically determined log level, the API `ara::log::Logger::WithLevel` shall be called.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

#### **Store LogStream objects in a variable:**

It is also possible to use the [Logging API](#) in an alternative way by storing a `ara::log::LogStream` object locally in some named variable. The difference to the temporary object is that it won't go out of scope already at the end of the statement, but stays valid and re-usable as long as the variable exists. Hence, it can be fed with data distributed over multiple lines of code. To get the message buffer processed by the [Logging framework](#), the `ara::log::LogStream::Flush` method needs to be called, otherwise the buffer will be processed when the object dies, i.e. when the variable goes out of scope, at the end of the function block.

#### **Performance remark:**

Due to the fact that a `ara::log::LogStream` is no longer created per message but rather could be re-used for multiple messages, the costs for this object creation is paid only once – per log level. How much this really influences the actual performance depends on the [Logging framework](#) implementation. However the main goal of this alternative usage of the [Logging API](#) is to get the multi-line builder functionality.

**Note:**

It is highly advised NOT to hold global `ara::log::LogStream` objects in multi-threaded `Applications`, because then concurrent access protection will no longer be covered by the `Logging API`.

**Usage examples:**

```
1 Logger& ctx0 = CreateLogger("CTX0", "Context Description CTX0");
2 ctx0.LogInfo() << "Some log information" << 123;

1 // Locally stored LogStream object will process the arguments
2 // until either Flush() is called or it goes out of scope from
3 // the block is was created
4 Logger& ctx1 = CreateLogger("CTX1", "Context Description CTX1");
5 LogStream localLogInfo = ctx1.LogInfo();
6 localLogInfo << "Some log information" << 123;
7 localLogInfo << "Some other information";
8 localLogInfo.Flush();
9 localLogInfo << "a new message..." << 456;
```

### 7.3.1.1 Message Tags

Arbitrary "message tags" can be set by calling the member function `ara::log::LogStream::WithTag` with an argument that is convertible to `ara::core::StringView`.

Multiple such tags can be added to a message; these tags will then be added to the message in the order of addition.

**Example:**

```
1 logger.WithLevel(LogLevel::kInfo)
2     .WithTag("filter1")
3     .WithTag("filter2")
4     << ...;
```

The length of a tag shall not exceed 255 characters. Only characters from the ASCII character set are allowed.

### 7.3.1.2 Conversion Functions

Sometimes it makes sense to represent integer numbers in hexadecimal or binary format instead of decimal format. Similarly, floating-point numbers often should appear with a certain precision.

For this purpose, it is possible to "annotate" numerical arguments with formatting hints. Viewer applications can use these hints in order to influence the appearance of the received numbers.

Formatting hints can be added with the generic `ara::log::Arg` decorator function, for instance:

```
1 mLog.LogInfo() << Arg(42, Hex());  
2 mLog.LogInfo() << Arg(43, Hex(4));
```

uses `ara::log::Hex` to add the “hint” to the message that this argument is supposed to be displayed as a hexadecimal value. The second line additionally adds the hint that the hexadecimal number should be displayed with four digits.

Other functions exist that allow to format as binary, decimal, or octal values, and to format floating-point values in different ways and with specific precisions.

It is the decision of the viewer application whether to heed these hints.

### 7.3.2 Modelled messages

The `ara::log` Functional Cluster defines a single member function `ara::log::Logger::Log` for sending modeled messages. Unlike the non-modeled message APIs, it represents a single-call interface, i.e. a single function call passes all arguments to the `ara::log::Logger` instance and performs all necessary actions to generate and send the message.

This has the advantage that the runtime cost for a modeled message that is eventually not being output (because the message’s log level does not reach the configured log level threshold) can be made very small: after parameter passing and function call, a single `if` clause checks the log level threshold and immediately returns if the threshold is not reached. This contrasts with the non-modeled message APIs, where multiple function calls are performed for constructing a message object, even if that is then eventually discarded.

**[SWS\_LOG\_00240]{DRAFT}** [If the API `ara::log::Logger::Log` is called, the implementation shall use the `DltMessage` that corresponds to the parameter `MsgId`.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00241]{DRAFT}** [The given argument types shall be verified during compile time and a compile error shall be raised if they do not match to the modeled message argument types .] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00242]{DRAFT}** [If the configuration item `DltLogSink.nonVerboseMode` is false, all (modeled) `DltMessages` sent to this `DltLogSink` shall be composed as verbose messages. Otherwise, non-verbose messages shall be composed.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

#### 7.3.2.1 Log message model

All modeled messages are defined as `DltMessages`, which are aggregated by a `LogAndTraceMessageCollectionSet`. Each `DltMessage` contains a `messageId`,

which needs to be unique within an ECU, and the `messageTypeInfo` denoting the log level, and optionally the `messageSourceFile` and `messageLineNumber`. The `DltMessage` aggregates an ordered list of `DltArguments`, which in turn aggregate `SwDataDefProps` in the role `networkRepresentation`. The name of a log message argument is taken from the `shortName` of the `DltArgument`, while the type and unit are taken from the `SwDataDefProps`.

At design time it is possible to define an `Executable` with a `SwComponentPrototype` that has a `PortPrototype` typed by an `LogAndTraceInterface`. Such a `PortPrototype` is used to describe that the `SwComponentPrototype` is able to forward logging information onto the external Dlt Log Viewer. The `DltMessages` that are used by the `SwComponentPrototype` are collected in the `LogAndTraceMessageCollectionSet` that is referenced from the `PortPrototype`.

At deployment time a mapping of the `PortPrototype` typed by a `LogAndTraceInterface` to a `DltLogSink` is described with the `DltLogSinkToPortPrototypeMapping` that takes a `Process` of the `Executable` as context into account.

The `DltLogSink` is referenced by the `LogAndTraceInstantiation` that in turn is associated with the `DltEcu` that carries the `ecuId`. The `LogAndTraceInstantiation` itself defines with `sessionIdSupport` whether session IDs are used or not. The `DltLogSinkToPortPrototypeMapping` defines the `dltSessionId` and contains a reference to `DltContext` that defines the `contextId` and the corresponding `contextDescription`. The `Process` in which the `Executable` is executed is assigned with the `DltApplication` that defines the `applicationId` and the corresponding `applicationDescription`.

The `DltLogSink` defines with the `category` the type of the output sink: `DltLogSinkRemote`, `DltLogSinkDlt`, `DltLogSinkFile`, `DltLogSinkConsole`.

In case the `DltLogSink` has the category `DltLogSinkRemote` to provide means to forward logging information to a Dlt log channel the `logChannelId` is defined. In case the `DltLogSink` has the category `DltLogSinkDlt` to provide means to forward logging information onto on a specific VLAN the `endpointConfiguration` is defined in addition to `logChannelId`. The `nonVerboseMode` describes whether the modeled messages will be sent as verbose messages as if they were non-modeled messages. In case the `DltLogSink` has the category `DltLogSinkFile` to provide means to forward logging information to a file in path of a file system a `path` is defined. In case the `DltLogSink` has the category `DltLogSinkConsole` to provide means to forward logging information the console the `bufferOutput` attribute defines whether a buffer is used or not.

In case `DltLogSink.segmentationSupported` is enabled, the messages shall use the segmentation information to segment the log messages when they are larger than the MTU of the Ethernet connection.

To create a `ara::log::Logger`, the application has to call `ara::log::CreateLogger` with the `ara::core::InstanceSpecifier` derived from the manifest (a

shortName path from the Executable to a [PortPrototype](#) or a mapping derived from [FunctionalClusterInteractsWithFunctionalClusterMapping](#)).

**[SWS\_LOG\_00251]{DRAFT}** [When [ara::log::CreateLogger](#) is called with [ara::core::InstanceSpecifier](#) as a parameter, the CtxID, AppID, Ecu ID and session ID shall be taken from the model and connections to logging sinks shall be created for the returned [ara::log::Logger](#) object. The InstanceSpecifier presents a [PortPrototype](#) typed by [LogAndTraceInterface](#) or [ServiceInterface](#) according to [constr\\_5286](#), [constr\\_5287](#).] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00257]{DRAFT}** [If the [ara::log::Logger::Log](#) function is called on an instance of [ara::log::Logger](#) that has no connection to the model, the call shall be ignored.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**Note:** Such an unconnected [ara::log::Logger](#) instance can be obtained, for example, from a call to [ara::log::CreateLogger](#)

### 7.3.2.2 ara::log Modeled Message Generation Principle

This chapter specifies those C++ header files used directly for modeled messages in an Adaptive Application. As part of the Adaptive Platform Methodology, these C++ header files are generated by a workflow tool (ara::log Modeled Message Generator) directly from the [LogAndTraceMessageCollectionSet](#) and [DltLogSink](#) ARXML configuration as the implementation of type and variable definitions representing modeled messages.

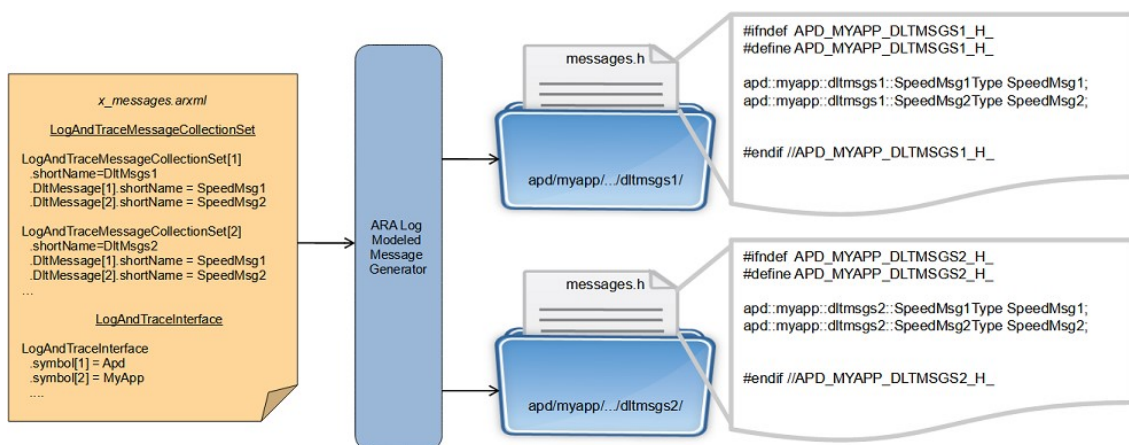


Figure 7.2: ara::log Modeled Message Generator

### 7.3.2.2.1 Header file directory structure

#### [SWS\_LOG\_00244]{DRAFT} Modeled message header files directory structure

[The modeled message header files defined by [SWS\_LOG\_00245] shall be located within the folder

```
1 <namespace [0]>/<namespace [1]>/.../<namespace [n]>/<name>/
```

where:

```
1 <namespace [0]> ... <namespace [n]>
```

are the namespace names as defined in `LogAndTraceInterface`, converted to lower case, and `<name>` is `LogAndTraceMessageCollectionSet.shortName`, converted to lower case.

|(RS\_LT\_00003, RS\_LT\_00049)

### 7.3.2.2.2 Modeled message header file

**[SWS\_LOG\_00245]{DRAFT} Modeled Message header file name** [The modeled message header file shall use the file name `messages.h`.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00246]{DRAFT} Modeled Message header file existence** [One `LogAndTraceMessageCollectionSet` shall correspond with one modeled message header file.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00247]{DRAFT} Inclusion of modeled messages** [The symbols defining the modeled messages of one `LogAndTraceMessageCollectionSet` shall be made exclusively available in the header file defined in [\[SWS\\_LOG\\_00245\]](#), [\[SWS\\_LOG\\_00246\]](#).] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

Namespaces are used to separate the symbols defined based on `LogAndTraceMessageCollectionSet` from each other to prevent name conflicts and they allow to use reasonably short names.

### 7.3.2.2.3 Contents in the modeled message header file

The modeled message header file contains `constexpr` variable definition and corresponding type definition for the parameters of the API `ara::log::Logger::Log`, and those definitions are defined inside user-defined namespaces to avoid variable or type name collision.

**[SWS\_LOG\_00248]{DRAFT} Namespaces in the modeled message header files** [Based on the symbol attributes of the ordered `SymbolProps` aggregated by `LogAndTraceInterface` and `LogAndTraceMessageCollectionSet.shortName` in role namespace, the C++ namespace of the modeled message header file shall be:

```

1 namespace <LogAndTraceInterface.namespace[0].symbol> {
2 namespace <LogAndTraceInterface.namespace[1].symbol> {
3 namespace <...> {
4 namespace <LogAndTraceInterface.namespace[n].symbol>{
5 namespace <LogAndTraceMessageCollectionSet.shortName>{
6 ...
7 } // namespace <LogAndTraceMessageCollectionSet.shortName>
8 } // namespace <LogAndTraceInterface.namespace[n].symbol>
9 } // namespace <...>
10 } // namespace <LogAndTraceInterface.namespace[1].symbol>
11 } // namespace <LogAndTraceInterface.namespace[0].symbol>

```

with all namespace names converted to lower-case letters.] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

#### Note:

In order to avoid name collisions between types and variables of different `LogAndTraceMessageCollectionSet` in situation where the different `LogAndTraceMessageCollectionSet` carry the same `shortName`, it is highly recommended to place

different `LogAndTraceMessageCollectionSet` into dedicated unique C++ namespaces. This is achieved by attaching corresponding ordered `SymbolProps` to the `LogAndTraceMessageCollectionSet` where the ordered `SymbolProps` differ in at least one of their symbol attributes.

**[SWS\_LOG\_00249]{DRAFT} Modeled message header files multiple inclusion guard** [The `ara::log` Modeled Message Generator shall generate a multiple inclusion guard around the whole header file in each modeled message header file according to the format:

```

1 #ifndef <path>_H_
2 #define <path>_H_
3 ...
4 #endif // <path>_H_
    
```

where `<path>` is the relative path of the header file according to [SWS\_LOG\_00244] up to but omitting the file extension, with all path components separated by an underscore ("`_`"), converted to upper-case letters.

] ([RS\\_LT\\_00003](#), [RS\\_LT\\_00049](#))

**[SWS\_LOG\_00250]{DRAFT} Implementation of `DltMessage`** [For each `DltMessage`, the modeled message header file shall contain the following `DltMessage` variable definition in the same namespace:

```

constexpr static <DltMessageName>Type <DltMessageName>;
where:
<DltMessageName> is DltMessage.shortName.
<DltMessageName>Type is an implementation-defined data type for DltMessage.]
(RS\_LT\_00003, RS\_LT\_00049)
    
```

### 7.3.2.3 Usage

To use modeled messages, an ARXML file can be used for generating header files which include `constexpr` variables within corresponding namespaces.

For instance, if the ARXML representation of the manifest contains the following:

```

<AR-PACKAGES>
<AR-PACKAGE>
  <SHORT-NAME>AUTOSAR</SHORT-NAME>
  <ELEMENTS>
    <LOG-AND-TRACE-INTERFACE>
      <SHORT-NAME>LogAndTraceInterface</SHORT-NAME>
      <NAMESPACES>
        <SYMBOL-PROPS>
          <SHORT-NAME>apd</SHORT-NAME>
          <SYMBOL>apd</SYMBOL>
        </SYMBOL-PROPS>
        <SYMBOL-PROPS>
          <SHORT-NAME>myapp</SHORT-NAME>
          <SYMBOL>myapp</SYMBOL>
      
```



```

        </SYMBOL-PROPS>
    </NAMESPACES>
</LOG-AND-TRACE-INTERFACE>
<ADAPTIVE-APPLICATION-SW-COMPONENT-TYPE>
    <SHORT-NAME>DltMessage_SWC</SHORT-NAME>
    <PORTS>
        <R-PORT-PROTOTYPE>
            <SHORT-NAME>DltMessages_RPort</SHORT-NAME>
            <REQUIRED-INTERFACE-TREF DEST="LOG-AND-TRACE-INTERFACE"/>/AUTOSAR/
                LogAndTraceInterface</REQUIRED-INTERFACE-TREF>
        </R-PORT-PROTOTYPE>
    </PORTS>
</ADAPTIVE-APPLICATION-SW-COMPONENT-TYPE>
<LT-MESSAGE-COLLECTION-TO-PORT-PROTOTYPE-MAPPING>
    <SHORT-NAME>DltMessages_Mapping</SHORT-NAME>
    <LOG-AND-TRACE-MESSAGE-COLLECTION-SET-REF DEST="LOG-AND-TRACE-MESSAGE-
        -COLLECTION-SET"/>/AUTOSAR/DltMessages</LOG-AND-TRACE-MESSAGE-
        COLLECTION-SET-REF>
    <R-PORT-PROTOTYPE-REF DEST="R-PORT-PROTOTYPE"/>/AUTOSAR/DltMessage_SWC
        /DltMessages_RPort</R-PORT-PROTOTYPE-REF>
</LT-MESSAGE-COLLECTION-TO-PORT-PROTOTYPE-MAPPING>
<LOG-AND-TRACE-MESSAGE-COLLECTION-SET>
    <SHORT-NAME>DltMessages</SHORT-NAME>
    <DLT-MESSAGES>
        <DLT-MESSAGE>
            <SHORT-NAME>SpeedMsg</SHORT-NAME>
            <DLT-ARGUMENTS>
                <DLT-ARGUMENT>
                    <SHORT-NAME>Velocity</SHORT-NAME>
                    <LENGTH>1</LENGTH>
                    <NETWORK-REPRESENTATION>
                        <SW-DATA-DEF-PROPS-VARIANTS>
                            <SW-DATA-DEF-PROPS-CONDITIONAL>
                                <BASE-TYPE-REF DEST="SW-BASE-TYPE"/>/AUTOSAR/StdTypes/
                                    double</BASE-TYPE-REF>
                                <UNIT-REF DEST="UNIT"/>/AUTOSAR/PhysicalUnits/
                                    Units_Blueprint/NoUnit</UNIT-REF>
                            </SW-DATA-DEF-PROPS-CONDITIONAL>
                        </SW-DATA-DEF-PROPS-VARIANTS>
                    </NETWORK-REPRESENTATION>
                </DLT-ARGUMENT>
            </DLT-ARGUMENTS>
            <MESSAGE-LINE-NUMBER>0</MESSAGE-LINE-NUMBER>
            <MESSAGE-SOURCE-FILE>source_file_path</MESSAGE-SOURCE-FILE>
            <MESSAGE-TYPE-INFO>DLT_TRACE_STATE</MESSAGE-TYPE-INFO>
        </DLT-MESSAGE>
    </DLT-MESSAGES>
</LOG-AND-TRACE-MESSAGE-COLLECTION-SET>
</ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>

```

and the source code contains this code sequence:

```

1 #include "ara/log/logger.h"
2 #include "apd/myapp/dltmessages/messages.h"

```

```

3
4 double value= 2.3;
5 Logger& logger = ...
6 logger.Log(apd::myapp::dltmessages::SpeedMsg, value);

```

then the `DltMessage` definition will be generated in a given namespace, `apd::myapp::dltmessages`. For each `LogAndTraceMessageCollectionSet`, an own header file will be generated, like `apd/myapp/dltmessages/messages.h`. The framework will define a global `constexpr` variable called `SpeedMsg` within the namespace `apd::myapp::dltmessages` in the header file. This variable contains knowledge about the message's modeled aspects, such as parameter types and log level, allowing the `ara::log` implementation to verify that the number and types of parameters given to `ara::log::Logger::Log` matches the model of the particular message.

For using modeled messages, it is necessary to explicitly include the header file for the corresponding `LogAndTraceMessageCollectionSet`. In the example above, it is `apd/myapp/dltmessages/messages.h`.

### 7.3.2.4 Customizing message properties

Certain properties can be customized for an individual modeled message, by using the separate API `ara::log::Logger::LogWith` that allows to add attributes to a modeled message. For instance:

```

1 logger.LogWith(std::make_tuple(Location(FILE, LINE)), SpeedMsg, 4.2);

```

Supported attributes are:

Location: file identifier and line number of the location where the log message is being sent, similar to `ara::log::LogStream::WithLocation`

Tag: Arbitrary message tag, similar to `ara::log::LogStream::WithTag`

## 7.4 Segmentation

L&T module decides based on the knowledge of the lower layer frame length, whether segmentation needs to be used. (case: usage of segmentation for shorter frames needs not to be considered). Overall length of segmented messages is limited to  $< 2^{48}$  bytes (i.e. 16bit header length \* 32bit sequence).

Proposal for the segmentation header: (no handshake needed)

- FrameType (8bit): FirstFrame, ConsecutiveFrame, LastFrame, AbortFrame;
- TotalLength (64bit), only with FirstFrame;
- SequenceCounter (32bit), only with ConsecutiveFrame;

- - AbortReason (8bit), only with AbortFrame;

LastFrame indicates successful transmission of the whole message. Successful reception can be assumed if the accumulated length of the data contained in the segmented frames equals the TotalLength of the FirstFrame. In the BaseHeader the HeaderType (HTYP2).Bit 11 shall be reserved for the SegmentationHeader (WS = With Segmentation). In the ExtensionHeader the length field of the SegmentationHeader will depend on the FrameType;

## 7.5 Log and Trace Timestamp

The [Log and Trace](#) information is transmitted by means of the [LT protocol](#) which is bus agnostic.

This protocol offers the possibility to include a timestamp in each sent message, as long as such messages are sent with an extended header (refer to [\[7\]](#) for more information).

The synchronized time base is supplied by the Time Synchronization [Functional Cluster](#). The `now()` method is used by the [Adaptive Applications](#) in order to retrieve the current time from the TS (refer to [\[8\]](#) for more information).

According to the requirement [\[TPS\\_MANI\\_03162\]](#), the reference time base is derived from the machine manifest [timeBaseResource](#).

**[SWS\_LOG\_00082]** [[Log and Trace](#) should have access to a synchronized time base. The attribute [timeBaseResource](#) in [LogAndTraceInstantiation](#) shall be used to identify the time base.]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00083]** [If the time base resource is referenced by the Log and Trace module in the manifest configuration [LogAndTraceInstantiation.timeBaseResource](#), the current timestamp information shall be included in each DLT message, otherwise not.]([RS\\_LT\\_00003](#), [RS\\_LT\\_00017](#))

**[SWS\_LOG\_00091]{DRAFT}** [When the `CreateLogger()` function is called, [Log and Trace](#) shall send a message, "local time base used" in case the used time base is a local time base or "global time base used" in case the used time base is a globally synchronized time base.

]([RS\\_LT\\_00003](#))

## 7.6 Log and Trace data loss prevention

[SWS\_LOG\_00095]{DRAFT} [When [Log and Trace](#) receives simultaneously a high load of trace information generated by multiple [Adaptive Applications](#), it shall buffer this data internally to prevent the data loss during its continuous transmission.]  
([RS\\_LT\\_00003](#), [RS\\_LT\\_00030](#))

## 7.7 Tracing

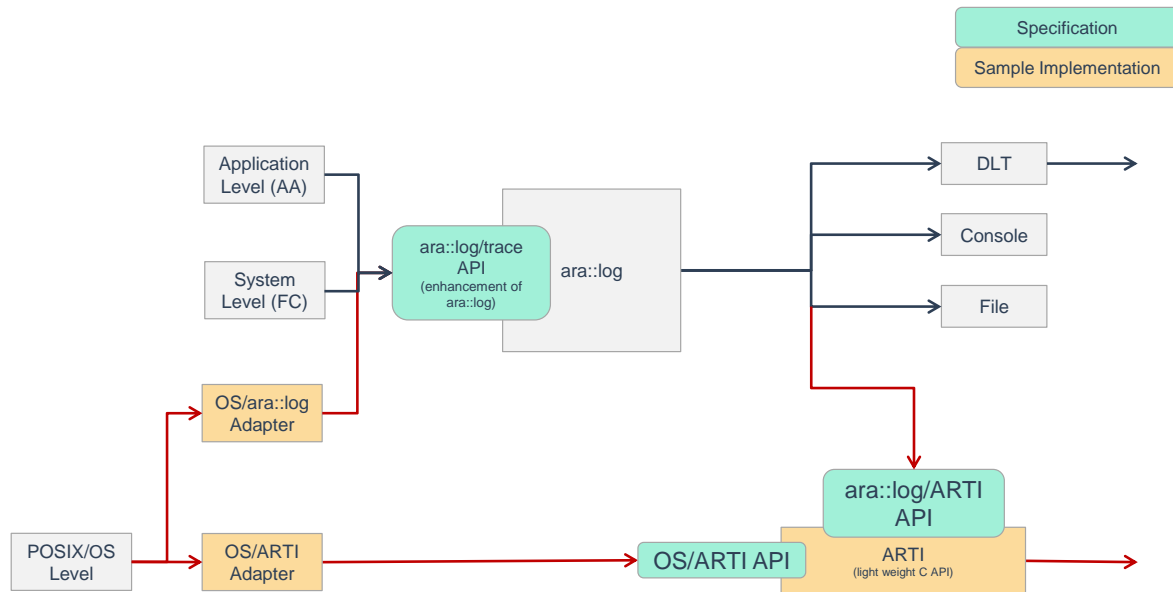
Tracing is crucial for a successful and effective application development and is needed, for determination of the timing behavior of their Applications. Tracing of the behavior of the Adaptive Platform and of Adaptive Applications has paramount advantage when analyzing information flow for numerous reasons, from debugging to measuring communication latencies to profiling different communication events.

Log & Trace introduces an overhead in the application. This overhead may influence the behavior of the application and uses resources as memory, execution time etc. On the other hand there are different uses cases during development of an application and running the application in the field. Thus sometimes it is necessary to log as many data as possible while the resources don't matter and sometimes the used resources have to be as little as possible. To achieve different goals, the different configurations of the Log & Trace should be considered. These configurations include:

- Precompile configuration,
- Static configuration,
- Dynamic configuration.

The precompile configuration configures the Log & Trace that none or minimal runtime overhead does exist in the application. Dedicated trace points can be enabled or disabled before the building of the application. Even so it is possible to configure trace points to use special trace capabilities of the environment. This guarantees minimal runtime overhead during the tweaking performance of the system. The static configuration is part of the deployed application. Certain configuration items i.e. the Log & Trace sinks that are not changeable when the application is running. Checks or initialization is done once when the application is started. The dynamic configuration introduces the most overhead because the checks or initialization has to be done each time a Log & Trace is called.

The trace methods are integrated in the `ara::log` Functional Cluster. For AUTOSAR applications the trace is identical to the use of the API for modeled messages. This chapter specifies internal handling of the trace to provide a clear interface between the AUTOSAR stack vendor and the trace tool vendor. It further shows special adaptations and specifies the configuration of the [ARTI-trace](#).



**Figure 7.3: Overview of Tracing**

### 7.7.1 OS/ara::log Adapter

The OS/ara::log Adapter adapts the trace functionality of the operating system to ara::log. Typically this adapter may be implemented as an additional daemon that maps kernel trace events to ara::log messages. This consumes runtime resources but provides the full flexibility of ara::log. The OS/ara::log Adapter is specified in [9, SWS OperatingSystemInterface] chapter OS/ara::log Adapter.

### 7.7.2 Precompile configuration of ara::log/Trace

The ara::log/Trace is configured with precompile configuration to allow only minimal or no overhead in the running application. Tracing with ara::log/Trace uses modeled messages to signal events.

From application side the tracing is identical to logging modeled messages. The modeled messages and its parameters are arguments of the modeled logging API:

```

1 template< typename MsgId, typename ... Params >
2   Log(const MsgId& msg_id, const Params& ...params) noexcept;
    
```

Based on the Executable.traceSwitchConfiguration and the MsgId the messages are further provided to the logger or/and to ara::log::ext::TraceArti. If only ara::log::ext::TraceArti is configured, then this message can be used for performance measurement without the overhead of log. If only log is configured, or if

a message is not configured for tracing, then the message is provided directly to the logger.

**[SWS\_LOG\_20001]{DRAFT}** [Modeled messages shall be routed to the logger if `Executable.traceSwitchConfiguration` is configured to `traceSwitchLog` for that message or if there is no entry in `Executable.traceSwitchConfiguration` for that message. The evaluation of routing shall be done at compile time.] ([RS\\_LT\\_00059](#), [RS\\_LT\\_00060](#), [RS\\_LT\\_00061](#), [RS\\_LT\\_00062](#))

**[SWS\_LOG\_20002]{DRAFT}** [Modeled messages shall be routed to `ara::log::ext::TraceArti` if `Executable.traceSwitchConfiguration` is configured to `traceSwitchArti` for that message. The evaluation of routing shall be done at compile time.] ([RS\\_LT\\_00059](#), [RS\\_LT\\_00060](#), [RS\\_LT\\_00061](#), [RS\\_LT\\_00062](#))

**[SWS\_LOG\_20003]{DRAFT}** [Modeled messages shall be routed to `ara::log::ext::TraceArti` and to the logger if `Executable.traceSwitchConfiguration` is configured to `traceSwitchArtiAndLog` for that message. The evaluation of routing shall be done at compile time.] ([RS\\_LT\\_00059](#), [RS\\_LT\\_00060](#), [RS\\_LT\\_00061](#), [RS\\_LT\\_00062](#))

**[SWS\_LOG\_20004]{DRAFT}** [Modeled messages shall be discarded if `Executable.traceSwitchConfiguration` is configured to `traceSwitchNone` for that message. The evaluation of routing shall be done at compile time.] ([RS\\_LT\\_00059](#), [RS\\_LT\\_00060](#), [RS\\_LT\\_00061](#), [RS\\_LT\\_00062](#))

If any message has to be routed the `ara::log::ext::TraceArti`, then the header file `trace_arti_spec.h` has to be included there. `trace_arti_spec.h` contains the generated specialization of `ara::log::ext::TraceArti`. `trace_arti_spec.h` is located in the directory of the generated modeled messages.

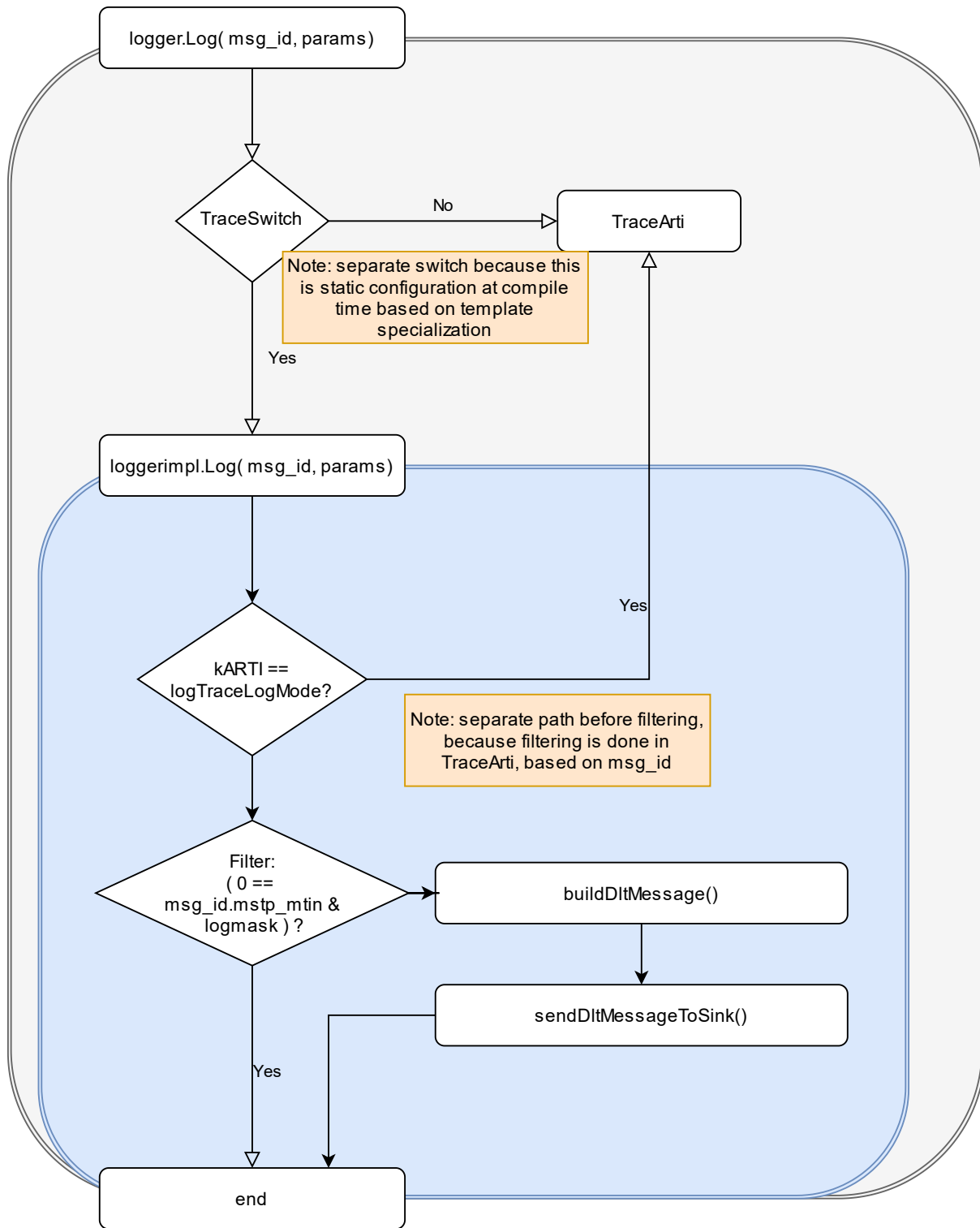
The base template function

```
1 template< typename MsgId, typename ... Params >
2     void TraceArti( const MsgId& msg_id, const Params& ...params ) noexcept
3 {
4 }
```

is declared in `ara/log/trace_arti.h`.

The specializations of the function `ara::log::ext::TraceArti` are generated by the code generator of the trace tool vendor. These generated functions are based on the configuration of the trace tool. The generated header file is named `trace_arti_spec.h` and is located where the header files of the modeled messages are located. Specializations of `ara::log::ext::TraceArti` are used to adapt the API to the capabilities of the used trace tool. For example, the basic trace features of the system like `LTTNG` can also serve as "trace tool".

Example message routing for minimal overhead can be achieved with the decorator pattern and template specialization. Hereby the `ara::log::Logger` decorates the `LoggerImpl`:



**Figure 7.4: Example program flow of ara::log/Trace**

The program flow is as follows: The application or functional cluster calls `logger.Log()`. This forwards the message to `TraceSwitch()`, which is a `MsgId` based, compile-time filter that forwards the call to the trace implementation of the trace tool (`ara::log::ext::TraceArti`) and/or to the log implementation



(`LoggerImpl.Log()`), depending on the configuration. The entire switching is based on template specialization and is done at compile time. It does not cost any runtime.

The following example of the `ara::log::Logger` implementation for modeled messages uses `ara::log::ext::TraceArti` to trace to ARTI, and `LoggerImpl` to log to the standard log path. `MsgId` is generated out of the message model.

```

1 class LoggerImpl // the decorated logger
2 {
3     public:
4     template< typename MsgId, typename ... Params >
5         void Log(const MsgId& msg_id, const Params& ... params) noexcept
6     {
7         // .... do the dlt logging here
8     }
9 };
10
11 class Logger // the decoration
12 {
13     // all other functions are forwarded to the decorated m_impl
14     public:
15     template< typename MsgId, typename ... Params >
16         void Log(const MsgId& msg_id, const Params& ...params) noexcept
17     {
18         TraceSwitch( m_impl, msg_id, params ... );
19     }
20     private:
21     LoggerImpl m_impl; // the decorated class
22 };

```

The decorated `logger.Log()` calls the `TraceSwitch` function template.

```

1 template< typename MsgId, typename ... Params >
2     void TraceSwitch( LoggerImpl& logger, const MsgId& msg_id,
3         const Params& ...params ) noexcept;
4     {
5         // by default (no specialization) the decorated logger is called
6         logger.Log( msg_id, params ... );
7     }
8
9 // specialized with ExecutionManagerProcessStateChangeMsgType
10 template< typename ... Params >
11     void TraceSwitch( LoggerImpl& logger,
12         const ExecutionManagerProcessStateChangeMsgType&
13         msg_id,
14         const Params& ...params ) noexcept
15     {
16         TraceArti( msg_id, params... );
17     }

```

In case of `ExecutionManagerProcessStateChangeMsgType` the `TraceSwitch` calls the specified `ara::log::ext::TraceArti`.

`TraceSwitch` is used to configure the routing of the message at compile time, based on its type. This allows to configure the routing for each message separately, which gives the possibility to route messages based on use case, e.g. performance measurement.

The `TraceSwitch` is generated by the code generator of the AUTOSAR-Stack vendor. The generated header file should be located in the same directory where the modeled messages are located.

### 7.7.3 Static configuration of `ara::log/Trace`

Modeled `ara::log` messages can be routed to ARTI trace as additional log sink beside console, file and network. This allows the trace to be configured statically. The ARTI trace can be switched on and off without recompiling the application.

**[SWS\_LOG\_20005]{DRAFT}** [When `DltLogChannel.logTraceLogMode` is set to `kArti`, then the `ara::log::Logger::Log` shall call `ara::log::ext::TraceArti` with all variadic parameters.]([RS\\_LT\\_00059](#), [RS\\_LT\\_00060](#), [RS\\_LT\\_00061](#), [RS\\_LT\\_00062](#))

The call of `ara::log::ext::TraceArti` should be done before the message is being formatted or filtered by the verbosity because the filtering for ARTI is done by the generated `ara::log::ext::TraceArti` or by the trace tool itself.

## 7.8 Output Bindings

### 7.8.1 Overview

`Log and Trace` has built-in support for console output and file output. In addition to that, it supports a “remote” backend, which represents a network-based sink. A typical choice on an AUTOSAR Machine is the `LT protocol`, but other backends can also be supported by vendors.

This section defines the mapping of the abstract `ara::log` API to such backends.

### 7.8.2 Console binding

#### 7.8.2.1 General

The console output binding is set by using the value `DLT_LOGSINK_CONSOLE` for a `DltLogSink` referenced by `LogAndTraceInstantiation`.

Please note that many aspects of the console output are currently implementation-defined. This includes, for instance, the general layout of messages, the format of timestamps, and which elements from the DLT message header are being output at all.

**[SWS\_LOG\_00227] Newline addition in console output** [The `Logging framework` shall append an EOL sequence to each message in console output.]([RS\\_LT\\_00002](#))

### 7.8.2.2 Message arguments

**[SWS\_LOG\_00228] Argument separation in console output** [When a message contains more than one payload argument, any two payload arguments shall be separated by a single space character (U+0020) in console output.] ([RS\\_LT\\_00002](#))

Example: A log call such as:

```
mLog.LogInfo() << "speed" << 4.1 << "m/s";
```

will result in this output:

```
... speed_4.1_m/s
```

where each “\_” represents a single space character.

**[SWS\_LOG\_00229] Display of argument attributes in console output** [If a payload argument contains a “name” attribute, then the “name” attribute shall be prepended to the argument value, and separated from the value with a colon character (U+003a). If a payload argument contains a “unit” attribute, then the “unit” attribute shall be appended to the argument value, and separated from the value with a colon character (U+003a) as well.] ([RS\\_LT\\_00056](#), [RS\\_LT\\_00002](#))

Example: `speed:42.1:km/h`, where “speed” is the value of the “name” attribute, and “km/h” is the value of the “unit” attribute

The following subsections details how the data types that are supported by the `ara::log` API are being represented in console output.

#### 7.8.2.2.1 bool

**[SWS\_LOG\_00230] Console output of bool values** [A message argument value of `bool` type shall be output to console as the string “0” (U+0030) for `false`, or “1” (U+0031) for `true`.] ([RS\\_LT\\_00002](#))

#### 7.8.2.2.2 ara::core::Span<const ara::core::Byte>

**[SWS\_LOG\_00231] Console output of raw binary data** [A message argument value of type `ara::core::Span<const ara::core::Byte>` shall be output to console as a sequence of hexadecimal octets separated by apostrophe characters (U+0027).] ([RS\\_LT\\_00002](#))

Example: `48'65'6c'6f`

### 7.8.2.2.3 InstanceSpecifier

**[SWS\_LOG\_00232] Console output of InstanceSpecifier values** [A message argument value of type `ara::core::InstanceSpecifier` shall be output to console as the result of calling `InstanceSpecifier::ToString`.] ([RS\\_LT\\_00002](#))

### 7.8.2.2.4 std::chrono::duration

**[SWS\_LOG\_00233] Console output of std::chrono::duration values** [A message argument value of type `std::chrono::duration` shall be output to console as a decimal integer value, followed by the duration's unit in SI notation, for at least these unit dimensions: `std::nano`, `std::micro`, `std::milli`, `std::centi`, `std::deci`, `std::ratio<1>`, `std::deca`, `std::hecto`, `std::kilo`, `std::mega`, `std::giga`.] ([RS\\_LT\\_00002](#))

*Note: The SI metric prefix for "micro" may be "μ" or simply "u".*

Example: 42ns

## 7.8.3 File binding

The file output binding is set by using the value `DLT_LOGSINK_FILE` for a `DltLogSink` referenced by `LogAndTraceInstantiation`.

The appearance of the "file" output is currently implementation-defined.

## 7.8.4 DLT binding

### 7.8.4.1 General

An output binding for the DLT protocol is set by using the value `DLT_LOGSINK_NETWORK` or `DLT_LOGSINK_DLT` for a `DltLogSink` referenced by `LogAndTraceInstantiation`.

### 7.8.4.2 Log level

The `LT protocol` supports the exact same log levels as `ara::log` does. There is therefore a 1:1 mapping of `ara::log` log levels to `LT protocol` log levels.

**[SWS\_LOG\_00234] Translation of log levels** [A log level attribute of a `DltMessage` shall be translated into the `LT protocol` log level with the same name.] ([RS\\_LT\\_00002](#))

### 7.8.4.3 Message arguments

The following subsections details how the data types that are supported by the `ara::log` API are being represented in the [LT protocol](#).

#### 7.8.4.3.1 bool

**[SWS\_LOG\_00235] DLT output of bool values** [A message argument of `bool` type shall be output as a DLT message payload argument of type `BOOL`.] ([RS\\_LT\\_00002](#))

#### 7.8.4.3.2 string types

**[SWS\_LOG\_00236] DLT output of string values** [A message argument of type `const char*` or `ara::core::StringView` shall be output as a DLT message payload argument of type `STRG`, with `TYFM` set to UTF-8 encoding.] ([RS\\_LT\\_00025](#), [RS\\_LT\\_00002](#))

#### 7.8.4.3.3 ara::core::Span<const ara::core::Byte>

**[SWS\_LOG\_00237] DLT output of raw binary data** [A message argument of type `ara::core::Span<const ara::core::Byte>` shall be output as a DLT message payload argument of type `RAWD`.] ([RS\\_LT\\_00002](#))

#### 7.8.4.3.4 InstanceSpecifier

**[SWS\_LOG\_00238] DLT output of InstanceSpecifier values** [A message argument of type `InstanceSpecifier` shall be output as a DLT message payload argument of type `STRG`, with `TYFM` set to UTF-8 encoding, consisting of the result of calling `InstanceSpecifier::ToString`.] ([RS\\_LT\\_00002](#))

## 8 API specification

### 8.1 API Common Data Types

#### 8.1.1 LogLevel

[SWS\_LOG\_00018]{DRAFT} Definition of API enum `ara::log::LogLevel` [

|                                |   |   |
|--------------------------------|---|---|
| <b>Kind:</b>                   | enumeration                               |   |
| <b>Header file:</b>            | #include "ara/log/common.h"               |   |
| <b>Forwarding header file:</b> | #include "ara/log/log_fwd.h"              |   |
| <b>Scope:</b>                  | namespace <code>ara::log</code>           |   |
| <b>Symbol:</b>                 | LogLevel                                  |   |
| <b>Underlying type:</b>        | std::uint8_t                              |   |
| <b>Syntax:</b>                 | enum class LogLevel : std::uint8_t {...}; |   |
| <b>Values:</b>                 | kOff= 0x00                                | No logging.   |
|                                | kFatal= 0x01                              | Fatal error, not recoverable.                               |
|                                | kError= 0x02                              | Error with impact to correct functionality.                 |
|                                | kWarn= 0x03                               | Warning if correct behavior cannot be ensured.              |
|                                | kInfo= 0x04                               | Informational, providing high level understanding.          |
|                                | kDebug= 0x05                              | Detailed information for programmers.                       |
|                                | kVerbose= 0x06                            | Extra-verbose debug messages (highest grade of information) |
| <b>Description:</b>            | List of possible severity levels .        |   |

]([RS\\_LT\\_00003](#))

#### 8.1.2 Format specifier

[SWS\_LOG\_00206] Definition of API enum `ara::log::Fmt` [

|                                |                                       |                                      |
|--------------------------------|---------------------------------------|--------------------------------------|
| <b>Kind:</b>                   | enumeration                           |                                      |
| <b>Header file:</b>            | #include "ara/log/logger.h"           |                                      |
| <b>Forwarding header file:</b> | #include "ara/log/log_fwd.h"          |                                      |
| <b>Scope:</b>                  | namespace <code>ara::log</code>       |                                      |
| <b>Symbol:</b>                 | Fmt                                   |                                      |
| <b>Underlying type:</b>        | std::uint16_t                         |                                      |
| <b>Syntax:</b>                 | enum class Fmt : std::uint16_t {...}; |                                      |
| <b>Values:</b>                 | kDefault= 0                           | implementation-defined formatting    |
|                                | kDec= 1                               | decimal (signed/unsigned)            |
|                                | kOct= 2                               | octal                                |
|                                | kHex= 3                               | hexadecimal                          |
|                                | kBin= 4                               | binary                               |
|                                | kDecFloat= 5                          | decimal float (like printf "%f")     |
|                                | kEngFloat= 6                          | engineering float (like printf "%e") |





|                     |   |   |
|---------------------|---|---|
|                     | kHexFloat= 7                                  | hex float (like printf "%a")                  |
|                     | kAutoFloat= 8                                 | automatic "shortest" float (like printf "%g") |
| <b>Description:</b> | Format specifiers for log message arguments . |   |

](RS\_LT\_00046)

### [SWS\_LOG\_00207] Definition of API class ara::log::Format [

|                                |   |
|--------------------------------|---|
| <b>Kind:</b>                   | struct  |
| <b>Header file:</b>            | #include "ara/log/logger.h"   |
| <b>Forwarding header file:</b> | #include "ara/log/log_fwd.h"  |
| <b>Scope:</b>                  | namespace ara::log  |
| <b>Symbol:</b>                 | Format  |
| <b>Syntax:</b>                 | struct Format final {...};  |
| <b>Description:</b>            | <p>A type holding a formatting hint.</p> <p>The interpretation of precision depends on fmt: For integral types (i.e. Fmt::kDec, Fmt::kOct, Fmt::kHex, Fmt::kBin), precision is interpreted as the minimum number of digits to output, similar to e.g. std::printf("%.7d"). For the floating-point specifiers Fmt::kDecFloat, Fmt::kEngFloat and Fmt::kHexFloat, precision denotes the exact number of digits to be shown after the decimal point; for Fmt::kAutoFloat, precision denotes the number of significant digits to be shown according to the rules of the std::printf "%g" specifier. If fmt is Fmt::kDefault, the precision field is ignored, and an implementation-defined formatting is applied. For integral types, if precision is 0, it is interpreted the same as if it was 1.</p> |

](RS\_LT\_00046)

### [SWS\_LOG\_00225] Definition of API variable ara::log::Format::fmt [

|                     |   |
|---------------------|---|
| <b>Kind:</b>        | variable                                |
| <b>Header file:</b> | #include "ara/log/logger.h"             |
| <b>Scope:</b>       | <a href="#">struct ara::log::Format</a> |
| <b>Symbol:</b>      | fmt                                     |
| <b>Type:</b>        | <a href="#">Fmt</a>                     |
| <b>Syntax:</b>      | Fmt fmt;                                |
| <b>Description:</b> | the format specifier                    |

](RS\_LT\_00046)

### [SWS\_LOG\_00226] Definition of API variable ara::log::Format::precision [

|                     |   |
|---------------------|---|
| <b>Kind:</b>        | variable                                |
| <b>Header file:</b> | #include "ara/log/logger.h"             |
| <b>Scope:</b>       | <a href="#">struct ara::log::Format</a> |
| <b>Symbol:</b>      | precision                               |
| <b>Type:</b>        | std::uint16_t                           |
| <b>Syntax:</b>      | std::uint16_t precision;                |
| <b>Description:</b> | the precision to use                    |

](RS\_LT\_00046)

For convenience, there are helper functions to create specific instances of `struct Format`; these should generally be used instead of creating `Format` instances manually.

### [SWS\_LOG\_00208] Definition of API function `ara::log::Dflt` [

|                          |  |                                |
|--------------------------|--|--------------------------------|
| <b>Kind:</b>             | function   |                                |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                                |
| <b>Scope:</b>            | namespace <code>ara::log</code>  |                                |
| <b>Symbol:</b>           | <code>Dflt()</code>  |                                |
| <b>Syntax:</b>           | <code>constexpr Format Dflt () noexcept;</code>  |                                |
| <b>Return value:</b>     | <code>Format</code>  | a <code>Format</code> instance |
| <b>Exception Safety:</b> | noexcept   |                                |
| <b>Description:</b>      | Create a <code>Format</code> instance with <code>Fmt::kDefault</code> formatting hint. |                                |

]([RS\\_LT\\_00046](#))

### [SWS\_LOG\_00211] Definition of API function `ara::log::Dec` [

|                          |  |                                |
|--------------------------|--|--------------------------------|
| <b>Kind:</b>             | function   |                                |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                                |
| <b>Scope:</b>            | namespace <code>ara::log</code>  |                                |
| <b>Symbol:</b>           | <code>Dec()</code>   |                                |
| <b>Syntax:</b>           | <code>constexpr Format Dec () noexcept;</code>   |                                |
| <b>Return value:</b>     | <code>Format</code>  | a <code>Format</code> instance |
| <b>Exception Safety:</b> | noexcept   |                                |
| <b>Description:</b>      | Create a <code>Format</code> instance with <code>Fmt::kDec</code> formatting hint and default precision. |                                |

]([RS\\_LT\\_00046](#))

### [SWS\_LOG\_00212] Definition of API function `ara::log::Dec` [

|                          |  |                                |
|--------------------------|--|--------------------------------|
| <b>Kind:</b>             | function   |                                |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                                |
| <b>Scope:</b>            | namespace <code>ara::log</code>  |                                |
| <b>Symbol:</b>           | <code>Dec(std::uint16_t precision)</code>  |                                |
| <b>Syntax:</b>           | <code>constexpr Format Dec (std::uint16_t precision) noexcept;</code>                                  |                                |
| <b>Parameters (in):</b>  | <code>precision</code>   | the precision to use           |
| <b>Return value:</b>     | <code>Format</code>  | a <code>Format</code> instance |
| <b>Exception Safety:</b> | noexcept   |                                |
| <b>Description:</b>      | Create a <code>Format</code> instance with <code>Fmt::kDec</code> formatting hint and given precision. |                                |

]([RS\\_LT\\_00046](#))

### [SWS\_LOG\_00213] Definition of API function `ara::log::Oct` [

|                     |                                 |  |
|---------------------|---------------------------------|--|
| <b>Kind:</b>        | function                        |  |
| <b>Header file:</b> | #include "ara/log/logger.h"     |  |
| <b>Scope:</b>       | namespace <code>ara::log</code> |  |





△

|                          |  |                   |
|--------------------------|--|-------------------|
| <b>Symbol:</b>           | Oct()  |                   |
| <b>Syntax:</b>           | constexpr <code>Format</code> Oct () noexcept;                                 |                   |
| <b>Return value:</b>     | Format   | a Format instance |
| <b>Exception Safety:</b> | noexcept   |                   |
| <b>Description:</b>      | Create a Format instance with Fmt::kOct formatting hint and default precision. |                   |

 ]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00214] Definition of API function ara::log::Oct [**

|                          |  |                      |
|--------------------------|--|----------------------|
| <b>Kind:</b>             | function   |                      |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                      |
| <b>Scope:</b>            | namespace ara::log   |                      |
| <b>Symbol:</b>           | Oct(std::uint16_t precision)   |                      |
| <b>Syntax:</b>           | constexpr <code>Format</code> Oct (std::uint16_t precision) noexcept;        |                      |
| <b>Parameters (in):</b>  | precision  | the precision to use |
| <b>Return value:</b>     | Format   | a Format instance    |
| <b>Exception Safety:</b> | noexcept   |                      |
| <b>Description:</b>      | Create a Format instance with Fmt::kOct formatting hint and given precision. |                      |

 ]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00209] Definition of API function ara::log::Hex [**

|                          |  |                   |
|--------------------------|--|-------------------|
| <b>Kind:</b>             | function   |                   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                   |
| <b>Scope:</b>            | namespace ara::log   |                   |
| <b>Symbol:</b>           | Hex()  |                   |
| <b>Syntax:</b>           | constexpr <code>Format</code> Hex () noexcept;                                 |                   |
| <b>Return value:</b>     | Format   | a Format instance |
| <b>Exception Safety:</b> | noexcept   |                   |
| <b>Description:</b>      | Create a Format instance with Fmt::kHex formatting hint and default precision. |                   |

 ]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00210] Definition of API function ara::log::Hex [**

|                          |  |                      |
|--------------------------|--|----------------------|
| <b>Kind:</b>             | function   |                      |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                      |
| <b>Scope:</b>            | namespace ara::log   |                      |
| <b>Symbol:</b>           | Hex(std::uint16_t precision)   |                      |
| <b>Syntax:</b>           | constexpr <code>Format</code> Hex (std::uint16_t precision) noexcept;        |                      |
| <b>Parameters (in):</b>  | precision  | the precision to use |
| <b>Return value:</b>     | Format   | a Format instance    |
| <b>Exception Safety:</b> | noexcept   |                      |
| <b>Description:</b>      | Create a Format instance with Fmt::kHex formatting hint and given precision. |                      |

 ]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00215] Definition of API function ara::log::Bin [**

|                          |  |                   |
|--------------------------|--|-------------------|
| <b>Kind:</b>             | function   |                   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                   |
| <b>Scope:</b>            | namespace ara::log   |                   |
| <b>Symbol:</b>           | Bin()  |                   |
| <b>Syntax:</b>           | constexpr <code>Format</code> Bin () noexcept;                                 |                   |
| <b>Return value:</b>     | Format   | a Format instance |
| <b>Exception Safety:</b> | noexcept   |                   |
| <b>Description:</b>      | Create a Format instance with Fmt::kBin formatting hint and default precision. |                   |

]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00216] Definition of API function ara::log::Bin [**

|                          |  |                      |
|--------------------------|--|----------------------|
| <b>Kind:</b>             | function   |                      |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                      |
| <b>Scope:</b>            | namespace ara::log   |                      |
| <b>Symbol:</b>           | Bin(std::uint16_t precision)   |                      |
| <b>Syntax:</b>           | constexpr <code>Format</code> Bin (std::uint16_t precision) noexcept;        |                      |
| <b>Parameters (in):</b>  | precision  | the precision to use |
| <b>Return value:</b>     | Format   | a Format instance    |
| <b>Exception Safety:</b> | noexcept   |                      |
| <b>Description:</b>      | Create a Format instance with Fmt::kBin formatting hint and given precision. |                      |

]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00217] Definition of API function ara::log::DecFloat [**

|                          |   |                      |
|--------------------------|---|----------------------|
| <b>Kind:</b>             | function  |                      |
| <b>Header file:</b>      | #include "ara/log/logger.h"   |                      |
| <b>Scope:</b>            | namespace ara::log  |                      |
| <b>Symbol:</b>           | DecFloat(std::uint16_t precision=6)   |                      |
| <b>Syntax:</b>           | constexpr <code>Format</code> DecFloat (std::uint16_t precision=6) noexcept;      |                      |
| <b>Parameters (in):</b>  | precision   | the precision to use |
| <b>Return value:</b>     | Format  | a Format instance    |
| <b>Exception Safety:</b> | noexcept  |                      |
| <b>Description:</b>      | Create a Format instance with Fmt::kDecFloat formatting hint and given precision. |                      |

]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00218] Definition of API function ara::log::DecFloatMax [**

|                      |  |                   |
|----------------------|--|-------------------|
| <b>Kind:</b>         | function   |                   |
| <b>Header file:</b>  | #include "ara/log/logger.h"                            |                   |
| <b>Scope:</b>        | namespace ara::log                                     |                   |
| <b>Symbol:</b>       | DecFloatMax()  |                   |
| <b>Syntax:</b>       | constexpr <code>Format</code> DecFloatMax () noexcept; |                   |
| <b>Return value:</b> | Format   | a Format instance |





|                          |   |
|--------------------------|---|
| <b>Exception Safety:</b> | noexcept  |
| <b>Description:</b>      | Create a Format instance with Fmt::kDecFloat formatting hint and a precision that is sufficient for full round-trip safety. |

](RS\_LT\_00046)

### [SWS\_LOG\_00219] Definition of API function ara::log::EngFloat [

|                          |   |                      |
|--------------------------|---|----------------------|
| <b>Kind:</b>             | function  |                      |
| <b>Header file:</b>      | #include "ara/log/logger.h"   |                      |
| <b>Scope:</b>            | namespace ara::log  |                      |
| <b>Symbol:</b>           | EngFloat(std::uint16_t precision=6)   |                      |
| <b>Syntax:</b>           | constexpr Format EngFloat (std::uint16_t precision=6) noexcept;                   |                      |
| <b>Parameters (in):</b>  | precision   | the precision to use |
| <b>Return value:</b>     | Format  | a Format instance    |
| <b>Exception Safety:</b> | noexcept  |                      |
| <b>Description:</b>      | Create a Format instance with Fmt::kEngFloat formatting hint and given precision. |                      |

](RS\_LT\_00046)

### [SWS\_LOG\_00220] Definition of API function ara::log::EngFloatMax [

|                          |   |                   |
|--------------------------|---|-------------------|
| <b>Kind:</b>             | function  |                   |
| <b>Header file:</b>      | #include "ara/log/logger.h"   |                   |
| <b>Scope:</b>            | namespace ara::log  |                   |
| <b>Symbol:</b>           | EngFloatMax()   |                   |
| <b>Syntax:</b>           | constexpr Format EngFloatMax () noexcept;   |                   |
| <b>Return value:</b>     | Format  | a Format instance |
| <b>Exception Safety:</b> | noexcept  |                   |
| <b>Description:</b>      | Create a Format instance with Fmt::kEngFloat formatting hint and a precision that is sufficient for full round-trip safety. |                   |

](RS\_LT\_00046)

### [SWS\_LOG\_00221] Definition of API function ara::log::HexFloat [

|                          |   |                      |
|--------------------------|---|----------------------|
| <b>Kind:</b>             | function  |                      |
| <b>Header file:</b>      | #include "ara/log/logger.h"   |                      |
| <b>Scope:</b>            | namespace ara::log  |                      |
| <b>Symbol:</b>           | HexFloat(std::uint16_t precision)   |                      |
| <b>Syntax:</b>           | constexpr Format HexFloat (std::uint16_t precision) noexcept;                     |                      |
| <b>Parameters (in):</b>  | precision   | the precision to use |
| <b>Return value:</b>     | Format  | a Format instance    |
| <b>Exception Safety:</b> | noexcept  |                      |
| <b>Description:</b>      | Create a Format instance with Fmt::kHexFloat formatting hint and given precision. |                      |

](RS\_LT\_00046)

**[SWS\_LOG\_00222] Definition of API function ara::log::HexFloatMax [**

|                          |  |                   |
|--------------------------|--|-------------------|
| <b>Kind:</b>             | function   |                   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |                   |
| <b>Scope:</b>            | namespace ara::log   |                   |
| <b>Symbol:</b>           | HexFloatMax()  |                   |
| <b>Syntax:</b>           | constexpr <code>Format</code> HexFloatMax () noexcept;   |                   |
| <b>Return value:</b>     | Format   | a Format instance |
| <b>Exception Safety:</b> | noexcept   |                   |
| <b>Description:</b>      | Create a Format instance with <code>Fmt::kHexFloat</code> formatting hint and a precision that is sufficient for full round-trip safety. |                   |

]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00223] Definition of API function ara::log::AutoFloat [**

|                          |   |                      |
|--------------------------|---|----------------------|
| <b>Kind:</b>             | function  |                      |
| <b>Header file:</b>      | #include "ara/log/logger.h"   |                      |
| <b>Scope:</b>            | namespace ara::log  |                      |
| <b>Symbol:</b>           | AutoFloat(std::uint16_t precision=6)  |                      |
| <b>Syntax:</b>           | constexpr <code>Format</code> AutoFloat (std::uint16_t precision=6) noexcept;                   |                      |
| <b>Parameters (in):</b>  | precision   | the precision to use |
| <b>Return value:</b>     | Format  | a Format instance    |
| <b>Exception Safety:</b> | noexcept  |                      |
| <b>Description:</b>      | Create a Format instance with <code>Fmt::kAutoFloat</code> formatting hint and given precision. |                      |

]([RS\\_LT\\_00046](#))

**[SWS\_LOG\_00224] Definition of API function ara::log::AutoFloatMax [**

|                          |   |                   |
|--------------------------|---|-------------------|
| <b>Kind:</b>             | function  |                   |
| <b>Header file:</b>      | #include "ara/log/logger.h"   |                   |
| <b>Scope:</b>            | namespace ara::log  |                   |
| <b>Symbol:</b>           | AutoFloatMax()  |                   |
| <b>Syntax:</b>           | constexpr <code>Format</code> AutoFloatMax () noexcept;   |                   |
| <b>Return value:</b>     | Format  | a Format instance |
| <b>Exception Safety:</b> | noexcept  |                   |
| <b>Description:</b>      | Create a Format instance with <code>Fmt::kAutoFloat</code> formatting hint and a precision that is sufficient for full round-trip safety. |                   |

]([RS\\_LT\\_00046](#))

### 8.1.3 ClientState

#### [SWS\_LOG\_00098]{DRAFT} Definition of API enum ara::log::ClientState [

|                                |   |  |
|--------------------------------|---|--|
| <b>Kind:</b>                   | enumeration   |  |
| <b>Header file:</b>            | #include "ara/log/common.h"   |  |
| <b>Forwarding header file:</b> | #include "ara/log/log_fwd.h"  |  |
| <b>Scope:</b>                  | namespace ara::log  |  |
| <b>Symbol:</b>                 | ClientState   |  |
| <b>Underlying type:</b>        | std::int8_t   |  |
| <b>Syntax:</b>                 | enum class ClientState : std::int8_t {...};                             |  |
| <b>Values:</b>                 | kUnknown= -1  | DLT back-end not up and running yet, state cannot be determined. |
|                                | kNotConnected   | No remote client detected.                                       |
|                                | kConnected  | Remote client is connected.                                      |
| <b>Description:</b>            | Client state representing the connection state of an external client. . |  |

](RS\_LT\_00003)

## 8.2 Function definitions

### 8.2.1 CreateLogger

#### [SWS\_LOG\_00021]{DRAFT} Definition of API function ara::log::CreateLogger [

|                          |  |   |
|--------------------------|--|---|
| <b>Kind:</b>             | function   |   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |   |
| <b>Scope:</b>            | namespace ara::log   |   |
| <b>Symbol:</b>           | CreateLogger(ara::core::StringView ctxId, ara::core::StringView ctxDescription, LogLevel ctxDefLogLevel)   |   |
| <b>Syntax:</b>           | Logger & CreateLogger (ara::core::StringView ctxId, ara::core::StringView ctxDescription, LogLevel ctxDefLogLevel) noexcept;                                   |   |
| <b>Parameters (in):</b>  | ctxId  | The context ID.   |
|                          | ctxDescription   | The description of the provided context ID.   |
|                          | ctxDefLogLevel   | The default log level, set to Warning severity if not explicitly specified.                                 |
| <b>Return value:</b>     | Logger &   | Reference to the internal managed instance of a Logger object. Ownership stays within the Logging framework |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Thread Safety:</b>    | reentrant  |   |
| <b>Description:</b>      | Creates a Logger object, holding the context which is registered in the Logging framework. If no model is available the sink shall be the console per default. |   |

] ([RS\\_LT\\_00003](#))

#### [SWS\_LOG\_00263]{DRAFT} Definition of API function ara::log::CreateLogger [

|                          |  |   |
|--------------------------|--|---|
| <b>Kind:</b>             | function   |   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |   |
| <b>Scope:</b>            | namespace ara::log   |   |
| <b>Symbol:</b>           | CreateLogger(ara::core::StringView ctxId, ara::core::StringView ctxDescription)  |   |
| <b>Syntax:</b>           | Logger & CreateLogger (ara::core::StringView ctxId, ara::core::StringView ctxDescription) noexcept;  |   |
| <b>Parameters (in):</b>  | ctxId  | The context ID  |
|                          | ctxDescription   | The description of the provided context ID  |
| <b>Return value:</b>     | Logger &   | reference to the internal managed instance of a Logger object<br>Ownership stays within the Logging framework |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Thread Safety:</b>    | reentrant  |   |
| <b>Description:</b>      | Creates a Logger object, holding the context which is registered in the Logging framework. If no model is available the sink shall be the console per default. |   |

] ([RS\\_LT\\_00003](#))

#### [SWS\_LOG\_00256]{DRAFT} Definition of API function ara::log::CreateLogger [

|                     |                             |  |
|---------------------|-----------------------------|--|
| <b>Kind:</b>        | function                    |  |
| <b>Header file:</b> | #include "ara/log/logger.h" |  |
| <b>Scope:</b>       | namespace ara::log          |  |





|                          |  |   |
|--------------------------|--|---|
| <b>Symbol:</b>           | CreateLogger(const ara::core::InstanceSpecifier &is)                     |   |
| <b>Syntax:</b>           | Logger & CreateLogger (const ara::core::InstanceSpecifier &is) noexcept; |   |
| <b>Parameters (in):</b>  | is   | an InstanceSpecifier  |
| <b>Return value:</b>     | Logger &   | reference to the internal managed instance of a Logger object |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Description:</b>      | Creates a Logger object derived from the manifest.                       |   |

](RS\_LT\_00003)

## 8.2.2 RegisterConnectionStateHandler

[SWS\_LOG\_00205]{DRAFT} Definition of API function ara::log::RegisterConnectionStateHandler [

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |  |
| <b>Scope:</b>            | namespace ara::log   |  |
| <b>Symbol:</b>           | RegisterConnectionStateHandler(std::function< void(ClientState)> callback)   |  |
| <b>Syntax:</b>           | void RegisterConnectionStateHandler (std::function< void(ClientState)> callback) noexcept;   |  |
| <b>Parameters (in):</b>  | callback   | a callback that is invoked whenever the connection state has changed |
| <b>Return value:</b>     | None   |  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Description:</b>      | Register a callback to be invoked whenever the connection state changes.<br>Only a single function can be installed this way; if a callback was already registered before, only the newly registered one is used henceforth. |  |

](RS\_LT\_00003)

## 8.2.3 Wrapper object creator

[SWS\_LOG\_00201]{DRAFT} Definition of API function ara::log::Arg [

|                         |  |                                      |
|-------------------------|--|--------------------------------------|
| <b>Kind:</b>            | function   |                                      |
| <b>Header file:</b>     | #include "ara/log/logger.h"  |                                      |
| <b>Scope:</b>           | namespace ara::log   |                                      |
| <b>Symbol:</b>          | Arg(T &&arg, const char *name=nullptr, const char *unit=nullptr, Format format=Dflt())   |                                      |
| <b>Syntax:</b>          | template <typename T><br>Argument< T > Arg (T &&arg, const char *name=nullptr, const char *unit=nullptr, Format format=Dflt()) noexcept; |                                      |
| <b>Parameters (in):</b> | arg  | an argument payload object           |
|                         | name   | an optional "name" attribute for arg |
|                         | unit   | an optional "unit" attribute for arg |



△

|                          |   |  |
|--------------------------|---|--|
|                          | format  | an optional formatting hint for integral or floating-point arguments; the default is to use the implementation's standard formatting |
| <b>Return value:</b>     | Argument< T >   | a wrapper object holding the supplied arguments  |
| <b>Exception Safety:</b> | noexcept  |  |
| <b>Description:</b>      | <p>Create a wrapper object for the given arguments.</p> <p>Calling this function shall be ill-formed if any of these conditions are met:</p> <ul style="list-style-type: none"> <li>• T is not an arithmetic type and not "bool" and not convertible to "ara::core::StringView" and not convertible to "ara::core::Span&lt;const ara::core::Byte&gt;"</li> <li>• T is convertible to "ara::core::StringView" or convertible to "ara::core::Span&lt;const ara::core::Byte&gt;" or "bool", and "unit" is not "nullptr"</li> </ul> |  |

](RS\_LT\_00003)



## 8.3 Class definitions

### 8.3.1 Class LogStream

The class `ara::log::LogStream` represents a [Log message](#), allowing stream operators to be used for appending data.

#### [SWS\_LOG\_00173]{DRAFT} Definition of API class `ara::log::LogStream` [

|                                |   |
|--------------------------------|---|
| <b>Kind:</b>                   | class   |
| <b>Header file:</b>            | #include "ara/log/log_stream.h"   |
| <b>Forwarding header file:</b> | #include "ara/log/log_fwd.h"  |
| <b>Scope:</b>                  | namespace ara::log  |
| <b>Symbol:</b>                 | LogStream   |
| <b>Syntax:</b>                 | <code>class LogStream final {...};</code>   |
| <b>Description:</b>            | Class LogStream Initiates it with the given log level directly on the back-end. . |

]([RS\\_LT\\_00003](#))

#### Note:

Normally [Application processes](#) would not use this class directly. Instead one of the log methods provided in the main [Logging API](#) shall be used. Those methods automatically setup a temporary object of this class with the given log severity level. The only reason to use this class directly is, if the user wants to hold a `ara::log::LogStream` object longer than the default one-statement scope. This is useful in order to create log messages that are distributed over multiple code lines. See the `ara::log::LogStream::Flush` method for further information. Once this temporary object gets out of scope, its destructor takes care that the message buffer is ready to be processed by the Logging framework.

#### 8.3.1.1 Extending the Logging API to understand custom types

The `ara::log::LogStream` class supports natively the formats stated in [chapter 8.2](#), it can be easily extended for other derived types by providing a stream operator that makes use of already supported types.

#### Example:

```

1 struct MyCustomType {
2     int8_t foo;
3     ara::core::String bar;
4 };
5
6 LogStream& operator<<(LogStream& out, const MyCustomType& value) {
7     return (out << value.foo << value.bar);
8 }
9
10 // Producing the output "42 the answer is."
11 Logger& ctx0 = CreateLogger("CTX0", "Context Description CTX0");
    
```

```
12 ctx0.LogDebug () << MyCustomType{42, " the answer is."};
```

### 8.3.1.2 LogStream::Flush

[SWS\_LOG\_00039]{DRAFT} Definition of API function `ara::log::LogStream::Flush` [

|                          |  |
|--------------------------|--|
| <b>Kind:</b>             | function   |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                              |
| <b>Symbol:</b>           | Flush()  |
| <b>Syntax:</b>           | <code>void Flush () noexcept;</code>                                   |
| <b>Return value:</b>     | None   |
| <b>Exception Safety:</b> | noexcept   |
| <b>Thread Safety:</b>    | reentrant  |
| <b>Description:</b>      | Sends out the current log buffer and initiates a new message stream. . |

]([RS\\_LT\\_00003](#))

#### Note:

Calling `ara::log::LogStream::Flush` is only necessary if the `ara::log::LogStream` object is going to be re-used within the same scope. Otherwise, if the object goes out of scope (e.g. end of function block) then the flushing operation will be done internally by the destructor. It is important to note that the `ara::log::LogStream::Flush` command does not empty the buffer, but it forwards the buffer's current contents to the [Logging framework](#).

### 8.3.1.3 Built-in operators for natively supported types

[SWS\_LOG\_00040]{DRAFT} Definition of API function `ara::log::LogStream::operator<<` [

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                      |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                            |  |
| <b>Symbol:</b>           | <code>operator&lt;&lt;(bool value)</code>                            |  |
| <b>Syntax:</b>           | <code>LogStream &amp; operator&lt;&lt; (bool value) noexcept;</code> |  |
| <b>Parameters (in):</b>  | value  | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Thread Safety:</b>    | reentrant  |  |
| <b>Description:</b>      | Appends given value to the internal message buffer.                  |  |

]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00041]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |   |  |
|--------------------------|---|--|
| <b>Kind:</b>             | function  |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                       |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                             |  |
| <b>Symbol:</b>           | operator<<(std::uint8_t value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (std::uint8_t value) noexcept; |  |
| <b>Parameters (in):</b>  | value   | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &   | *this  |
| <b>Exception Safety:</b> | noexcept  |  |
| <b>Thread Safety:</b>    | reentrant   |  |
| <b>Description:</b>      | Writes unsigned int 8 bit parameter into message.                     |  |

]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00042]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                              |  |
| <b>Symbol:</b>           | operator<<(std::uint16_t value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (std::uint16_t value) noexcept; |  |
| <b>Parameters (in):</b>  | value  | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Thread Safety:</b>    | reentrant  |  |
| <b>Description:</b>      | Writes unsigned int 16 bit parameter into message.                     |  |

]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00043]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                              |  |
| <b>Symbol:</b>           | operator<<(std::uint32_t value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (std::uint32_t value) noexcept; |  |
| <b>Parameters (in):</b>  | value  | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Thread Safety:</b>    | reentrant  |  |
| <b>Description:</b>      | Writes unsigned int 32 bit parameter into message.                     |  |

]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00044]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                              |  |
| <b>Symbol:</b>           | operator<<(std::uint64_t value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (std::uint64_t value) noexcept; |  |
| <b>Parameters (in):</b>  | value  | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Thread Safety:</b>    | reentrant  |  |
| <b>Description:</b>      | Writes unsigned int 64 bit parameter into message.                     |  |

]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00045]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                      |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                            |  |
| <b>Symbol:</b>           | operator<<(std::int8_t value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (std::int8_t value) noexcept; |  |
| <b>Parameters (in):</b>  | value  | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Thread Safety:</b>    | reentrant  |  |
| <b>Description:</b>      | Writes signed int 8 bit parameter into message.                      |  |

]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00046]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |   |  |
|--------------------------|---|--|
| <b>Kind:</b>             | function  |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                       |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                             |  |
| <b>Symbol:</b>           | operator<<(std::int16_t value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (std::int16_t value) noexcept; |  |
| <b>Parameters (in):</b>  | value   | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &   | *this  |
| <b>Exception Safety:</b> | noexcept  |  |
| <b>Thread Safety:</b>    | reentrant   |  |
| <b>Description:</b>      | Writes signed int 16 bit parameter into message.                      |  |

]([RS\\_LT\\_00003](#))

[SWS\_LOG\_00047]{DRAFT} **Definition of API function ara::log::LogStream::operator<<** [

|                          |   |  |
|--------------------------|---|--|
| <b>Kind:</b>             | function  |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                       |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                             |  |
| <b>Symbol:</b>           | operator<<(std::int32_t value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (std::int32_t value) noexcept; |  |
| <b>Parameters (in):</b>  | value   | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &   | *this  |
| <b>Exception Safety:</b> | noexcept  |  |
| <b>Thread Safety:</b>    | reentrant   |  |
| <b>Description:</b>      | Writes signed int 32 bit parameter into message.                      |  |

]([RS\\_LT\\_00003](#))

[SWS\_LOG\_00048]{DRAFT} **Definition of API function ara::log::LogStream::operator<<** [

|                          |   |  |
|--------------------------|---|--|
| <b>Kind:</b>             | function  |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                       |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                             |  |
| <b>Symbol:</b>           | operator<<(std::int64_t value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (std::int64_t value) noexcept; |  |
| <b>Parameters (in):</b>  | value   | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &   | *this  |
| <b>Exception Safety:</b> | noexcept  |  |
| <b>Thread Safety:</b>    | reentrant   |  |
| <b>Description:</b>      | Writes signed int 64 bit parameter into message.                      |  |

]([RS\\_LT\\_00003](#))

[SWS\_LOG\_00049]{DRAFT} **Definition of API function ara::log::LogStream::operator<<** [

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                      |  |
| <b>Symbol:</b>           | operator<<(float value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (float value) noexcept; |  |
| <b>Parameters (in):</b>  | value  | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Thread Safety:</b>    | reentrant  |  |
| <b>Description:</b>      | Writes float 32 bit parameter into message.                    |  |

]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00050]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |   |  |
|--------------------------|---|--|
| <b>Kind:</b>             | function  |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                 |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                       |  |
| <b>Symbol:</b>           | operator<<(double value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (double value) noexcept; |  |
| <b>Parameters (in):</b>  | value   | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &   | *this  |
| <b>Exception Safety:</b> | noexcept  |  |
| <b>Thread Safety:</b>    | reentrant   |  |
| <b>Description:</b>      | Writes float 64 bit parameter into message.                     |  |

]([RS\\_LT\\_00003](#))

### 8.3.1.4 Built-in operators for extra types

**[SWS\_LOG\_00062]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>  |  |
| <b>Symbol:</b>           | operator<<(const ara::core::StringView value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (const ara::core::StringView value) noexcept; |  |
| <b>Parameters (in):</b>  | value  | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Thread Safety:</b>    | reentrant  |  |
| <b>Description:</b>      | Writes ara::core::StringView into message.   |  |

]([RS\\_LT\\_00003](#))

**[SWS\_LOG\_00051]{DRAFT} Definition of API function ara::log::LogStream::operator<< [**

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |  |
| <b>Scope:</b>            | <a href="#">class ara::log::LogStream</a>                                  |  |
| <b>Symbol:</b>           | operator<<(const char *const value)  |  |
| <b>Syntax:</b>           | <a href="#">LogStream</a> & operator<< (const char *const value) noexcept; |  |
| <b>Parameters (in):</b>  | value  | Value to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |





|                       |  |
|-----------------------|--|
| <b>Thread Safety:</b> | reentrant  |
| <b>Description:</b>   | Writes null terminated UTF8 string into message. |

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**[SWS\_LOG\_00063]{DRAFT} Definition of API function ara::log::operator<< [**

|                          |   |  |
|--------------------------|---|--|
| <b>Kind:</b>             | function  |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                   |  |
| <b>Scope:</b>            | namespace ara::log  |  |
| <b>Symbol:</b>           | operator<<(LogStream &out, LogLevel value)                        |  |
| <b>Syntax:</b>           | LogStream & operator<< (LogStream &out, LogLevel value) noexcept; |  |
| <b>Parameters (in):</b>  | out   | LogStream Object which is used to append the logged LogLevel (value) to        |
|                          | value   | LogLevel enum parameter as text to be appended to the internal message buffer. |
| <b>Return value:</b>     | LogStream &   | *this  |
| <b>Exception Safety:</b> | noexcept  |  |
| <b>Thread Safety:</b>    | reentrant   |  |
| <b>Description:</b>      | Appends LogLevel enum parameter as text into message.             |  |

|(RS\_LT\_00003)

**[SWS\_LOG\_00124]{DRAFT} Definition of API function ara::log::operator<< [**

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |  |
| <b>Scope:</b>            | namespace ara::log   |  |
| <b>Symbol:</b>           | operator<<(LogStream &out, const core::ErrorCode &ec)  |  |
| <b>Syntax:</b>           | LogStream & operator<< (LogStream &out, const core::ErrorCode &ec) noexcept;   |  |
| <b>Parameters (in):</b>  | out  | the LogStream object into which to add the value |
|                          | ec   | the ErrorCode instance to log                    |
| <b>Return value:</b>     | LogStream &  | out  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Description:</b>      | Write a core::ErrorCode instance into the message.<br><br>When output to the console, the ErrorCode shall be shown in an implementation-defined way as a String holding the result of ErrorCode::Domain().Name() (i.e. the ErrorDomain's Shortname), and the integral error code number. |  |

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**[SWS\_LOG\_00125]{DRAFT} Definition of API function ara::log::operator<< [**

|                     |   |  |
|---------------------|---|--|
| <b>Kind:</b>        | function  |  |
| <b>Header file:</b> | #include "ara/log/log_stream.h"   |  |
| <b>Scope:</b>       | namespace ara::log  |  |
| <b>Symbol:</b>      | operator<<(LogStream &out, const std::chrono::duration< Rep, Period > &value) |  |







|                          |  |   |
|--------------------------|--|---|
| <b>Syntax:</b>           | <pre>template &lt;typename Rep, typename Period&gt; LogStream &amp; operator&lt;&lt; (LogStream &amp;out, const std::chrono::duration&lt; Rep, Period &gt; &amp;value) noexcept;</pre> |   |
| <b>Template param:</b>   | Rep  | arithmetic type representing the number of ticks in this duration       |
|                          | Period   | a std::ratio type representing the tick period of the clock, in seconds |
| <b>Parameters (in):</b>  | out  | the LogStream object into which to add the value                        |
|                          | value  | the duration instance to log  |
| <b>Return value:</b>     | LogStream &  | out   |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Description:</b>      | Write a std::chrono::duration instance into the message.   |   |

](RS\_LT\_00049)

### [SWS\_LOG\_00126]{DRAFT} Definition of API function ara::log::operator<< [

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |  |
| <b>Scope:</b>            | namespace ara::log   |  |
| <b>Symbol:</b>           | operator<<(LogStream &out, const ara::core::InstanceSpecifier &value)  |  |
| <b>Syntax:</b>           | <pre>LogStream &amp; operator&lt;&lt; (LogStream &amp;out, const ara::core::Instance Specifier &amp;value) noexcept;</pre> |  |
| <b>Parameters (in):</b>  | out  | the LogStream object into which to add the value |
|                          | value  | the InstanceSpecifier to log                     |
| <b>Return value:</b>     | LogStream &  | out  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Description:</b>      | Write a core::InstanceSpecifier into the message.  |  |

](RS\_LT\_00049)

### [SWS\_LOG\_00127]{DRAFT} Definition of API function ara::log::operator<< [

|                          |   |  |
|--------------------------|---|--|
| <b>Kind:</b>             | function  |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"   |  |
| <b>Scope:</b>            | namespace ara::log  |  |
| <b>Symbol:</b>           | operator<<(LogStream &out, const void *value)   |  |
| <b>Syntax:</b>           | <pre>LogStream &amp; operator&lt;&lt; (LogStream &amp;out, const void *value) noexcept;</pre> |  |
| <b>Parameters (in):</b>  | out   | the LogStream object into which to add the value |
|                          | value   | to log   |
| <b>Return value:</b>     | LogStream &   | out  |
| <b>Exception Safety:</b> | noexcept  |  |

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[SWS\_LOG\_00128]{DRAFT} **Definition of API function ara::log::LogStream::operator<<** [

|                          |  |  |
|--------------------------|--|--|
| <b>Kind:</b>             | function   |  |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"  |  |
| <b>Scope:</b>            | class ara::log::LogStream  |  |
| <b>Symbol:</b>           | operator<<(core::Span< const core::Byte > data)  |  |
| <b>Syntax:</b>           | LogStream & operator<< (core::Span< const core::Byte > data) noexcept;   |  |
| <b>Parameters (in):</b>  | data   | a Span<const Byte> covering the range to be logged |
| <b>Return value:</b>     | LogStream &  | *this  |
| <b>Exception Safety:</b> | noexcept   |  |
| <b>Description:</b>      | Write a byte sequence into message.<br>This call shall copy the sequence of core::Byte objects as-is into the message. |  |

](RS\_LT\_00003)

### 8.3.1.5 Attribute handling

[SWS\_LOG\_00203]{DRAFT} **Definition of API function ara::log::LogStream::operator<<** [

|                          |   |                             |
|--------------------------|---|-----------------------------|
| <b>Kind:</b>             | function  |                             |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"   |                             |
| <b>Scope:</b>            | class ara::log::LogStream   |                             |
| <b>Symbol:</b>           | operator<<(const Argument< T > &arg)  |                             |
| <b>Syntax:</b>           | template <typename T><br>LogStream & operator<< (const Argument< T > &arg) noexcept;  |                             |
| <b>Template param:</b>   | T   | the argument payload type   |
| <b>Parameters (in):</b>  | arg   | the argument wrapper object |
| <b>Return value:</b>     | LogStream &   | *this                       |
| <b>Exception Safety:</b> | noexcept  |                             |
| <b>Description:</b>      | Log an argument with attributes.<br>When output to the console, the value and all its attributes shall be shown as a single argument. |                             |

](RS\_LT\_00003)

### 8.3.1.6 Modifiers

[SWS\_LOG\_00258]{DRAFT} **Definition of API function ara::log::LogStream::WithPrivacy** [

|                     |                                 |  |
|---------------------|---------------------------------|--|
| <b>Kind:</b>        | function                        |  |
| <b>Header file:</b> | #include "ara/log/log_stream.h" |  |
| <b>Scope:</b>       | class ara::log::LogStream       |  |





|                          |   |  |
|--------------------------|---|--|
| <b>Symbol:</b>           | WithPrivacy(T value)  |  |
| <b>Syntax:</b>           | template <typename T><br>LogStream & WithPrivacy (T value) noexcept;  |  |
| <b>Parameters (in):</b>  | value   | a (project-specific) value to add as privacy level of the message template |
| <b>Return value:</b>     | LogStream &   | *this  |
| <b>Exception Safety:</b> | noexcept  |  |
| <b>Description:</b>      | Set the message's privacy level.<br><br>A program that calls this function with a T that is neither an integral nor an enum type is ill-formed. Only the lower 8 bits of value are used, any higher-level bits are ignored. |  |

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### [SWS\_LOG\_00129]{DRAFT} Definition of API function ara::log::LogStream::With Location [

|                          |  |                             |
|--------------------------|--|-----------------------------|
| <b>Kind:</b>             | function   |                             |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                                      |                             |
| <b>Scope:</b>            | class ara::log::LogStream  |                             |
| <b>Symbol:</b>           | WithLocation(core::StringView file, int line)                        |                             |
| <b>Syntax:</b>           | LogStream & WithLocation (core::StringView file, int line) noexcept; |                             |
| <b>Parameters (in):</b>  | file   | the source file identifier  |
|                          | line   | the source file line number |
| <b>Return value:</b>     | LogStream &  | *this                       |
| <b>Exception Safety:</b> | noexcept   |                             |
| <b>Description:</b>      | Add source file location into the message.                           |                             |

|(RS\_LT\_00003)

### [SWS\_LOG\_00132]{DRAFT} Definition of API function ara::log::LogStream::With Tag [

|                          |  |   |
|--------------------------|--|---|
| <b>Kind:</b>             | function   |   |
| <b>Header file:</b>      | #include "ara/log/log_stream.h"                      |   |
| <b>Scope:</b>            | class ara::log::LogStream                            |   |
| <b>Symbol:</b>           | WithTag(core::StringView tag)                        |   |
| <b>Syntax:</b>           | LogStream & WithTag (core::StringView tag) noexcept; |   |
| <b>Parameters (in):</b>  | tag  | the tag text to attach to the current message |
| <b>Return value:</b>     | LogStream &  | *this   |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Description:</b>      | Add the given single tag to the current message.     |   |

|(RS\_LT\_00003)

### 8.3.2 Class Logger

The class `ara::log::Logger` represents a logger context. The `Logging framework` defines contexts which can be seen as logger instances within one `Application process` or process scope.

#### [SWS\_LOG\_00172]{DRAFT} Definition of API class `ara::log::Logger` [

|                                |  |
|--------------------------------|--|
| <b>Kind:</b>                   | class                                  |
| <b>Header file:</b>            | #include "ara/log/logger.h"            |
| <b>Forwarding header file:</b> | #include "ara/log/log_fwd.h"           |
| <b>Scope:</b>                  | namespace ara::log                     |
| <b>Symbol:</b>                 | Logger                                 |
| <b>Syntax:</b>                 | <code>class Logger final {...};</code> |
| <b>Description:</b>            | Interface for sending log messages.    |

]([RS\\_LT\\_00003](#))

The contexts have the following properties:

- 1) Context ID
- 2) Description of the Context ID
- 3) Default log level

A context will be automatically registered against the `Logging back-end` during creation phase, as well as automatically deregistered during process shutdown phase. So the end user does not care for the objects life time. To ensure such housekeeping functionality, a strong ownership of the logger instances needs to be ensured towards the `Logging framework`. This means that the `Application process` are not supposed to call the `Logger` constructor themselves.

The user is not allowed to create a `Logger` object by himself. `Logger` context needs to be created by the provided API call `CreateLogger()`.

#### 8.3.2.1 `Logger::LogFatal`

#### [SWS\_LOG\_00064]{DRAFT} Definition of API function `ara::log::Logger::LogFatal` [

|                      |  |                                     |
|----------------------|--|-------------------------------------|
| <b>Kind:</b>         | function   |                                     |
| <b>Header file:</b>  | #include "ara/log/logger.h"                        |                                     |
| <b>Scope:</b>        | <code>class ara::log::Logger</code>                |                                     |
| <b>Symbol:</b>       | <code>LogFatal()</code>                            |                                     |
| <b>Syntax:</b>       | <code>LogStream LogFatal () const noexcept;</code> |                                     |
| <b>Return value:</b> | LogStream  | LogStream object of Fatal severity. |





|                          |  |
|--------------------------|--|
| <b>Exception Safety:</b> | noexcept   |
| <b>Description:</b>      | Creates a <code>LogStream</code> object.<br>Returned object will accept arguments via the insert stream operator " <code>@c &lt;&lt;</code> ".   |
| <b>Notes:</b>            | In the normal usage scenario, the object's life time of the created <code>LogStream</code> is scoped within one statement (ends with <code>;</code> after last passed argument). If one wants to extend the <code>LogStream</code> object's life time, the object might be assigned to a named variable. |

](RS\_LT\_00003)

### 8.3.2.2 `Logger::LogError`

[SWS\_LOG\_00065]{DRAFT} Definition of API function `ara::log::Logger::LogError`

[

|                          |   |
|--------------------------|---|
| <b>Kind:</b>             | function  |
| <b>Header file:</b>      | <code>#include "ara/log/logger.h"</code>                                  |
| <b>Scope:</b>            | <code>class ara::log::Logger</code>                                       |
| <b>Symbol:</b>           | <code>LogError()</code>   |
| <b>Syntax:</b>           | <code>LogStream LogError () const noexcept;</code>                        |
| <b>Return value:</b>     | <code>LogStream</code>   <code>LogStream</code> object of Error severity. |
| <b>Exception Safety:</b> | noexcept  |
| <b>Description:</b>      | Same as <code>Logger::LogFatal()</code> .                                 |

](RS\_LT\_00003)

### 8.3.2.3 `Logger::LogWarn`

[SWS\_LOG\_00066]{DRAFT} Definition of API function `ara::log::Logger::LogWarn`

[

|                          |  |
|--------------------------|--|
| <b>Kind:</b>             | function   |
| <b>Header file:</b>      | <code>#include "ara/log/logger.h"</code>                                 |
| <b>Scope:</b>            | <code>class ara::log::Logger</code>                                      |
| <b>Symbol:</b>           | <code>LogWarn()</code>   |
| <b>Syntax:</b>           | <code>LogStream LogWarn () const noexcept;</code>                        |
| <b>Return value:</b>     | <code>LogStream</code>   <code>LogStream</code> object of Warn severity. |
| <b>Exception Safety:</b> | noexcept   |
| <b>Description:</b>      | Same as <code>Logger::LogFatal()</code> .                                |

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### 8.3.2.4 Logger::LogInfo

#### [SWS\_LOG\_00067]{DRAFT} Definition of API function ara::log::Logger::LogInfo

[

|                          |                                      |                                    |
|--------------------------|--------------------------------------|------------------------------------|
| <b>Kind:</b>             | function                             |                                    |
| <b>Header file:</b>      | #include "ara/log/logger.h"          |                                    |
| <b>Scope:</b>            | class ara::log::Logger               |                                    |
| <b>Symbol:</b>           | LogInfo()                            |                                    |
| <b>Syntax:</b>           | LogStream LogInfo () const noexcept; |                                    |
| <b>Return value:</b>     | LogStream                            | LogStream object of Info severity. |
| <b>Exception Safety:</b> | noexcept                             |                                    |
| <b>Description:</b>      | Same as Logger::LogFatal().          |                                    |

](RS\_LT\_00003)

### 8.3.2.5 Logger::LogDebug

#### [SWS\_LOG\_00068]{DRAFT} Definition of API function ara::log::Logger::LogDebug

[

|                          |                                       |                                     |
|--------------------------|---------------------------------------|-------------------------------------|
| <b>Kind:</b>             | function                              |                                     |
| <b>Header file:</b>      | #include "ara/log/logger.h"           |                                     |
| <b>Scope:</b>            | class ara::log::Logger                |                                     |
| <b>Symbol:</b>           | LogDebug()                            |                                     |
| <b>Syntax:</b>           | LogStream LogDebug () const noexcept; |                                     |
| <b>Return value:</b>     | LogStream                             | LogStream object of Debug severity. |
| <b>Exception Safety:</b> | noexcept                              |                                     |
| <b>Description:</b>      | Same as Logger::LogFatal().           |                                     |

](RS\_LT\_00003)

### 8.3.2.6 Logger::LogVerbose

#### [SWS\_LOG\_00069]{DRAFT} Definition of API function ara::log::Logger::LogVerbose

[

|                          |   |                                       |
|--------------------------|---|---------------------------------------|
| <b>Kind:</b>             | function                                |                                       |
| <b>Header file:</b>      | #include "ara/log/logger.h"             |                                       |
| <b>Scope:</b>            | class ara::log::Logger                  |                                       |
| <b>Symbol:</b>           | LogVerbose()                            |                                       |
| <b>Syntax:</b>           | LogStream LogVerbose () const noexcept; |                                       |
| <b>Return value:</b>     | LogStream                               | LogStream object of Verbose severity. |
| <b>Exception Safety:</b> | noexcept                                |                                       |
| <b>Description:</b>      | Same as Logger::LogFatal().             |                                       |

|(RS\_LT\_00003)

### 8.3.2.7 Logger::IsEnabled

[SWS\_LOG\_00070]{DRAFT} Definition of API function `ara::log::Logger::IsEnabled` [

|                          |  |   |
|--------------------------|--|---|
| <b>Kind:</b>             | function   |   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |   |
| <b>Scope:</b>            | class <code>ara::log::Logger</code>  |   |
| <b>Symbol:</b>           | IsEnabled(LogLevel logLevel)   |   |
| <b>Syntax:</b>           | <code>bool IsEnabled (LogLevel logLevel) const noexcept;</code>  |   |
| <b>Parameters (in):</b>  | logLevel   | The to be checked log level.  |
| <b>Return value:</b>     | bool   | True if desired log level satisfies the configured reporting level. |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Description:</b>      | <p>Check current configured log reporting level.</p> <p>Applications may want to check the actual configured reporting log level of certain loggers before doing log data preparation that is runtime intensive.</p> |   |

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### 8.3.2.8 Logger::WithLevel

[SWS\_LOG\_00131]{DRAFT} Definition of API function `ara::log::Logger::WithLevel` [

|                          |  |   |
|--------------------------|--|---|
| <b>Kind:</b>             | function   |   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |   |
| <b>Scope:</b>            | class <code>ara::log::Logger</code>                                      |   |
| <b>Symbol:</b>           | WithLevel(LogLevel logLevel)   |   |
| <b>Syntax:</b>           | <code>LogStream WithLevel (LogLevel logLevel) const noexcept;</code>     |   |
| <b>Parameters (in):</b>  | logLevel   | the log level to use for this LogStream instance  |
| <b>Return value:</b>     | LogStream  | a new LogStream instance with the given log level |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Description:</b>      | Log message with a programmatically determined log level can be written. |   |

|(RS\_LT\_00003)

### 8.3.2.9 Logger::Log

#### [SWS\_LOG\_00204]{DRAFT} Definition of API function ara::log::Logger::Log [

|                          |  |   |
|--------------------------|--|---|
| <b>Kind:</b>             | function   |   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |   |
| <b>Scope:</b>            | class ara::log::Logger   |   |
| <b>Symbol:</b>           | Log(const MsgId &id, const Params &... args)   |   |
| <b>Syntax:</b>           | <pre>template &lt;typename MsgId, typename... Params&gt; void Log (const MsgId &amp;id, const Params &amp;... args) noexcept;</pre>            |   |
| <b>Template param:</b>   | MsgId  | the type of the id parameter                                  |
|                          | Args   | the types of the args parameters                              |
| <b>Parameters (in):</b>  | id   | an implementation-defined type identifying the message object |
|                          | args   | the arguments to add to the message                           |
| <b>Return value:</b>     | None   |   |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Description:</b>      | Log a modeled message.<br>If this function is called with an argument list that does not match the modeled message, the program is ill-formed. |   |

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### 8.3.2.10 Logger::LogWith

#### [SWS\_LOG\_00133]{DRAFT} Definition of API function ara::log::Logger::LogWith [

|                          |  |   |
|--------------------------|--|---|
| <b>Kind:</b>             | function   |   |
| <b>Header file:</b>      | #include "ara/log/logger.h"  |   |
| <b>Scope:</b>            | class ara::log::Logger   |   |
| <b>Symbol:</b>           | LogWith(const std::tuple< Attrs... > &attrs, const MsgId &msgId, const Params &... params)   |   |
| <b>Syntax:</b>           | <pre>template &lt;typename... Attrs, typename MsgId, typename... Params&gt; void LogWith (const std::tuple&lt; Attrs... &gt; &amp;attrs, const MsgId &amp;msgId, const Params &amp;... params) noexcept;</pre> |   |
| <b>Template param:</b>   | Attrs  | the types of attrs  |
|                          | MsgId  | the type of msgId   |
|                          | Params   | the types of the params   |
| <b>Parameters (in):</b>  | attrs  | a std::tuple containing attributes of the message                               |
|                          | msgId  | an implementation-defined instance of type MsgId identifying the message object |
|                          | params   | the arguments to add to the message   |
| <b>Return value:</b>     | None   |   |
| <b>Exception Safety:</b> | noexcept   |   |
| <b>Description:</b>      | This function does not participate in overload resolution if any of Attrs... is not an "Attr" (TBD).   |   |

](RS\_LT\_00003)



### 8.3.2.11 Logger::SetThreshold

[SWS\_LOG\_00255]{DRAFT} Definition of API function `ara::log::Logger::SetThreshold` [

|                          |   |
|--------------------------|---|
| <b>Kind:</b>             | function  |
| <b>Header file:</b>      | #include "ara/log/logger.h"                                   |
| <b>Scope:</b>            | <a href="#">class ara::log::Logger</a>                        |
| <b>Symbol:</b>           | SetThreshold(LogLevel threshold)                              |
| <b>Syntax:</b>           | <code>void SetThreshold (LogLevel threshold) noexcept;</code> |
| <b>Parameters (in):</b>  | threshold   the new threshold                                 |
| <b>Return value:</b>     | None  |
| <b>Exception Safety:</b> | noexcept  |
| <b>Description:</b>      | Set log level threshold for this Logger instance.             |

]([RS\\_LT\\_00049](#))

### 8.3.2.12 Wrapper type

[SWS\_LOG\_00261] Definition of API class `ara::log::Argument` [

|                                |  |
|--------------------------------|--|
| <b>Kind:</b>                   | class  |
| <b>Header file:</b>            | #include "ara/log/log_stream.h"  |
| <b>Forwarding header file:</b> | #include "ara/log/log_fwd.h"   |
| <b>Scope:</b>                  | namespace ara::log   |
| <b>Symbol:</b>                 | Argument   |
| <b>Syntax:</b>                 | <code>template &lt;typename T&gt;<br/>class Argument final {...};</code>   |
| <b>Template param:</b>         | typename T   the argument payload type   |
| <b>Description:</b>            | Wrapper type for holding a payload argument with its attributes.<br>The setup of this class is implementation-defined. |

]([RS\\_LT\\_00003](#))

## A Mentioned Manifest Elements

For the sake of completeness, this chapter contains a set of class tables representing meta-classes mentioned in the context of this document.

|                        |   |              |             |   |
|------------------------|---|--------------|-------------|---|
| <b>Class</b>           | <b>DltApplication</b>   |              |             |   |
| <b>Package</b>         | M2::AUTOSARTemplates::LogAndTraceExtract  |              |             |   |
| <b>Note</b>            | This meta-class represents the application from which the log and trace message originates.                   |              |             |   |
| <b>Base</b>            | ARObject, <a href="#">Identifiable</a> , <a href="#">MultilanguageReferrable</a> , <a href="#">Referrable</a> |              |             |   |
| <b>Aggregated by</b>   | <a href="#">DltEcu.application</a>  |              |             |   |
| <b>Attribute</b>       | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| applicationDescription | String  | 0..1         | attr        | This attribute can be used to describe the applicationId that is used in the log and trace message in more detail.  |
| applicationId          | String  | 0..1         | attr        | This attribute identifies the SW-C/BSW module in the log and trace message.   |
| context                | <a href="#">DltContext</a>  | *            | ref         | Definition of ContextIds for the Application.<br><b>Stereotypes:</b> atpSplittable; atpVariation<br><b>Tags:</b><br>atp.Splitkey=context.dltContext, context.variationPoint.shortLabel<br>vh.latestBindingTime=systemDesignTime |

**Table A.1: DltApplication**

|                       |   |              |             |   |
|-----------------------|---|--------------|-------------|---|
| <b>Class</b>          | <b>DltArgument</b>  |              |             |   |
| <b>Package</b>        | M2::AUTOSARTemplates::LogAndTraceExtract  |              |             |   |
| <b>Note</b>           | This element defines an Argument in a DltMessage.   |              |             |   |
| <b>Base</b>           | ARObject, <a href="#">Identifiable</a> , <a href="#">MultilanguageReferrable</a> , <a href="#">Referrable</a> |              |             |   |
| <b>Aggregated by</b>  | <a href="#">DltArgument.dltArgumentEntry</a> , <a href="#">DltMessage.dltArgument</a>                         |              |             |   |
| <b>Attribute</b>      | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| dltArgumentEntry      | <a href="#">DltArgument</a>   | *            | aggr        | This aggregation is used to describe subElements of a DltArgument that defines a Structure.   |
| length                | PositiveInteger   | 0..1         | attr        | Describes the DltArgument length in case of Arrays and Strings in number of BaseType.   |
| networkRepresentation | <a href="#">SwDataDefProps</a>  | 0..1         | aggr        | Definition of the networkRepresentation of the DltArgument.<br><b>Stereotypes:</b> atpSplittable<br><b>Tags:</b> atp.Splitkey=networkRepresentation |
| optional              | Boolean   | 0..1         | attr        | This attribute defines whether the argument is optional or not. If set to true, the argument can be omitted from the payload of a DLT message.      |
| predefinedText        | Boolean   | 0..1         | attr        | This attribute defines whether the DltArgument is a predefinedText (Static Data).   |
| variableLength        | Boolean   | 0..1         | attr        | This attribute defines whether the length of the DltArgument is variable (determined at runtime) or not.  |

**Table A.2: DltArgument**

|                      |  |              |             |   |
|----------------------|--|--------------|-------------|---|
| <b>Class</b>         | <b>DltContext</b>  |              |             |   |
| <b>Package</b>       | M2::AUTOSARTemplates::LogAndTraceExtract   |              |             |   |
| <b>Note</b>          | This meta-class represents the Context that groups Log and Trace Messages that are generated by an application.<br><b>Tags:</b> atp.recommendedPackage=DltContexts       |              |             |   |
| <b>Base</b>          | <i>ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, UploadableDesignElement, UploadablePackageElement</i> |              |             |   |
| <b>Aggregated by</b> | ARPackage.element  |              |             |   |
| <b>Attribute</b>     | <b>Type</b>  | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| contextDescription   | String   | 0..1         | attr        | This attribute can be used to describe the contextId that is used in the log and trace message in more detail.  |
| contextId            | String   | 0..1         | attr        | This attribute is used to group log and trace messages produced by an application to distinguish functionality.   |
| dltMessage           | <a href="#">DltMessage</a>   | *            | ref         | Group of Log and Trace Messages assigned to the Dlt Context<br><br><b>Stereotypes:</b> atpSplittable; atpVariation<br><b>Tags:</b><br>atp.Splitkey=dltMessage.dltMessage, dltMessage.variationPoint.shortLabel<br>vh.latestBindingTime=systemDesignTime |

**Table A.3: DltContext**

|                      |  |              |             |   |
|----------------------|--|--------------|-------------|---|
| <b>Class</b>         | <b>DltEcu</b>  |              |             |   |
| <b>Package</b>       | M2::AUTOSARTemplates::LogAndTraceExtract   |              |             |   |
| <b>Note</b>          | This element represents an Ecu or Machine that produces logging and tracing information.<br><b>Tags:</b> atp.recommendedPackage=DltEcus                                  |              |             |   |
| <b>Base</b>          | <i>ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, UploadableDesignElement, UploadablePackageElement</i> |              |             |   |
| <b>Aggregated by</b> | ARPackage.element  |              |             |   |
| <b>Attribute</b>     | <b>Type</b>  | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| application          | <a href="#">DltApplication</a>   | *            | aggr        | Application on DltEcu that provides log or trace data.<br><br><b>Stereotypes:</b> atpSplittable; atpVariation<br><b>Tags:</b><br>atp.Splitkey=application.shortName, application.variationPoint.shortLabel<br>vh.latestBindingTime=systemDesignTime |
| eculd                | String   | 0..1         | attr        | This attribute defines the name of the ECU for use within the Dlt protocol.   |

**Table A.4: DltEcu**

|                      |  |              |             |  |
|----------------------|--|--------------|-------------|--|
| <b>Class</b>         | <b>DltLogSink</b>  |              |             |  |
| <b>Package</b>       | M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace  |              |             |  |
| <b>Note</b>          | The meta-class defines the output sink for DltLogMessages<br><b>Tags:</b> atp.recommendedPackage=DltLogSinks   |              |             |  |
| <b>Base</b>          | <i>ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, UploadableDeploymentElement, UploadablePackageElement</i> |              |             |  |
| <b>Aggregated by</b> | ARPackage.element  |              |             |  |
| <b>Attribute</b>     | <b>Type</b>  | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>  |
| bufferOutput         | Boolean  | 0..1         | attr        | This attribute defines whether a buffer is used in case that the output sink is the console. |





| Class                 | DltLogSink  |      |      |   |
|-----------------------|---|------|------|---|
| defaultLogThreshold   | LogTraceDefaultLogLevelEnum                                 | 0..1 | attr | This attribute allows to set a log level Threshold for Log Level filtering.   |
| defaultTraceState     | Boolean   | 0..1 | attr | This attributes defines the default trace status.   |
| endpointConfiguration | <a href="#">PlatformModuleEthernetEndpointConfiguration</a> | 0..1 | ref  | Network configuration (Protocol, Port, IP Address) for transmission of dlt messages on a specific VLAN.   |
| logChannelId          | String  | 0..1 | attr | This attribute identifies the LogChannel for usage within the Log And Trace protocol.   |
| nonVerboseMode        | Boolean   | 0..1 | attr | This attribute defines whether this DltLogSink supports non-Verbose Dlt messages. If disabled only verbose mode messages shall be used.   |
| path                  | UriString   | 0..1 | attr | This attribute defines the path to the file that is used as output sink.  |
| queueSize             | PositiveInteger   | 0..1 | attr | Length of the queue (in which messages can be stored before processing) in the unit "Log message".  |
| segmentationSupported | Boolean   | 0..1 | attr | If enabled, segmentation will be used for DLT messages that are larger than EthernetCommunicationConnector.maximumTransmissionUnit referenced via DltLogSink.endpointConfiguration. |

**Table A.5: DltLogSink**

| Class                | DltLogSinkToPortPrototypeMapping  |       |      |  |
|----------------------|---|-------|------|--|
| <b>Package</b>       | M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace   |       |      |  |
| <b>Note</b>          | This meta-class maps a PortPrototype to an output sink of a log and trace message.<br><b>Tags:</b> atp.recommendedPackage=DltLogSinkToPortPrototypeMappings                 |       |      |  |
| <b>Base</b>          | <i>ARElement, ARObjct, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, UploadableDeploymentElement, UploadablePackageElement</i> |       |      |  |
| <b>Aggregated by</b> | ARPackage.element   |       |      |  |
| Attribute            | Type  | Mult. | Kind | Note   |
| dltContext           | <a href="#">DltContext</a>  | 0..1  | ref  | Assignment of the DltContext that groups log and trace messages that will be transmitted to the DltLogSink.                                |
| dltLogSink           | <a href="#">DltLogSink</a>  | *     | ref  | Reference to the output sink to which the log or trace message will be transmitted,  |
| dltSessionId         | PositiveInteger   | 0..1  | attr | This attribute allows distinguishing log/trace messages from different instances of the same SW-C.   |
| pPortPrototype       | PPortPrototype  | 0..1  | iref | Reference to PPortPrototype that is mapped to the DltLog Sink.<br><b>InstanceRef implemented by:</b> PPortPrototypeInExecutableInstanceRef |
| process              | <a href="#">Process</a>   | 0..1  | ref  | This reference represents the process required as context for the mapping.   |
| rPortPrototype       | RPortPrototype  | 0..1  | iref | Reference to RPortPrototype that is mapped to a DltLog Sink<br><b>InstanceRef implemented by:</b> RPortPrototypeInExecutableInstanceRef    |

**Table A.6: DltLogSinkToPortPrototypeMapping**

|                       |   |              |             |  |
|-----------------------|---|--------------|-------------|--|
| <b>Class</b>          | <b>DitMessage</b>   |              |             |  |
| <b>Package</b>        | M2::AUTOSARTemplates::LogAndTraceExtract  |              |             |  |
| <b>Note</b>           | This element defines a DitMessage.  |              |             |  |
| <b>Base</b>           | ARObject, <a href="#">Identifiable</a> , <a href="#">MultilanguageReferrable</a> , <a href="#">Referrable</a> |              |             |  |
| <b>Aggregated by</b>  | <a href="#">LogAndTraceMessageCollectionSet.ditMessage</a>  |              |             |  |
| <b>Attribute</b>      | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>  |
| ditArgument (ordered) | <a href="#">DitArgument</a>   | *            | aggr        | Ordered collection of DitArguments in the DitMessage.  |
| messageId             | PositiveInteger   | 0..1         | attr        | This attribute defines the unique Id for the DitMessage.   |
| messageLine Number    | PositiveInteger   | 0..1         | attr        | This attribute describes the position in the source file in which this log message was called.     |
| messageSource File    | String  | 0..1         | attr        | This attribute describes the source file in which this log message was called.                     |
| messageType Info      | String  | 0..1         | attr        | This attribute describes the message Type  |
| privacyLevel          | PrivacyLevel  | 0..1         | aggr        | The Privacy Level helps to identify the Log and Trace content towards the degree of privacy to it. |

**Table A.7: DitMessage**

|                            |   |              |             |  |
|----------------------------|---|--------------|-------------|--|
| <b>Class</b>               | <b>Executable</b>   |              |             |  |
| <b>Package</b>             | M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::ApplicationStructure   |              |             |  |
| <b>Note</b>                | This meta-class represents an executable program.<br><b>Tags:</b> atp.recommendedPackage=Executables  |              |             |  |
| <b>Base</b>                | ARElement, ARObject, AtpClassifier, CollectableElement, <a href="#">Identifiable</a> , <a href="#">MultilanguageReferrable</a> , <a href="#">PackageableElement</a> , <a href="#">Referrable</a> , <a href="#">UploadableDesignElement</a> , <a href="#">UploadablePackageElement</a> |              |             |  |
| <b>Aggregated by</b>       | ARPackage.element   |              |             |  |
| <b>Attribute</b>           | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>  |
| buildType                  | BuildTypeEnum   | 0..1         | attr        | This attribute describes the buildType of a module and/or platform implementation.   |
| implementation Props       | Executable ImplementationProps  | *            | aggr        | This aggregation contains the collection of implementation-specific properties necessary to properly build the enclosing Executable.   |
| minimumTimer Granularity   | TimeValue   | 0..1         | attr        | This attribute describes the minimum timer resolution (TimeValue of one tick) that is required by the Executable.  |
| reporting Behavior         | ExecutionState ReportingBehavior Enum   | 0..1         | attr        | this attribute controls the execution state reporting behavior of the enclosing Executable.  |
| rootSw Component Prototype | RootSwComponent Prototype   | 0..1         | aggr        | This represents the root SwCompositionPrototype of the Executable. This aggregation is required (in contrast to a direct reference of a SwComponentType) in order to support the definition of instanceRefs in Executable context. |
| traceSwitch Configuration  | TraceSwitch Configuration   | *            | aggr        | Configuration of the MsgId based trace switch<br><b>Tags:</b> atp.Status=draft   |
| version                    | StrongRevisionLabel String  | 0..1         | attr        | Version of the executable.   |

**Table A.8: Executable**

|                      |   |              |             |             |
|----------------------|---|--------------|-------------|-------------|
| <b>Class</b>         | <b>FunctionalClusterInteractsWithFunctionalClusterMapping</b> (abstract)  |              |             |             |
| <b>Package</b>       | M2::AUTOSARTemplates::AdaptivePlatform::FunctionalClusterInteractsWithFunctionalClusterMapping  |              |             |             |
| <b>Note</b>          | This meta-class identifies a relation between functional clusters on the adaptive platform such one functional cluster can call APIs of the other functional cluster.   |              |             |             |
| <b>Base</b>          | <i>ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, UploadableDeploymentElement, UploadablePackageElement</i>  |              |             |             |
| <b>Subclasses</b>    | ArtifactChecksumToCryptoProviderMapping, ComCertificateToCryptoCertificateMapping, ComKeyToCryptoKeySlotMapping, ComSecOcToCryptoKeySlotMapping, FunctionalClusterInteractsWithPersistenceDeploymentMapping, FunctionalClusterToSecurityEventDefinitionMapping, NmInteractsWithSmMapping, PersistenceDeploymentElementToCryptoKeySlotMapping, PersistenceDeploymentToCryptoKeySlotMapping, PersistenceDeploymentToDltLogSinkMapping, SmInteractsWithNmMapping, TimeBaseProviderToPersistenceMapping, UcmToTimeBaseResourceMapping |              |             |             |
| <b>Aggregated by</b> | ARPackage.element   |              |             |             |
| <b>Attribute</b>     | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b> |
| -                    | -   | -            | -           | -           |

**Table A.9: FunctionalClusterInteractsWithFunctionalClusterMapping**

|                   |  |
|-------------------|--|
| <b>Class</b>      | <b>Identifiable</b> (abstract)   |
| <b>Package</b>    | M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Identifiable   |
| <b>Note</b>       | Instances of this class can be referred to by their identifier (within the namespace borders). In addition to this, Identifiables are objects which contribute significantly to the overall structure of an AUTOSAR description. In particular, Identifiables might contain Identifiables.   |
| <b>Base</b>       | <i>ARObject, MultilanguageReferrable, Referrable</i>   |
| <b>Subclasses</b> | ARPackage, <i>AbstractDolpLogicAddressProps, AbstractEvent, AbstractImplementationDataTypeElement, AbstractSecurityEventFilter, AbstractSecurityIdsmInstanceFilter, AbstractServiceInstance, AbstractSignalBasedToSignalTriggeringMapping, AdaptiveSwcInternalBehavior, ApApplicationEndpoint, ApplicationEndpoint, ApplicationError, AppliedStandard, ArtifactChecksum, ArtifactLocator, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpFeature, AutosarOperationArgumentInstance, AutosarVariableInstance, BuildActionEntity, BuildActionEnvironment, Chapter, CheckpointTransition, ClassContentConditional, ClientIdDefinition, ClientServerOperation, Code, CollectableElement, ComManagementMapping, CommConnectorPort, CommunicationConnector, CommunicationController, Compiler, ConsistencyNeeds, ConsumedEventGroup, CouplingPort, CouplingPortStructuralElement, CryptoCertificate, CryptoKeySlot, CryptoProvider, CryptoServiceMapping, DataPrototypeGroup, DataTransformation, DdsCpDomain, DdsCpPartition, DdsCpQosProfile, DdsCpTopic, DdsDomainRange, DependencyOnArtifact, DiagEventDebounceAlgorithm, DiagnosticAuthTransmitCertificateEvaluation, DiagnosticConnectedIndicator, DiagnosticDataElement, DiagnosticDebounceAlgorithmProps, DiagnosticFunctionInhibitSource, DiagnosticParameterElement, DiagnosticRoutineSubfunction, DiagnosticSovdMethodPrimitive, DltApplication, DltArgument, DltMessage, DolpInterface, DolpLogicAddress, DolpRoutingActivation, E2EProfileConfiguration, End2EndEventProtectionProps, End2EndMethodProtectionProps, EndToEndProtection, EthernetWakeupSleepOnDataLineConfig, EventHandler, EventMapping, ExclusiveArea, ExecutableEntity, ExecutionTime, FMAAttributeDef, FMFeatureMapAssertion, FMFeatureMapCondition, FMFeatureMapElement, FMFeatureRelation, FMFeatureRestriction, FMFeatureSelection, FieldMapping, FireAndForgetMethodMapping, FlexrayArTpNode, FlexrayTpPduPool, FrameTriggering, GeneralParameter, GlobalSupervision, GlobalTimeGateway, GlobalTimeMaster, GlobalTimeSlave, HealthChannel, HeapUsage, HwAttributeDef, HwAttributeLiteralDef, HwPin, HwPinGroup, IEEE1722TpAcfBus, IEEE1722TpAcfBusPart, IPsecRule, IPv6ExtHeaderFilterList, ISignalToIPduMapping, ISignalTriggering, IdentCaption, ImpositionTime, InternalTriggeringPoint, Keyword, LifeCycleState, Linker, MacMulticastGroup, MacSecKayParticipant, McDataInstance, MemorySection, MemoryUsage, MethodMapping, ModeDeclaration, ModeDeclarationMapping, ModeSwitchPoint, NetworkEndpoint, NmCluster, NmNode, PackageableElement, ParameterAccess, PduActivationRoutingGroup, PduToFrameMapping, PduTriggering, PerInstanceMemory, PersistenceDeploymentElement, PersistenceInterfaceElement, PhmSupervision, PhysicalChannel, PortGroup, PortInterfaceMapping, PossibleErrorReaction, ProcessToMachineMapping, Processor, ProcessorCore, PskIdentityToKeySlotMapping, ResourceConsumption, ResourceGroup, RootSwClusterDesignComponentPrototype, RootSwComponentPrototype, RootSwCompositionPrototype, RptComponent, RptContainer, RptExecutableEntity, RptExecutableEntityEvent, RptExecutionContext, RptProfile, RptServicePoint, RunnableEntityGroup, SdgAttribute, SdgClass, SecOcJobMapping, SecOcJobRequirement, SecureCommunicationAuthenticationProps, SecureCommunicationDeployment, SecureCommunicationFreshnessProps, SecurityEventContextProps,</i> |





| <b>Class</b>     | <b>Identifiable</b> (abstract)  |              |             |   |
|------------------|---|--------------|-------------|---|
|                  | △<br><i>ServiceEventDeployment, ServiceFieldDeployment, ServiceInterfaceElementSecureComConfig, ServiceMethodDeployment, ServiceNeeds, SignalServiceTranslationEventProps, SignalServiceTranslationProps, SocketAddress, SoftwarePackageStep, SomeipEventGroup, SomeipProvidedEventGroup, SomeipTpChannel, SpecElementReference, StackUsage, StateManagementActionItem, StateManagementActionList, StateManagementStateNotification, StateManagementStateRequest, StaticSocketConnection, StructuredReq, SupervisionCheckpoint, SupervisionMode, SupervisionModeCondition, SwGenericAxisParamType, SwServiceArg, SwcServiceDependency, SystemMapping, TimeBaseResource, TimingClock, TimingClockSyncAccuracy, TimingCondition, TimingConstraint, TimingDescription, TimingExtensionResource, TimingModelInstance, TlsCryptoCipherSuite, TlsCryptoCipherSuiteProps, TlsJobMapping, Topic1, TpAddress, TraceableTable, TraceableText, TracedFailure, TransformationProps, TransformationTechnology, Trigger, UcmDescription, UcmRetryStrategy, UcmStep, VariableAccess, VariationPointProxy, VehicleRolloutStep, ViewMap, VlanConfig, WaitPoint</i> |              |             |   |
| <b>Attribute</b> | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| adminData        | AdminData   | 0..1         | aggr        | This represents the administrative data for the identifiable object.<br><br><b>Stereotypes:</b> atpSplitable<br><b>Tags:</b><br>atp.Splitkey=adminData<br>xml.sequenceOffset=-40  |
| annotation       | Annotation  | *            | aggr        | Possibility to provide additional notes while defining a model element (e.g. the ECU Configuration Parameter Values). These are not intended as documentation but are mere design notes.<br><br><b>Tags:</b> xml.sequenceOffset=-25   |
| category         | CategoryString  | 0..1         | attr        | The category is a keyword that specializes the semantics of the Identifiable. It affects the expected existence of attributes and the applicability of constraints.<br><br><b>Tags:</b> xml.sequenceOffset=-50  |
| desc             | MultiLanguageOverviewParagraph  | 0..1         | aggr        | This represents a general but brief (one paragraph) description what the object in question is about. It is only one paragraph! Desc is intended to be collected into overview tables. This property helps a human reader to identify the object in question.<br><br>More elaborate documentation, (in particular how the object is built or used) should go to "introduction".<br><br><b>Tags:</b> xml.sequenceOffset=-60  |
| introduction     | DocumentationBlock  | 0..1         | aggr        | This represents more information about how the object in question is built or is used. Therefore it is a DocumentationBlock.<br><br><b>Tags:</b> xml.sequenceOffset=-30   |
| uuid             | String  | 0..1         | attr        | The purpose of this attribute is to provide a globally unique identifier for an instance of a meta-class. The values of this attribute should be globally unique strings prefixed by the type of identifier. For example, to include a DCE UUID as defined by The Open Group, the UUID would be preceded by "DCE:". The values of this attribute may be used to support merging of different AUTOSAR models. The form of the UUID (Universally Unique Identifier) is taken from a standard defined by the Open Group (was Open Software Foundation). This standard is widely used, including by Microsoft for COM (GUIDs) and by many companies for DCE, which is based on CORBA. The method for generating these 128-bit IDs is published in the standard and the effectiveness and uniqueness of the IDs is not in practice disputed. If the id namespace is omitted, DCE is assumed. An example is "DCE:2fac1234-31f8-11b4-a222-08002b34c003". The |





|              |                                |  |  |  |
|--------------|--------------------------------|--|--|--|
| <b>Class</b> | <b>Identifiable</b> (abstract) |  |  |  |
|              |                                |  |  | uuid attribute has no semantic meaning for an AUTOSAR model and there is no requirement for AUTOSAR tools to manage the timestamp.<br>Tags: xml.attribute=true |

**Table A.10: Identifiable**

|                      |   |              |             |   |
|----------------------|---|--------------|-------------|---|
| <b>Class</b>         | <b>LogAndTraceInstantiation</b>   |              |             |   |
| <b>Package</b>       | M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::LogAndTrace   |              |             |   |
| <b>Note</b>          | This meta-class defines the attributes for the Log&Trace configuration on a specific machine.   |              |             |   |
| <b>Base</b>          | ARObject, AdaptiveModuleInstantiation, AtpClassifier, AtpFeature, AtpStructureElement, <a href="#">Identifiable</a> , MultilanguageReferrable, NonOsModuleInstantiation, <a href="#">Referrable</a> |              |             |   |
| <b>Aggregated by</b> | AtpClassifier.atpFeature, <a href="#">Machine.moduleInstantiation</a>   |              |             |   |
| <b>Attribute</b>     | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| dltEcu               | <a href="#">DltEcu</a>  | 0..1         | ref         | Reference to the Ecu representation in the Log And Trace Extract.   |
| logSink              | <a href="#">DltLogSink</a>  | *            | ref         | Reference to output sinks for log or trace messages that are produced on the Machine.   |
| sessionIdSupport     | Boolean   | 0..1         | attr        | This attribute defines whether the sessionId is used or not.  |
| timeBaseResource     | TimeBaseResource  | *            | ref         | This reference is used to describe to which time base the Log and Trace module has access. From the Time Base Resource the Log and Trace module gets the needed information to generate the time stamp. |

**Table A.11: LogAndTraceInstantiation**

|                      |  |              |             |             |
|----------------------|--|--------------|-------------|-------------|
| <b>Class</b>         | <b>LogAndTraceInterface</b>  |              |             |             |
| <b>Package</b>       | M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface   |              |             |             |
| <b>Note</b>          | This meta-class provides the ability to implement a PortInterface for support of Logging or Tracing.<br>Tags: atp.recommendedPackage=PortInterfaces  |              |             |             |
| <b>Base</b>          | ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, CollectableElement, <a href="#">Identifiable</a> , MultilanguageReferrable, PackageableElement, PortInterface, <a href="#">Referrable</a> |              |             |             |
| <b>Aggregated by</b> | ARPackage.element  |              |             |             |
| <b>Attribute</b>     | <b>Type</b>  | <b>Mult.</b> | <b>Kind</b> | <b>Note</b> |
| -                    | -  | -            | -           | -           |

**Table A.12: LogAndTraceInterface**

|                      |   |              |             |             |
|----------------------|---|--------------|-------------|-------------|
| <b>Class</b>         | <b>LogAndTraceMessageCollectionSet</b>  |              |             |             |
| <b>Package</b>       | M2::AUTOSARTemplates::LogAndTraceExtract  |              |             |             |
| <b>Note</b>          | Collection of DltMessages<br>Tags: atp.recommendedPackage=LogAndTraceMessageCollectionSets  |              |             |             |
| <b>Base</b>          | ARElement, ARObject, CollectableElement, <a href="#">Identifiable</a> , MultilanguageReferrable, PackageableElement, <a href="#">Referrable</a> , UploadableDesignElement, UploadablePackageElement |              |             |             |
| <b>Aggregated by</b> | ARPackage.element   |              |             |             |
| <b>Attribute</b>     | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b> |







| Class      | LogAndTraceMessageCollectionSet |   |      |   |
|------------|---------------------------------|---|------|---|
| dltMessage | <a href="#">DltMessage</a>      | * | aggr | Collection of DltMessages in the DltMessageCollection Set.<br><b>Stereotypes:</b> atpSplitable; atpVariation<br><b>Tags:</b><br>atp.Splitkey=dltMessage.shortName, dlt Message.variationPoint.shortLabel<br>vh.latestBindingTime=systemDesignTime |

**Table A.13: LogAndTraceMessageCollectionSet**

| Class                                     | Machine  |       |      |  |
|---|--|-------|------|--|
| <b>Package</b>                            | M2::AUTOSARTemplates::AdaptivePlatform::MachineManifest  |       |      |  |
| <b>Note</b>                               | Machine that represents an Adaptive Autosar Software Stack.<br><b>Tags:</b> atp.recommendedPackage=Machines  |       |      |  |
| <b>Base</b>                               | <i>ARElement, ARObject, AtpClassifier, AtpFeature, AtpStructureElement, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, UploadableDeploymentElement, UploadablePackageElement</i> |       |      |  |
| <b>Aggregated by</b>                      | ARPackage.element, AtpClassifier.atpFeature  |       |      |  |
| Attribute                                 | Type   | Mult. | Kind | Note   |
| default Application Timeout               | EnterExitTimeout   | 0..1  | aggr | This aggregation defines a default timeout in the context of a given Machine with respect to the launching and termination of applications.  |
| environment Variable                      | TagWithOptionalValue   | *     | aggr | This aggregation represents the collection of environment variables that shall be added to the environment defined on the level of the enclosing Machine.<br><b>Stereotypes:</b> atpSplitable<br><b>Tags:</b> atp.Splitkey=environmentVariable |
| machineDesign                             | MachineDesign  | 0..1  | ref  | Reference to the MachineDesign this Machine is implementing.   |
| module Instantiation                      | AdaptiveModule Instantiation   | *     | aggr | Configuration of Adaptive Autosar module instances that are running on the machine.<br><b>Stereotypes:</b> atpSplitable<br><b>Tags:</b> atp.Splitkey=moduleInstantiation.shortName   |
| processor                                 | Processor  | *     | aggr | This represents the collection of processors owned by the enclosing machine.   |
| secure Communication Deployment           | SecureCommunication Deployment   | *     | aggr | Deployment of secure communication protocol configuration settings to crypto module entities.<br><b>Stereotypes:</b> atpSplitable<br><b>Tags:</b> atp.Splitkey=secureCommunication Deployment.shortName  |
| trustedPlatform Executable LaunchBehavior | TrustedPlatform ExecutableLaunch BehaviorEnum  | 0..1  | attr | This attribute controls the behavior of how authentication affects the ability to launch for each Executable.  |

**Table A.14: Machine**

|                        |  |              |             |   |
|------------------------|--|--------------|-------------|---|
| <b>Class</b>           | <b>PlatformModuleEthernetEndpointConfiguration</b>   |              |             |   |
| <b>Package</b>         | M2::AUTOSARTemplates::AdaptivePlatform::PlatformModuleDeployment::AdaptiveModuleImplementation   |              |             |   |
| <b>Note</b>            | This meta-class defines the attributes for the configuration of a port, protocol type and IP address of the communication on a VLAN.<br><b>Tags:</b> atp.recommendedPackage=PlatformModuleEndpointConfigurations |              |             |   |
| <b>Base</b>            | ARElement, ARObject, CollectableElement, <a href="#">Identifiable</a> , MultilanguageReferrable, PackageableElement, PlatformModuleEndpointConfiguration, <a href="#">Referrable</a>                             |              |             |   |
| <b>Aggregated by</b>   | ARPackage.element  |              |             |   |
| <b>Attribute</b>       | <b>Type</b>  | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| communicationConnector | EthernetCommunicationConnector   | 0..1         | ref         | Reference to the CommunicationConnector (VLAN) for which the network configuration is defined.  |
| ipv4MulticastIpAddress | Ip4AddressString   | 0..1         | attr        | Multicast IPv4 Address to which the message will be transmitted.  |
| ipv6MulticastIpAddress | Ip6AddressString   | 0..1         | attr        | Multicast IPv6 Address to which the message will be transmitted.  |
| secureComPropsForTcp   | SecureComProps   | 0..1         | ref         | Reference to communication security configuration settings that are valid for the tcp unicast endpoint (Tcp Port + unicast IP Address) defined by the PlatformModule EthernetEndpointConfiguration. |
| secureComPropsForUdp   | SecureComProps   | 0..1         | ref         | Reference to communication security configuration settings that are valid for the udp unicast endpoint (Udp Port + unicast IP Address) defined by the PlatformModule EthernetEndpointConfiguration. |
| tcpPort                | ApApplicationEndpoint  | 0..1         | ref         | This reference allows to configure a tcp port number.   |
| udpPort                | ApApplicationEndpoint  | 0..1         | ref         | This reference allows to configure a udp port number.   |

**Table A.15: PlatformModuleEthernetEndpointConfiguration**

|                                 |   |              |             |  |
|---------------------------------|---|--------------|-------------|--|
| <b>Class</b>                    | <b>PortPrototype</b> (abstract)   |              |             |  |
| <b>Package</b>                  | M2::AUTOSARTemplates::SWComponentTemplate::Components   |              |             |  |
| <b>Note</b>                     | Base class for the ports of an AUTOSAR software component.<br>The aggregation of PortPrototypes is subject to variability with the purpose to support the conditional existence of ports. |              |             |  |
| <b>Base</b>                     | ARObject, AtpBlueprintable, AtpFeature, AtpPrototype, <a href="#">Identifiable</a> , MultilanguageReferrable, <a href="#">Referrable</a>  |              |             |  |
| <b>Subclasses</b>               | AbstractProvidedPortPrototype, AbstractRequiredPortPrototype  |              |             |  |
| <b>Aggregated by</b>            | AtpClassifier.atpFeature, SwComponentType.port  |              |             |  |
| <b>Attribute</b>                | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>  |
| clientServerAnnotation          | ClientServerAnnotation  | *            | aggr        | Annotation of this PortPrototype with respect to client/server communication.                          |
| delegatedPortAnnotation         | DelegatedPortAnnotation   | 0..1         | aggr        | Annotations on this delegated port.  |
| ioHwAbstractionServerAnnotation | IoHwAbstractionServerAnnotation   | *            | aggr        | Annotations on this IO Hardware Abstraction port.  |
| modePortAnnotation              | ModePortAnnotation  | *            | aggr        | Annotations on this mode port.   |
| nvDataPortAnnotation            | NvDataPortAnnotation  | *            | aggr        | Annotations on this non volatile data port.  |
| parameterPortAnnotation         | ParameterPortAnnotation   | *            | aggr        | Annotations on this parameter port.  |
| portPrototypeProps              | PortPrototypeProps  | 0..1         | aggr        | This attribute allows for the definition of further qualification of the semantics of a PortPrototype. |





| <b>Class</b>             | <b>PortPrototype</b> (abstract) |   |      |  |
|--------------------------|---------------------------------|---|------|--|
| senderReceiverAnnotation | SenderReceiverAnnotation        | * | aggr | Collection of annotations of this ports sender/receiver communication. |
| triggerPortAnnotation    | TriggerPortAnnotation           | * | aggr | Annotations on this trigger port.                                      |

**Table A.16: PortPrototype**

| <b>Class</b>                | <b>Process</b>  |              |             |   |
|-----------------------------|---|--------------|-------------|---|
| <b>Package</b>              | M2::AUTOSARTemplates::AdaptivePlatform::ExecutionManifest   |              |             |   |
| <b>Note</b>                 | This meta-class provides information required to execute the referenced <a href="#">Executable</a> .<br><b>Tags:</b> atp.recommendedPackage=Processes   |              |             |   |
| <b>Base</b>                 | <i>ARElement, ARObject, AbstractExecutionContext, AtpClassifier, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, UploadableDeploymentElement, UploadablePackageElement</i> |              |             |   |
| <b>Aggregated by</b>        | ARPackage.element   |              |             |   |
| <b>Attribute</b>            | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| design                      | ProcessDesign   | 0..1         | ref         | This reference represents the identification of the design-time representation for the Process that owns the reference.   |
| executable                  | <a href="#">Executable</a>  | *            | ref         | Reference to executable that is executed in the process.<br><b>Stereotypes:</b> atpUriDef   |
| functionClusterAffiliation  | String  | 0..1         | attr        | This attribute specifies which functional cluster the Process is affiliated with.   |
| numberOfRestartAttempts     | PositiveInteger   | 0..1         | attr        | This attribute defines how often a process shall be restarted if the start fails.<br>numberOfRestartAttempts = "0" OR Attribute not existing, start once<br>numberOfRestartAttempts = "1", start a second time      |
| preMapping                  | Boolean   | 0..1         | attr        | This attribute describes whether the executable is preloaded into the memory.   |
| processStateMachine         | ModeDeclarationGroupPrototype   | 0..1         | aggr        | Set of Process States that are defined for the process.   |
| securityEvent               | SecurityEventDefinition   | *            | ref         | The reference identifies the collection of SecurityEvents that can be reported by the Process.<br><b>Stereotypes:</b> atpSplitable; atpUriDef<br><b>Tags:</b><br>atp.Splitkey=securityEvent<br>atp.Status=candidate |
| stateDependentStartupConfig | StateDependentStartupConfig   | *            | aggr        | Applicable startup configurations.  |

**Table A.17: Process**

| <b>Class</b>   | <b>Referrable</b> (abstract)  |
|----------------|---|
| <b>Package</b> | M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Identifiable                          |
| <b>Note</b>    | Instances of this class can be referred to by their identifier (while adhering to namespace borders). |
| <b>Base</b>    | <i>ARObject</i>   |





|                    |  |              |             |  |
|--------------------|--|--------------|-------------|--|
| <b>Class</b>       | <b>Referrable</b> (abstract)   |              |             |  |
| <b>Subclasses</b>  | <i>AtpDefinition</i> , <i>BswDistinguishedPartition</i> , <i>BswModuleCallPoint</i> , <i>BswModuleClientServerEntry</i> , <i>BswVariableAccess</i> , <i>CouplingPortTrafficClassAssignment</i> , <i>CppImplementationDataTypeContextTarget</i> , <i>DiagnosticEnvModeElement</i> , <i>EthernetPriorityRegeneration</i> , <i>ExclusiveAreaNestingOrder</i> , <i>HwDescriptionEntity</i> , <i>ImplementationProps</i> , <i>ModeTransition</i> , <i>MultilanguageReferrable</i> , <i>NmNetworkHandle</i> , <i>PncMappingIdent</i> , <i>SingleLanguageReferrable</i> , <i>SoConIPdulIdentifier</i> , <i>SocketConnectionBundle</i> , <i>SomeipRequiredEventGroup</i> , <i>TimeSyncServerConfiguration</i> , <i>TpConnectionIdent</i> |              |             |  |
| <b>Attribute</b>   | <b>Type</b>  | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>  |
| shortName          | Identifier   | 1            | attr        | This specifies an identifying shortName for the object. It needs to be unique within its context and is intended for humans but even more for technical reference.<br><br><b>Stereotypes:</b> atpIdentityContributor<br><b>Tags:</b><br>xml.enforceMinMultiplicity=true<br>xml.sequenceOffset=-100 |
| shortName Fragment | ShortNameFragment  | *            | aggr        | This specifies how the Referrable.shortName is composed of several shortNameFragments.<br><br><b>Tags:</b> xml.sequenceOffset=-90  |

**Table A.18: Referrable**

|                      |  |              |             |  |
|----------------------|--|--------------|-------------|--|
| <b>Class</b>         | <b>ServiceInterface</b>  |              |             |  |
| <b>Package</b>       | M2::AUTOSARTemplates::AdaptivePlatform::ApplicationDesign::PortInterface   |              |             |  |
| <b>Note</b>          | This represents the ability to define a PortInterface that consists of a heterogeneous collection of methods, events and fields.<br><br><b>Tags:</b> atp.recommendedPackage=ServiceInterfaces  |              |             |  |
| <b>Base</b>          | <i>ARElement</i> , <i>ARObject</i> , <i>AtpBlueprint</i> , <i>AtpBlueprintable</i> , <i>AtpClassifier</i> , <i>AtpType</i> , <i>CollectableElement</i> , <i>Identifiable</i> , <i>MultilanguageReferrable</i> , <i>PackageableElement</i> , <i>PortInterface</i> , <i>Referrable</i> |              |             |  |
| <b>Aggregated by</b> | ARPackage.element  |              |             |  |
| <b>Attribute</b>     | <b>Type</b>  | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>  |
| event                | VariableDataPrototype  | *            | aggr        | This represents the collection of events defined in the context of a ServiceInterface.<br><br><b>Stereotypes:</b> atpSplitable; atpVariation<br><b>Tags:</b><br>atp.Splitkey=event.shortName, event.variationPoint.shortLabel<br>vh.latestBindingTime=blueprintDerivationTime<br>xml.sequenceOffset=30 |
| field                | Field  | *            | aggr        | This represents the collection of fields defined in the context of a ServiceInterface.<br><br><b>Stereotypes:</b> atpSplitable; atpVariation<br><b>Tags:</b><br>atp.Splitkey=field.shortName, field.variationPoint.shortLabel<br>vh.latestBindingTime=blueprintDerivationTime<br>xml.sequenceOffset=40 |
| majorVersion         | PositiveInteger  | 0..1         | attr        | Major version of the service contract.<br><br><b>Tags:</b> xml.sequenceOffset=10   |





| Class        | ServiceInterface      |      |      |   |
|--------------|-----------------------|------|------|---|
| method       | ClientServerOperation | *    | aggr | This represents the collection of methods defined in the context of a ServiceInterface.<br><b>Stereotypes:</b> atpSplittable; atpVariation<br><b>Tags:</b><br>atp.Splitkey=method.shortName, method.variation<br>Point.shortLabel<br>vh.latestBindingTime=blueprintDerivationTime<br>xml.sequenceOffset=50    |
| minorVersion | PositiveInteger       | 0..1 | attr | Minor version of the service contract.<br><b>Tags:</b> xml.sequenceOffset=20  |
| trigger      | Trigger               | *    | aggr | This represents the collection of triggers defined in the context of a ServiceInterface.<br><b>Stereotypes:</b> atpSplittable; atpVariation<br><b>Tags:</b><br>atp.Splitkey=trigger.shortName, trigger.variation<br>Point.shortLabel<br>vh.latestBindingTime=blueprintDerivationTime<br>xml.sequenceOffset=60 |

**Table A.19: ServiceInterface**

| Class                | SwComponentPrototype  |              |             |   |
|----------------------|---|--------------|-------------|---|
| <b>Package</b>       | M2::AUTOSARTemplates::SWComponentTemplate::Composition  |              |             |   |
| <b>Note</b>          | Role of a software component within a composition.  |              |             |   |
| <b>Base</b>          | ARObject, AtpFeature, AtpPrototype, <a href="#">Identifiable</a> , <a href="#">MultilanguageReferrable</a> , <a href="#">Referrable</a> |              |             |   |
| <b>Aggregated by</b> | AtpClassifier.atpFeature, CompositionSwComponentType.component  |              |             |   |
| <b>Attribute</b>     | <b>Type</b>   | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>   |
| type                 | SwComponentType   | 0..1         | tref        | Type of the instance.<br><b>Stereotypes:</b> isOfType |

**Table A.20: SwComponentPrototype**

| Class          | <<atpVariation>> SwDataDefProps   |
|----------------|---|
| <b>Package</b> | M2::MSR::DataDictionary::DataDefProperties  |
| <b>Note</b>    | <p>This class is a collection of properties relevant for data objects under various aspects. One could consider this class as a "pattern of inheritance by aggregation". The properties can be applied to all objects of all classes in which SwDataDefProps is aggregated.</p> <p>Note that not all of the attributes or associated elements are useful all of the time. Hence, the process definition (e.g. expressed with an OCL or a Document Control Instance MSR-DCI) has the task of implementing limitations.</p> <p>SwDataDefProps covers various aspects:</p> <ul style="list-style-type: none"> <li>• Structure of the data element for calibration use cases: is it a single value, a curve, or a map, but also the recordLayouts which specify how such elements are mapped/converted to the DataTypes in the programming language (or in AUTOSAR). This is mainly expressed by properties like swRecordLayout and swCalprmAxisSet</li> <li>• Implementation aspects, mainly expressed by swImplPolicy, swVariableAccessImplPolicy, swAddrMethod, swPointerTargetProps, baseType, implementationDataType and additionalNativeTypeQualifier</li> <li>• Access policy for the MCD system, mainly expressed by swCalibrationAccess</li> </ul> |





|                               |  |              |             |  |
|-------------------------------|--|--------------|-------------|--|
| <b>Class</b>                  | <<atpVariation>> <b>SwDataDefProps</b>   |              |             |  |
|                               | <ul style="list-style-type: none"> <li>Semantics of the data element, mainly expressed by compuMethod and/or unit, dataConstr, invalid Value</li> <li>Code generation policy provided by swRecordLayout</li> </ul> <b>Tags:</b> vh.latestBindingTime=codeGenerationTime  |              |             |  |
| <b>Base</b>                   | ARObject   |              |             |  |
| <b>Aggregated by</b>          | AutosarDataType.swDataDefProps, CompositeNetworkRepresentation.networkRepresentation, DataPrototype.swDataDefProps, DataPrototypeTransformationProps.networkRepresentationProps, DiagnosticDataElement.swDataDefProps, DiagnosticEnvDataElementCondition.swDataDefProps, <a href="#">DltArgument.networkRepresentation</a> , FlatInstanceDescriptor.swDataDefProps, ImplementationDataTypeElement.swDataDefProps, InstantiationDataDefProps.swDataDefProps, ISignal.networkRepresentationProps, McDataInstance.resultingProperties, ParameterAccess.swDataDefProps, PerInstanceMemory.swDataDefProps, <a href="#">ReceiverComSpec.networkRepresentation</a> , <a href="#">SenderComSpec.networkRepresentation</a> , SomeipDataPrototypeTransformationProps.networkRepresentation, SwPointerTargetProps.swDataDefProps, SwServiceArg.swDataDefProps, SwSystemconst.swDataDefProps, SystemSignal.physicalProps |              |             |  |
| <b>Attribute</b>              | <b>Type</b>  | <b>Mult.</b> | <b>Kind</b> | <b>Note</b>  |
| additionalNativeTypeQualifier | NativeDeclarationString  | 0..1         | attr        | This attribute is used to declare native qualifiers of the programming language which can neither be deduced from the baseType (e.g. because the data object describes a pointer) nor from other more abstract attributes. Examples are qualifiers like "volatile", "strict" or "enum" of the C-language. All such declarations have to be put into one string.<br><b>Tags:</b> xml.sequenceOffset=235 |
| annotation                    | Annotation   | *            | aggr        | This aggregation allows to add annotations (yellow pads ...) related to the current data object.<br><b>Tags:</b><br>xml.roleElement=true<br>xml.roleWrapperElement=true<br>xml.sequenceOffset=20<br>xml.typeElement=false<br>xml.typeWrapperElement=false  |
| baseType                      | SwBaseType   | 0..1         | ref         | Base type associated with the containing data object.<br><b>Tags:</b> xml.sequenceOffset=50  |
| compuMethod                   | CompuMethod  | 0..1         | ref         | Computation method associated with the semantics of this data object.<br><b>Tags:</b> xml.sequenceOffset=180   |
| dataConstr                    | DataConstr   | 0..1         | ref         | Data constraint for this data object.<br><b>Tags:</b> xml.sequenceOffset=190   |
| displayFormat                 | DisplayFormatString  | 0..1         | attr        | This property describes how a number is to be rendered e.g. in documents or in a measurement and calibration system.<br><b>Tags:</b> xml.sequenceOffset=210  |
| displayPresentation           | DisplayPresentationEnum  | 0..1         | attr        | This attribute controls the presentation of the related data for measurement and calibration tools.  |





| Class                      | <<atpVariation>> SwDataDefProps    |      |      |  |
|----------------------------|------------------------------------|------|------|--|
| implementation<br>DataType | AbstractImplementation<br>DataType | 0..1 | ref  | <p>This association denotes the ImplementationDataType of a data declaration via its aggregated SwDataDefProps. It is used whenever a data declaration is not directly referring to a base type. Especially</p> <ul style="list-style-type: none"> <li>• redefinition of an ImplementationDataType via a "typedef" to another ImplementationDatatype</li> <li>• the target type of a pointer (see SwPointerTarget Props), if it does not refer to a base type directly</li> <li>• the data type of an array or record element within an ImplementationDataType, if it does not refer to a base type directly</li> <li>• the data type of an SwServiceArg, if it does not refer to a base type directly</li> </ul> <p><b>Tags:</b> xml.sequenceOffset=215</p> |
| invalidValue               | ValueSpecification                 | 0..1 | aggr | <p>Optional value to express invalidity of the actual data element.</p> <p><b>Tags:</b> xml.sequenceOffset=255</p>   |
| stepSize                   | Float                              | 0..1 | attr | <p>This attribute can be used to define a value which is added to or subtracted from the value of a DataPrototype when using up/down keys while calibrating.</p>   |
| swAddrMethod               | SwAddrMethod                       | 0..1 | ref  | <p>Addressing method related to this data object. Via an association to the same SwAddrMethod it can be specified that several DataPrototypes shall be located in the same memory without already specifying the memory section itself.</p> <p><b>Tags:</b> xml.sequenceOffset=30</p>  |
| swAlignment                | AlignmentType                      | 0..1 | attr | <p>The attribute describes the intended typical alignment of the DataPrototype. If the attribute is not defined the alignment is determined by the swBaseType size and the memoryAllocationKeywordPolicy of the referenced Sw AddrMethod.</p> <p><b>Tags:</b> xml.sequenceOffset=33</p>  |
| swBit<br>Representation    | SwBitRepresentation                | 0..1 | aggr | <p>Description of the binary representation in case of a bit variable.</p> <p><b>Tags:</b> xml.sequenceOffset=60</p>   |
| swCalibration<br>Access    | SwCalibrationAccess<br>Enum        | 0..1 | attr | <p>Specifies the read or write access by MCD tools for this data object.</p> <p><b>Tags:</b> xml.sequenceOffset=70</p>   |
| swCalprmAxis<br>Set        | SwCalprmAxisSet                    | 0..1 | aggr | <p>This specifies the properties of the axes in case of a curve or map etc. This is mainly applicable to calibration parameters.</p> <p><b>Tags:</b> xml.sequenceOffset=90</p>   |
| swComparison<br>Variable   | SwVariableRefProxy                 | *    | aggr | <p>Variables used for comparison in an MCD process.</p> <p><b>Tags:</b><br/>xml.sequenceOffset=170<br/>xml.typeElement=false</p>   |
| swData<br>Dependency       | SwDataDependency                   | 0..1 | aggr | <p>Describes how the value of the data object has to be calculated from the value of another data object (by the MCD system).</p> <p><b>Tags:</b> xml.sequenceOffset=200</p>   |





| <b>Class</b>          | <b>&lt;&lt;atpVariation&gt;&gt; SwDataDefProps</b> |      |      |   |
|-----------------------|--|------|------|---|
| swHostVariable        | SwVariableRefProxy                                 | 0..1 | aggr | Contains a reference to a variable which serves as a host-variable for a bit variable. Only applicable to bit objects.<br><br><b>Tags:</b><br>xml.sequenceOffset=220<br>xml.typeElement=false   |
| swImplPolicy          | SwImplPolicyEnum                                   | 0..1 | attr | Implementation policy for this data object.<br><br><b>Tags:</b> xml.sequenceOffset=230  |
| swIntendedResolution  | Numerical  | 0..1 | attr | The purpose of this element is to describe the requested quantization of data objects early on in the design process.<br><br>The resolution ultimately occurs via the conversion formula present (compuMethod), which specifies the transition from the physical world to the standardized world (and vice-versa) (here, "the slope per bit" is present implicitly in the conversion formula).<br><br>In the case of a development phase without a fixed conversion formula, a pre-specification can occur through swIntendedResolution.<br><br>The resolution is specified in the physical domain according to the property "unit".<br><br><b>Tags:</b> xml.sequenceOffset=240 |
| swInterpolationMethod | Identifier   | 0..1 | attr | This is a keyword identifying the mathematical method to be applied for interpolation. The keyword needs to be related to the interpolation routine which needs to be invoked.<br><br><b>Tags:</b> xml.sequenceOffset=250   |
| swIsVirtual           | Boolean  | 0..1 | attr | This element distinguishes virtual objects. Virtual objects do not appear in the memory, their derivation is much more dependent on other objects and hence they shall have a swDataDependency .<br><br><b>Tags:</b> xml.sequenceOffset=260   |
| swPointerTargetProps  | SwPointerTargetProps                               | 0..1 | aggr | Specifies that the containing data object is a pointer to another data object.<br><br>Note: This atpSplitable property has no atp.Splitkey due to atpVariation (PropertySetPattern).<br><br><b>Stereotypes:</b> atpSplitable<br><b>Tags:</b> xml.sequenceOffset=280   |
| swRecordLayout        | SwRecordLayout                                     | 0..1 | ref  | Record layout for this data object.<br><br><b>Tags:</b> xml.sequenceOffset=290  |
| swRefreshTiming       | MultidimensionalTime                               | 0..1 | aggr | This element specifies the frequency in which the object involved shall be or is called or calculated. This timing can be collected from the task in which write access processes to the variable run. But this cannot be done by the MCD system.<br><br>So this attribute can be used in an early phase to express the desired refresh timing and later on to specify the real refresh timing.<br><br><b>Tags:</b> xml.sequenceOffset=300  |
| swTextProps           | SwTextProps  | 0..1 | aggr | the specific properties if the data object is a text object.<br><br><b>Tags:</b> xml.sequenceOffset=120   |







| Class                          | <<atpVariation>> SwDataDefProps |      |      |   |
|--------------------------------|---------------------------------|------|------|---|
| swValueBlockSize               | Numerical                       | 0..1 | attr | This represents the size of a Value Block<br><b>Stereotypes:</b> atpVariation<br><b>Tags:</b><br>vh.latestBindingTime=preCompileTime<br>xml.sequenceOffset=80   |
| swValueBlockSizeMult (ordered) | Numerical                       | *    | attr | This attribute is used to specify the dimensions of a value block (VAL_BLK) for the case that that value block has more than one dimension.<br><br>The dimensions given in this attribute are ordered such that the first entry represents the first dimension, the second entry represents the second dimension, and so on.<br><br>For one-dimensional value blocks the attribute swValueBlockSize shall be used and this attribute shall not exist.<br><b>Stereotypes:</b> atpVariation<br><b>Tags:</b> vh.latestBindingTime=preCompileTime |
| unit                           | Unit                            | 0..1 | ref  | Physical unit associated with the semantics of this data object. This attribute applies if no compuMethod is specified. If both units (this as well as via compuMethod) are specified the units shall be compatible.<br><b>Tags:</b> xml.sequenceOffset=350   |
| valueAxisDataType              | ApplicationPrimitiveDataType    | 0..1 | ref  | The referenced ApplicationPrimitiveDataType represents the primitive data type of the value axis within a compound primitive (e.g. curve, map). It supersedes CompuMethod, Unit, and BaseType.<br><b>Tags:</b> xml.sequenceOffset=355   |

**Table A.21: SwDataDefProps**

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

**Table A.22: SymbolProps**

## B Platform Extension API (normative)

The focus of the APIs in this section are for OEM-specific platform extensions. The abstraction of the interfaces is lower which could lead to a higher machine dependency

### B.1 Tracing Interface in ara::log

The tracing interface is not for applications. It is internally used in ara::log to provide an interface for external trace tools.

#### B.1.1 TraceArti

[SWS\_LOG\_20000]{DRAFT} Definition of API function ara::log::ext::TraceArti [

|                          |   |   |
|--------------------------|---|---|
| <b>Kind:</b>             | function  |   |
| <b>Header file:</b>      | #include "ara/log/trace_arti.h"   |   |
| <b>Scope:</b>            | namespace ara::log::ext   |   |
| <b>Symbol:</b>           | TraceArti(const MsgId &msg_id, const Params &... params)  |   |
| <b>Syntax:</b>           | <pre>template &lt;typename MsgId, typename... Params&gt; void TraceArti (const MsgId &amp;msg_id, const Params &amp;... params) noexcept;</pre>   |   |
| <b>Template param:</b>   | MsgId   | the type of the msg_id parameter                              |
|                          | Params  | the types of the params parameters                            |
| <b>Parameters (in):</b>  | msg_id  | an implementation-defined type identifying the message object |
|                          | params  | the arguments of the message                                  |
| <b>Return value:</b>     | None  |   |
| <b>Exception Safety:</b> | noexcept  |   |
| <b>Description:</b>      | <p>Handles a modeled message, specific to the used trace tool.</p> <p>This function is only called internally by the Logger framework when switching between Log and TraceArti. It represents the interface to trace tools. The runtime overhead of this function shall be kept as minimal as possible, e.g. by using specializations based on the MsgId.</p> |   |

] ([RS\\_LT\\_00003](#))

## C Change History

Please note that the lists in this chapter also include specification items that have been removed from the specification in a later version. These specification items do not appear as hyperlinks in the document.

### C.1 Change History of this document according to AUTOSAR Release R23-11

#### C.1.1 Added Specification Items in R23-11

| Number          | Heading   |
|-----------------|---|
| [SWS_LOG_00172] | Definition of API class ara::log::Logger            |
| [SWS_LOG_20000] | Definition of API function ara::log::ext::TraceArti |
| [SWS_LOG_20001] |   |
| [SWS_LOG_20002] |   |
| [SWS_LOG_20003] |   |
| [SWS_LOG_20004] |   |
| [SWS_LOG_20005] |   |

**Table C.1: Added Specification Items in R23-11**

#### C.1.2 Changed Specification Items in R23-11

| Number          | Heading  |
|-----------------|--|
| [SWS_LOG_00005] |  |
| [SWS_LOG_00018] | Definition of API enum ara::log::LogLevel                  |
| [SWS_LOG_00021] | Definition of API function ara::log::CreateLogger          |
| [SWS_LOG_00039] | Definition of API function ara::log::LogStream::Flush      |
| [SWS_LOG_00040] | Definition of API function ara::log::LogStream::operator<< |
| [SWS_LOG_00041] | Definition of API function ara::log::LogStream::operator<< |
| [SWS_LOG_00042] | Definition of API function ara::log::LogStream::operator<< |
| [SWS_LOG_00043] | Definition of API function ara::log::LogStream::operator<< |
| [SWS_LOG_00044] | Definition of API function ara::log::LogStream::operator<< |
| [SWS_LOG_00045] | Definition of API function ara::log::LogStream::operator<< |
| [SWS_LOG_00046] | Definition of API function ara::log::LogStream::operator<< |
| [SWS_LOG_00047] | Definition of API function ara::log::LogStream::operator<< |
| [SWS_LOG_00048] | Definition of API function ara::log::LogStream::operator<< |





| Number          | Heading   |
|-----------------|---|
| [SWS_LOG_00049] | Definition of API function ara::log::LogStream::operator<<          |
| [SWS_LOG_00050] | Definition of API function ara::log::LogStream::operator<<          |
| [SWS_LOG_00051] | Definition of API function ara::log::LogStream::operator<<          |
| [SWS_LOG_00062] | Definition of API function ara::log::LogStream::operator<<          |
| [SWS_LOG_00063] | Definition of API function ara::log::operator<<                     |
| [SWS_LOG_00064] | Definition of API function ara::log::Logger::LogFatal               |
| [SWS_LOG_00065] | Definition of API function ara::log::Logger::LogError               |
| [SWS_LOG_00066] | Definition of API function ara::log::Logger::LogWarn                |
| [SWS_LOG_00067] | Definition of API function ara::log::Logger::LogInfo                |
| [SWS_LOG_00068] | Definition of API function ara::log::Logger::LogDebug               |
| [SWS_LOG_00069] | Definition of API function ara::log::Logger::LogVerbose             |
| [SWS_LOG_00070] | Definition of API function ara::log::Logger::IsEnabled              |
| [SWS_LOG_00098] | Definition of API enum ara::log::ClientState                        |
| [SWS_LOG_00124] | Definition of API function ara::log::operator<<                     |
| [SWS_LOG_00125] | Definition of API function ara::log::operator<<                     |
| [SWS_LOG_00126] | Definition of API function ara::log::operator<<                     |
| [SWS_LOG_00127] | Definition of API function ara::log::operator<<                     |
| [SWS_LOG_00128] | Definition of API function ara::log::LogStream::operator<<          |
| [SWS_LOG_00129] | Definition of API function ara::log::LogStream::WithLocation        |
| [SWS_LOG_00131] | Definition of API function ara::log::Logger::WithLevel              |
| [SWS_LOG_00132] | Definition of API function ara::log::LogStream::WithTag             |
| [SWS_LOG_00133] | Definition of API function ara::log::Logger::LogWith                |
| [SWS_LOG_00173] | Definition of API class ara::log::LogStream                         |
| [SWS_LOG_00201] | Definition of API function ara::log::Arg                            |
| [SWS_LOG_00203] | Definition of API function ara::log::LogStream::operator<<          |
| [SWS_LOG_00204] | Definition of API function ara::log::Logger::Log                    |
| [SWS_LOG_00205] | Definition of API function ara::log::RegisterConnectionStateHandler |
| [SWS_LOG_00206] | Definition of API enum ara::log::Fmt                                |
| [SWS_LOG_00207] | Definition of API class ara::log::Format                            |
| [SWS_LOG_00208] | Definition of API function ara::log::Dflt                           |
| [SWS_LOG_00209] | Definition of API function ara::log::Hex                            |
| [SWS_LOG_00210] | Definition of API function ara::log::Hex                            |
| [SWS_LOG_00211] | Definition of API function ara::log::Dec                            |
| [SWS_LOG_00212] | Definition of API function ara::log::Dec                            |
| [SWS_LOG_00213] | Definition of API function ara::log::Oct                            |
| [SWS_LOG_00214] | Definition of API function ara::log::Oct                            |
| [SWS_LOG_00215] | Definition of API function ara::log::Bin                            |
| [SWS_LOG_00216] | Definition of API function ara::log::Bin                            |





| Number          | Heading   |
|-----------------|---|
| [SWS_LOG_00217] | Definition of API function ara::log::DecFloat               |
| [SWS_LOG_00218] | Definition of API function ara::log::DecFloatMax            |
| [SWS_LOG_00219] | Definition of API function ara::log::EngFloat               |
| [SWS_LOG_00220] | Definition of API function ara::log::EngFloatMax            |
| [SWS_LOG_00221] | Definition of API function ara::log::HexFloat               |
| [SWS_LOG_00222] | Definition of API function ara::log::HexFloatMax            |
| [SWS_LOG_00223] | Definition of API function ara::log::AutoFloat              |
| [SWS_LOG_00224] | Definition of API function ara::log::AutoFloatMax           |
| [SWS_LOG_00225] | Definition of API variable ara::log::Format::fmt            |
| [SWS_LOG_00226] | Definition of API variable ara::log::Format::precision      |
| [SWS_LOG_00255] | Definition of API function ara::log::Logger::SetThreshold   |
| [SWS_LOG_00256] | Definition of API function ara::log::CreateLogger           |
| [SWS_LOG_00258] | Definition of API function ara::log::LogStream::WithPrivacy |
| [SWS_LOG_00261] | Definition of API class ara::log::Argument                  |
| [SWS_LOG_00263] | Definition of API function ara::log::CreateLogger           |

**Table C.2: Changed Specification Items in R23-11**

### C.1.3 Deleted Specification Items in R23-11

none