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Table of Contents

Bibliography

[1] Software Component Template
AUTOSAR_TPS_SoftwareComponentTemplate

[2] Requirements on Standardization Template
AUTOSAR_RS_StandardizationTemplate

[3] Predefined Names in AUTOSAR
AUTOSAR_TR_PredefinedNames

[4] Specifications of Safety Extensions
AUTOSAR_TPS_SafetyExtensions

[5] List of Basic Software Modules
AUTOSAR_TR_BSWModuleList

[6] Key words for use in RFCs to Indicate Requirement Levels
http://www.ietf.org/rfc/rfc2119.txt

[7] Generic Structure Template
AUTOSAR_TPS_GenericStructureTemplate

[8] XML Path language (XPath)
http://www.w3.org/TR/xpath/

[9] ANTLR parser generator V3

[10] Specification of ECU Configuration
AUTOSAR_TPS_ECUConfiguration

[11] Unique Names for Documentation, Measurement and Calibration: Modeling and Naming Aspects including Automatic Generation
AUTOSAR_TR_AIMeasurementCalibrationDiagnostics

[12] XML Specification of Application Interfaces
AUTOSAR_MOD_AISpecification

[13] Specification of Timing Extensions
AUTOSAR_TPS_TimingExtensions

[14] Explanation of Application Interfaces of the Powertrain Engine Domain
AUTOSAR_EXP_AIPowertrain

[15] SW-C and System Modeling Guide
AUTOSAR_TR_SWCModelingGuide

[16] Specification of Platform Types
AUTOSAR_SWS_PlatformTypes

[17] Interoperability of AUTOSAR Tools
AUTOSAR_TR_InteroperabilityOfAutosarTools

[18] Specification of CRC Routines
AUTOSAR_SWS_CRCLibrary

[19] Methodology
AUTOSAR_TR_Methodology

[20] Meta Model
AUTOSAR_MMOD_MetaModel

[21] Collection of constraints on AUTOSAR M1 models
AUTOSAR_TR_AutosarModelConstraints

[22] Interoperability Of Autosar Tools Supplement
AUTOSAR_TR_InteroperabilityOfAutosarToolsSupplement

[23] Meta Model-generated XML Schema
AUTOSAR_MMOD_XMLSchema

[24] XML Schema Production Rules
AUTOSAR_TPS_XMLSchemaProductionRules

[25] Software Process Engineering Meta-Model Specification
http://www.omg.org/spec/SPEM/2.0/

1 Introduction

AUTOSAR models are in many cases not created from scratch but existing content is taken as the basis. The existing content could be contributed by the AUTOSAR initiative itself in form of standardized model elements.

This document specifies the Standardization Template. This template is intended to support the delivery of standardized model elements by AUTOSAR and others.

AUTOSAR 4.0 already specifies the blueprint approach for standardization. This approach is continued and refined by the Standardization Template. It thereby replaces Appendix A in Software Component Template ([1]).

As an particular example, let us consider the standardization of application interfaces. That is, in terms of the AUTOSAR meta-model the standardization mainly applies to the definition of `PortPrototype`s for specific purposes.

Due to the structure of the AUTOSAR meta-model it is not possible to merely express a standardized `PortPrototype` because for good reasons the latter does not exist on its own but is always owned by a `SwComponentType`.

The Standardization Template specifies the approach to overcome this situation.

For more details such as use cases please refer to [2].

1.1 Document Conventions

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

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

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

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

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

Class	AUTOSAR			
Package	M2::AUTOSARTemplates::AutosarTopLevelStructure			
Note	Root element of an AUTOSAR description, also the root element in corresponding XML documents. **Tags:** xml.globalElement=true			
Base	ARObject			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
adminData	AdminData	0..1	aggr	This represents the administrative data of an Autosar file. **Tags:** xml.sequenceOffset=10
arPackage	ARPackage	*	aggr	This is the top level package in an AUTOSAR model. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=blueprintDerivationTime xml.sequenceOffset=30
fileInfoComment	FileInfoComment	0..1	aggr	This represents a possibility to provide a structured comment in an AUTOSAR file. **Tags:** xml.roleElement=true; xml.sequence Offset=-10; xml.typeElement=false
introduction	Documentation Block	0..1	aggr	This represents an introduction on the Autosar file. It is intended for example to rpresent disclaimers and legal notes. **Tags:** xml.sequenceOffset=20

Table 1.1: AUTOSAR

The first rows in the table have the following meaning:

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

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

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

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

The headers in the table have the following meaning:

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

Type: The type of an attribute of the class.

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

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

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

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

1.2 Requirements Tracing

The following table references the requirements specified in [2] and links to the fulfill-ments of these.

Requirement	Description	Satisfied by
[RS_STDT_00001]	Shall support and explain Blueprints in general	[TPS_STDT_00002] [TPS_STDT_00027] [TPS_STDT_00042] [TPS_STDT_00065] [TPS_STDT_00067]
[RS_STDT_00002]	Formalized description of BSW SWS	[TPS_STDT_00014] [TPS_STDT_00040] [TPS_STDT_00041] [TPS_STDT_00049] [TPS_STDT_00067] [TPS_STDT_00090] [TPS_STDT_00091]
[RS_STDT_00003]	Shall allow to represent port blueprints	[TPS_STDT_00007] [TPS_STDT_00047] [TPS_STDT_00061] [TPS_STDT_00082]
[RS_STDT_00004]	Shall allow to represent shortName patterns	[TPS_STDT_00003] [TPS_STDT_00047] [TPS_STDT_00055]
[RS_STDT_00005]	Shall support keywords and keyword abbreviations	[TPS_STDT_00004] [TPS_STDT_00012] [TPS_STDT_00068] [TPS_STDT_00069] [TPS_STDT_00070]
[RS_STDT_00006]	Shall be implemented without compatibility problems to existing template	[TPS_STDT_00033] [TPS_STDT_00041] [TPS_STDT_00047]
[RS_STDT_00007]	Shall be based on the AUTOSAR XML schema	[TPS_STDT_00033] [TPS_STDT_00041] [TPS_STDT_00047]
[RS_STDT_00008]	Shall provide means to support analyzing the conformity of implementations with the AUTOSAR standards	[TPS_STDT_00001] [TPS_STDT_00003] [TPS_STDT_00012] [TPS_STDT_00042] [TPS_STDT_00048] [TPS_STDT_00052] [TPS_STDT_00054] [TPS_STDT_00059] [TPS_STDT_00060]
[RS_STDT_00009]	Shall be able to represent requirements stated in SWS	[TPS_STDT_00001] [TPS_STDT_00042] [TPS_STDT_00050] [TPS_STDT_00052] [TPS_STDT_00060]
[RS_STDT_00010]	Shall refer to ECUC parameter definition	[TPS_STDT_00025] [TPS_STDT_00040]
[RS_STDT_00011]	Shall be able to standardize components	[TPS_STDT_00024]
[RS_STDT_00012]	Shall be able to standardize architecture	[TPS_CDT_00024]

Requirement	Description	Satisfied by
[RS_STDT_00013]	Shall be able to express parts of reference paths resp. package hierarchies	[TPS_STDT_00013] [TPS_STDT_00051]
[RS_STDT_00014]	Shall be able to express levels of obligation	[TPS_STDT_00028] [TPS_STDT_00053] [TPS_STDT_00067]
[RS_STDT_00015]	Shall support different Approaches to derive from Blueprints	[TPS_STDT_00028]
[RS_STDT_00016]	Shall be able to express information about the state of model elements	[TPS_STDT_00038]
[RS_STDT_00017]	Shall cover the compatibility of blueprints and derived objects	[TPS_STDT_00005] [TPS_STDT_00008] [TPS_STDT_00051] [TPS_STDT_00072] [TPS_STDT_00085] [TPS_STDT_00086] [TPS_STDT_00087]
[RS_STDT_00018]	Shall allow to describe the dependencies of APIs (e.g. invocation and callback/polling interfaces)	[TPS_STDT_00014] [TPS_STDT_00048] [TPS_STDT_00090] [TPS_STDT_00091]
[RS_STDT_00019]	Shall define the mandatory semantics for a Blueprint	[TPS_STDT_00003] [TPS_STDT_00006] [TPS_STDT_00010] [TPS_STDT_00021] [TPS_STDT_00028] [TPS_STDT_00048]
[RS_STDT_00020]	Shall support variants of a VariableDataprototype	[TPS_STDT_00028] [TPS_STDT_00030] [TPS_STDT_00044] [TPS_STDT_00045] [TPS_STDT_00046]
[RS_STDT_00021]	Shall support multiple instantiation for an example SWC with PortBlueprint	[TPS_STDT_00003] [TPS_STDT_00036] [TPS_STDT_00037]
[RS_STDT_00022]	Means of exchange format between stakeholders for blueprints	[TPS_STDT_00025]
[RS_STDT_00023]	Shall be able to standardize Alias Names	[TPS_STDT_00011]
[RS_STDT_00024]	Shall be able to standardize Unique Names and Display Names	[TPS_STDT_00031]
[RS_STDT_00025]	Shall be able to standardize life cycle states	[TPS_STDT_00043] [TPS_STDT_00064]
[RS_STDT_00026]	Shall allow to represent port interface blueprints	[TPS_STDT_00009] [TPS_STDT_00066]
[RS_STDT_00027]	Shall allow to evaluate the integrity of Blueprints	[TPS_STDT_00034]
[RS_STDT_00028]	Shall allow to generate BSW "Standard AUTOSAR Interface" description from model	[TPS_STDT_00023] [TPS_STDT_00067]

Requirement	Description	Satisfied by
[RS_STDT_00029]	Shall be able to represent further Blueprints	[TPS_STDT_00014] [TPS_STDT_00015] [TPS_STDT_00016] [TPS_STDT_00017] [TPS_STDT_00018] [TPS_STDT_00019] [TPS_STDT_00020] [TPS_STDT_00022] [TPS_STDT_00023] [TPS_STDT_00026] [TPS_STDT_00035] [TPS_STDT_00049] [TPS_STDT_00079] [TPS_STDT_00083] [TPS_STDT_00084] [TPS_STDT_00090]
[RS_STDT_00030]	Shall allow to standardize package structures	[TPS_STDT_00013] [TPS_STDT_00067]
[RS_STDT_00031]	Shall support general specification items	[TPS_STDT_00042] [TPS_STDT_00056] [TPS_STDT_00057] [TPS_STDT_00058] [TPS_STDT_00089]
[RS_STDT_00032]	Shall be able to provide Blueprints for Roles and Rights	[TPS_STDT_00062]
[RS_STDT_00033]	Shall be able to provide Blueprints for Build Action Manifest	[TPS_STDT_00063] [TPS_STDT_00065]
[RS_STDT_00034]	Blueprinting of Implicit Communication Behavior	[TPS_STDT_00071] [TPS_STDT_00073] [TPS_STDT_00074] [TPS_STDT_00075] [TPS_STDT_00076]
[RS_STDT_00035]	Shall support blueprinting of keywords	[TPS_STDT_00077]
[RS_STDT_00036]	StandardizationTemplate shall specify the representation of requirements in AUTOSAR documents	[TPS_STDT_00078]
[RS_STDT_00037]	StandardizationTemplate shall specify the representation of specification items in AUTOSAR documents	[TPS_STDT_00080]
[RS_STDT_00038]	StandardizationTemplate shall specify the representation of constraint items in AUTOSAR documents	[TPS_STDT_00081] [TPS_STDT_00088]
[RS_STDT_00039]	StandardizationTemplate shall specify the representation of test items in AUTOSAR documents	[TPS_STDT_00029]
[RS_STDT_00040]	Multiplicity of elements in derived objects	[TPS_STDT_00032] [TPS_STDT_00039]
[RS_STDT_00042]	Shall provide the ability to define naming conventions for public symbols	[TPS_STDT_00004] [TPS_STDT_00012] [TPS_STDT_00068] [TPS_STDT_00069] [TPS_STDT_00070]
[RS_STDT_00101]	Description of Data Exchange Point Shall Provide a Human Readable High-Level Overview	[TPS_STDT_00120] [TPS_STDT_00121]

Requirement	Description	Satisfied by
[RS_STDT_00102]	Description of Data Exchange Point Shall Describe Work Product in Methodology	[TPS_STDT_00100] [TPS_STDT_00102] [TPS_STDT_00103] [TPS_STDT_00104] [TPS_STDT_00123] [TPS_STDT_00156] [TPS_STDT_00187] [TPS_STDT_00188] [TPS_STDT_00192] [TPS_STDT_00193]
[RS_STDT_00103]	Description of Data Exchange Point Shall Describe Intended Use	[TPS_STDT_00100] [TPS_STDT_00102] [TPS_STDT_00103] [TPS_STDT_00104] [TPS_STDT_00123] [TPS_STDT_00124] [TPS_STDT_00156] [TPS_STDT_00187] [TPS_STDT_00188] [TPS_STDT_00192] [TPS_STDT_00193]
[RS_STDT_00104]	Description of Data Exchange Point Shall Describe Tool and Organization	[TPS_STDT_00121]
[RS_STDT_00105]	Description of Data Exchange Point Shall Describe AUTOSAR Revision	[TPS_STDT_00122] [TPS_STDT_00191]
[RS_STDT_00106]	Description of Data Exchange Point Shall Describe Relevant or Excluded Subset of the AUTOSAR Meta-Model	[TPS_STDT_00102] [TPS_STDT_00103] [TPS_STDT_00104] [TPS_STDT_00107] [TPS_STDT_00108] [TPS_STDT_00109] [TPS_STDT_00112] [TPS_STDT_00113] [TPS_STDT_00114] [TPS_STDT_00119] [TPS_STDT_00124] [TPS_STDT_00126] [TPS_STDT_00129] [TPS_STDT_00138] [TPS_STDT_00139] [TPS_STDT_00140] [TPS_STDT_00141] [TPS_STDT_00142] [TPS_STDT_00143] [TPS_STDT_00144] [TPS_STDT_00145] [TPS_STDT_00146] [TPS_STDT_00157] [TPS_STDT_00159]

Requirement	Description	Satisfied by
		[TPS_STDT_00163] [TPS_STDT_00174] [TPS_STDT_00177] [TPS_STDT_00178] [TPS_STDT_00179] [TPS_STDT_00180] [TPS_STDT_00181] [TPS_STDT_00182] [TPS_STDT_00186] [TPS_STDT_00190] [TPS_STDT_00191] [TPS_STDT_00195] [TPS_STDT_00196] [TPS_STDT_00197] [TPS_STDT_00198] [TPS_STDT_00199] [TPS_STDT_00200]
[RS_STDT_00107]	Description of Data Exchange Point Shall Describe Relevant or Excluded Subset of Model	[TPS_STDT_00130] [TPS_STDT_00157]
[RS_STDT_00108]	Description of Data Exchange Point Shall Describe Relevant Constraints	[TPS_STDT_00102] [TPS_STDT_00103] [TPS_STDT_00104] [TPS_STDT_00111] [TPS_STDT_00124] [TPS_STDT_00125] [TPS_STDT_00147] [TPS_STDT_00157] [TPS_STDT_00164] [TPS_STDT_00165]
[RS_STDT_00109]	Description of Data Exchange Point Shall Describe Relevant Spec Items	[TPS_STDT_00102] [TPS_STDT_00103] [TPS_STDT_00104] [TPS_STDT_00124] [TPS_STDT_00157]
[RS_STDT_00110]	Description of Data Exchange Point Shall Describe Model Completeness	[TPS_STDT_00157] [TPS_STDT_00174]
[RS_STDT_00111]	Description of Data Exchange Point Shall Describe Applicability of Default Values	[TPS_STDT_00127] [TPS_STDT_00157] [TPS_STDT_00204] [TPS_STDT_00207]
[RS_STDT_00113]	Description of Data Exchange Point Shall Describe Limitation of Values of Primitive Attributes	[TPS_STDT_00157] [TPS_STDT_00173] [TPS_STDT_00203]
[RS_STDT_00114]	Description of Data Exchange Point Shall Support Severity Levels for Compliance with Individual Rules of the Profile	[TPS_STDT_00126] [TPS_STDT_00157] [TPS_STDT_00172] [TPS_STDT_00186]
[RS_STDT_00115]	Description of Data Exchange Point Shall Describe Rationales of Decisions	[TPS_STDT_00168] [TPS_STDT_00170]
[RS_STDT_00116]	Description of Data Exchange Point Shall Describe Usage of AUTOSAR Extension Mechanisms	[TPS_STDT_00132] [TPS_STDT_00157]
[RS_STDT_00117]	AUTOSAR Shall Provide Guidelines for Comparison of Profiles for Data Exchange Points	[TPS_STDT_00115] [TPS_STDT_00116]

Requirement	Description	Satisfied by
[RS_STDT_00118]	AUTOSAR Shall Provide Guidelines for Compatibility of Profiles for Data Exchange Points	[TPS_STDT_00101] [TPS_STDT_00110] [TPS_STDT_00115] [TPS_STDT_00116] [TPS_STDT_00128] [TPS_STDT_00131] [TPS_STDT_00133] [TPS_STDT_00134] [TPS_STDT_00135] [TPS_STDT_00136] [TPS_STDT_00160] [TPS_STDT_00183] [TPS_STDT_00201] [TPS_STDT_00202] [TPS_STDT_00205] [TPS_STDT_00206] [TPS_STDT_00208] [TPS_STDT_00209] [TPS_STDT_00210]
[RS_STDT_00120]	AUTOSAR Shall Provide Support for Handling of Incomplete Profiles for Data Exchange Points	[TPS_STDT_00105] [TPS_STDT_00106]
[RS_STDT_00121]	AUTOSAR Shall Provide Guidance for Checking Compliance of AUTOSAR Model Against Profiles for Data Exchange Points	[TPS_STDT_00117] [TPS_STDT_00118] [TPS_STDT_00125] [TPS_STDT_00129] [TPS_STDT_00159] [TPS_STDT_00163] [TPS_STDT_00164] [TPS_STDT_00165] [TPS_STDT_00167] [TPS_STDT_00169]
[RS_STDT_00122]	AUTOSAR Shall Provide Guidance for Identification of Not Yet Described Aspects within Profiles for Data Exchange Points	[TPS_STDT_00111]
[RS_STDT_00125]	Support of AUTOSAR Specific Modeling Patterns	[TPS_STDT_00175] [TPS_STDT_00176]

Table 1.2: Requirements Tracing

2 Support for Traceability

AUTOSAR has defined four levels of requirements for its standardization work:

1. AUTOSAR Project Objectives

2. AUTOSAR Main Requirements

3. AUTOSAR Requirements Specifications (RS, SRS, ATR)

4. AUTOSAR Specifications (SWS, TPS, AI, TR, MOD, ATS, EXP etc.)

The used abbreviations are defined in [3].
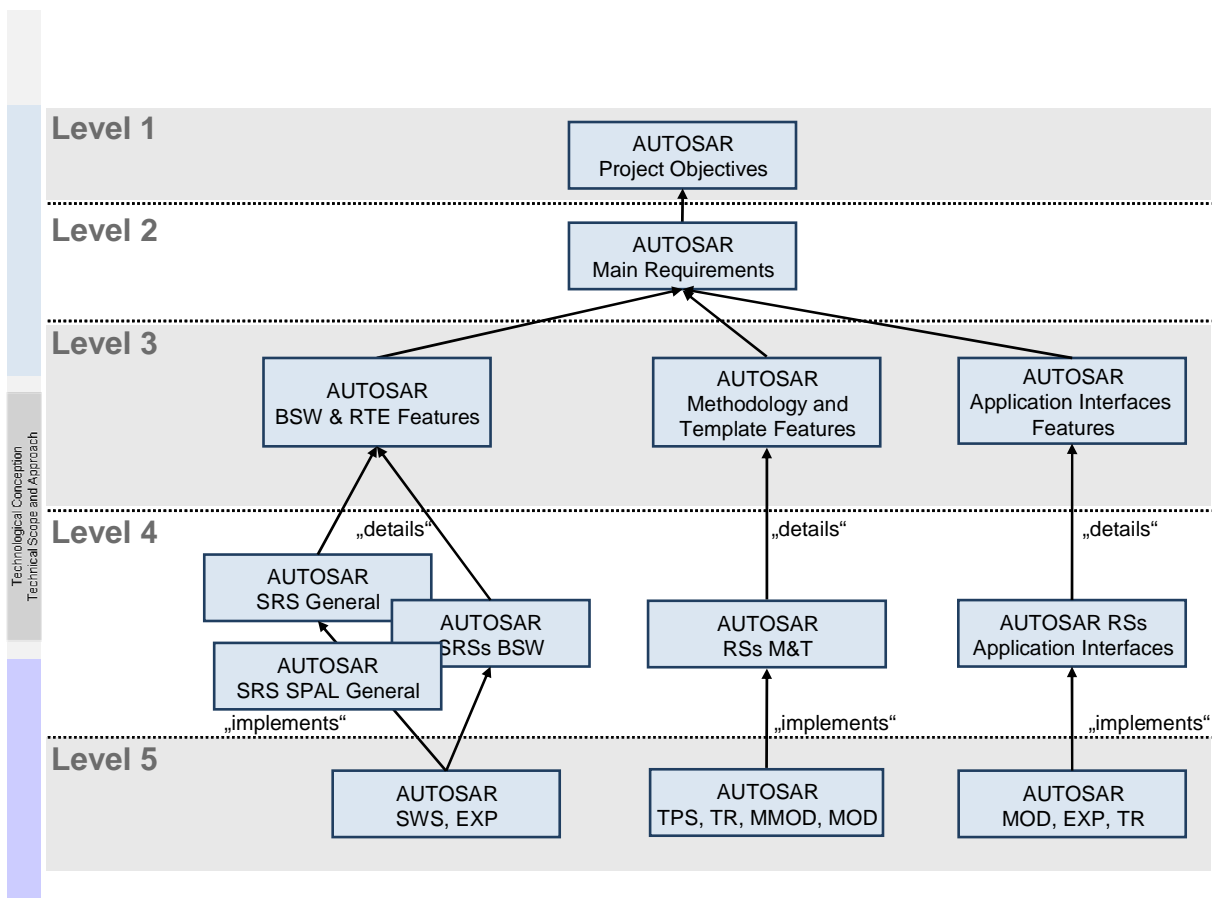
Figure 2.1: Specification levels

The assignment of platform based documents is realized by the "applies to" relation as illustrated in figure 2.2.
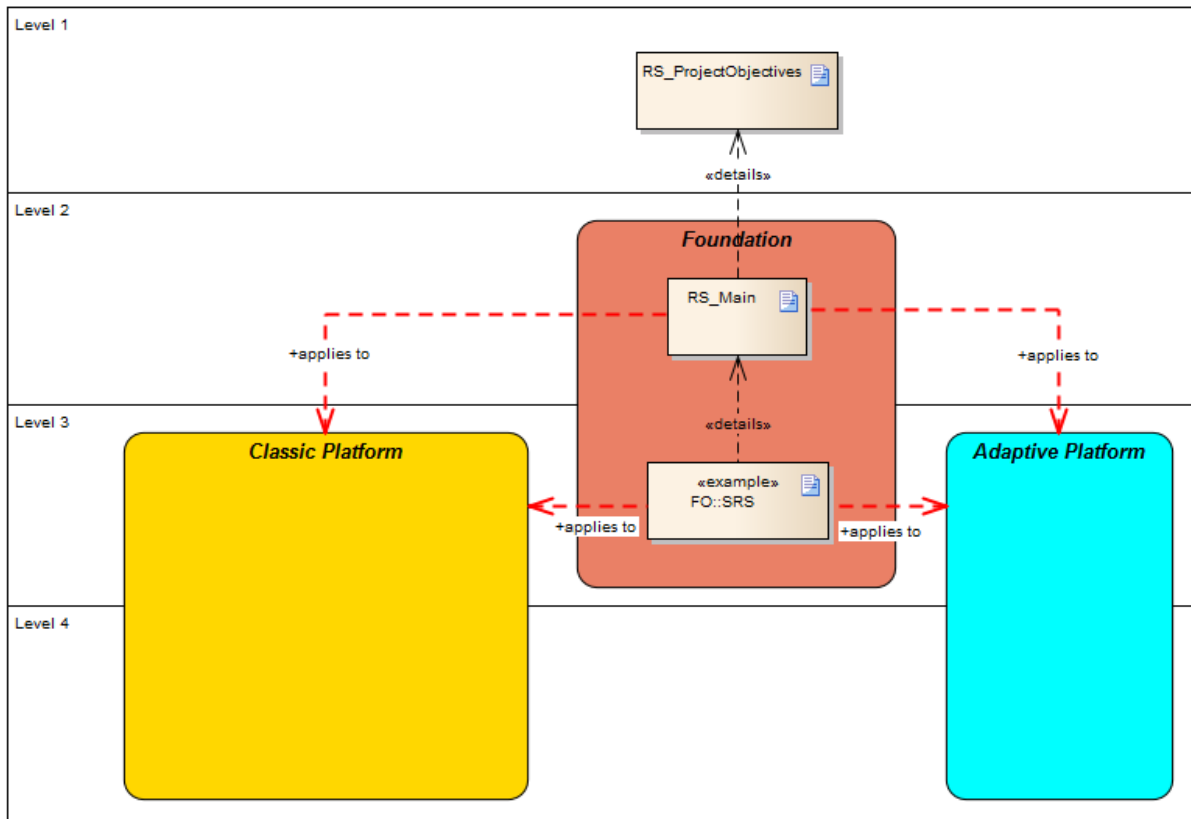
Figure 2.2: Platform based document structure

[TPS_STDT_00001] Support bottom up tracing ⌈ Standardization Template supports bottom up tracing between these levels by the meta-class `Traceable`. This allows to represent traceable entities and to establish traces between those. These entities reside within a `DocumentationBlock`. One prominent place is `DocumentationBlock.trace` in particular within `Identifiable.introduction`. ⌋ *(RS_STDT_00008, RS_STDT_00009)*

[TPS_STDT_00080] Representation of specification items in AUTOSAR documents ⌈ AUTOSAR specification items are represented using the structure with the following attributes:

- The headline consists of an Id (short name) which shall be written inside squared brackets and shall follow [TPS_STDT_00042].

- After the Id the `LifeCycleState` follows in curly brackets. The allowed values are VALID, DRAFT and OBSOLETE and shall follow [TPS_GST_00051]. If there is no `LifeCycleState` information stated then the state is VALID.

- After the `LifeCycleState` an optional specification item title (long name) should be stated to improve human readability.

- The next line starts with an opening half bracket and the content of the specification item follows. The end of it shall be marked by the closing half bracket.

- After the closing half bracket an opening round bracket indicates the comma separated list of requirements which are fulfilled by this specification item. The end of it shall be marked by the closing round bracket. If no up traces are available the round brackets shall be written with empty content.

- The specification items shall describe the semantics and syntax of models.

⌋*(RS_STDT_00037)*

[TPS_STDT_00081] Representation of constraint items in AUTOSAR template documents ⌈ AUTOSAR constraint items in template documents are represented using the structure with the following attributes:

- The Id (short name) of the constraint is composed by "constr_" and a four digit number as identifier. Both shall be written in squared brackets. The four digit number (identifier) shall be harmonized globally and committed.

- After the Id the `LifeCycleState` follows in curly brackets. The allowed values are VALID, DRAFT and OBSOLETE and shall follow [TPS_GST_00051]. If there is no `LifeCycleState` information stated then the state is VALID.

- After the `LifeCycleState` the constraint title (long name) follows.

- The constraint content shall be written inside the opening and closing half bracket.

- The constraint items shall further restrict the validity of models.

⌋*(RS_STDT_00038)*

[TPS_STDT_00088] Representation of constraint items in AUTOSAR non template documents ⌈ AUTOSAR constraint items in AUTOSAR non template documents are represented using the structure with the following attributes:

- The headline consists of an Id (short name) which shall be written inside squared brackets and shall follow [TPS_STDT_00042].

- After the Id the `LifeCycleState` follows in curly brackets. The allowed values are VALID, DRAFT and OBSOLETE and shall follow [TPS_GST_00051]. If there is no `LifeCycleState` information stated then the state is VALID.

- After the `LifeCycleState` the constraint title (long name) follows.

- The constraint content shall be written inside the opening and closing half bracket.

⌋*(RS_STDT_00038)*

[TPS_STDT_00078] Representation of requirements in AUTOSAR documents ⌈ AUTOSAR requirements are represented using the structure of [TPS_STDT_00060] where the following attributes are presented as a table:

- Id (short name) and requirement (long name) are shown in the headline.

- The requirement (long name) shall be a complete English sentence using one of the keywords from [TPS_STDT_00053]. That means a mandatory requirement follows the written form: "<who> shall do <what>".

- "implements" represents the uptrace at the end of the table

- "applies to" shall contain a comma separated tag list with one or more of the following values "CP", "AP", "FO", "TC", "TA"

- Type, Description, Rationale, Applies To, Use Case, Dependencies and Supporting Material are shown as table rows.

- The value of Type shall be one of "valid", "draft" or "obsolete", see [TPS_STDT_00064].

⌋*(RS_STDT_00036)*

The rendition is illustrated in figure 2.3.

[SWS_FOO_07711] Formal Requirements shall look like this ⌈

Type:	valid
Description:	Additional text to improve the understanding of the requirement (optional). The description shall neither refine nor enhance the requirement by using key words (as defined below).
Rationale:	Why is this requirement important, what its omission could cause? We deliberately should harmonize the presentation of the AUTOSAR requirements.
Use Case:	A scenario that makes the requirement necessary or useful. [UC_FOO_00001], [UC_FOO_00002]
Applies to:	CP, TC
Dependencies:	References to other requirements in this document which this requirement depends on. More than one reference shall be separated by semicolon. For example see [RS_TOC_00007], [RS_TOC_00002]
Supporting Material:	References to other documents, models etc.

⌋*(SRS_FOO_00815, SRS_BAR_00007)*

Figure 2.3: Requirements Table

[constr_2603] Use of "applies to" in context of the specification level ⌈ On specification level 1 and 2 only the requirements table including the appliesTo attribute shall be used. On the specification levels 3 and 4 only the requirements table without the appliesTo attribute shall be used. Exception: Documents of the foundation which are handled on specification level 3. ⌋*()*

Rational: This avoids unintentional cross references which disturb the structure of tracing.

[constr_2604] Allowed uptraces in context of "applies to" values ⌈ Traces to documents of upper specification levels shall be conform to the values assigned to appliesTo. ⌋*()*

Note: Patterns of not allowed uptraces are marked with "NOT ALLOWED" in figure 2.4.
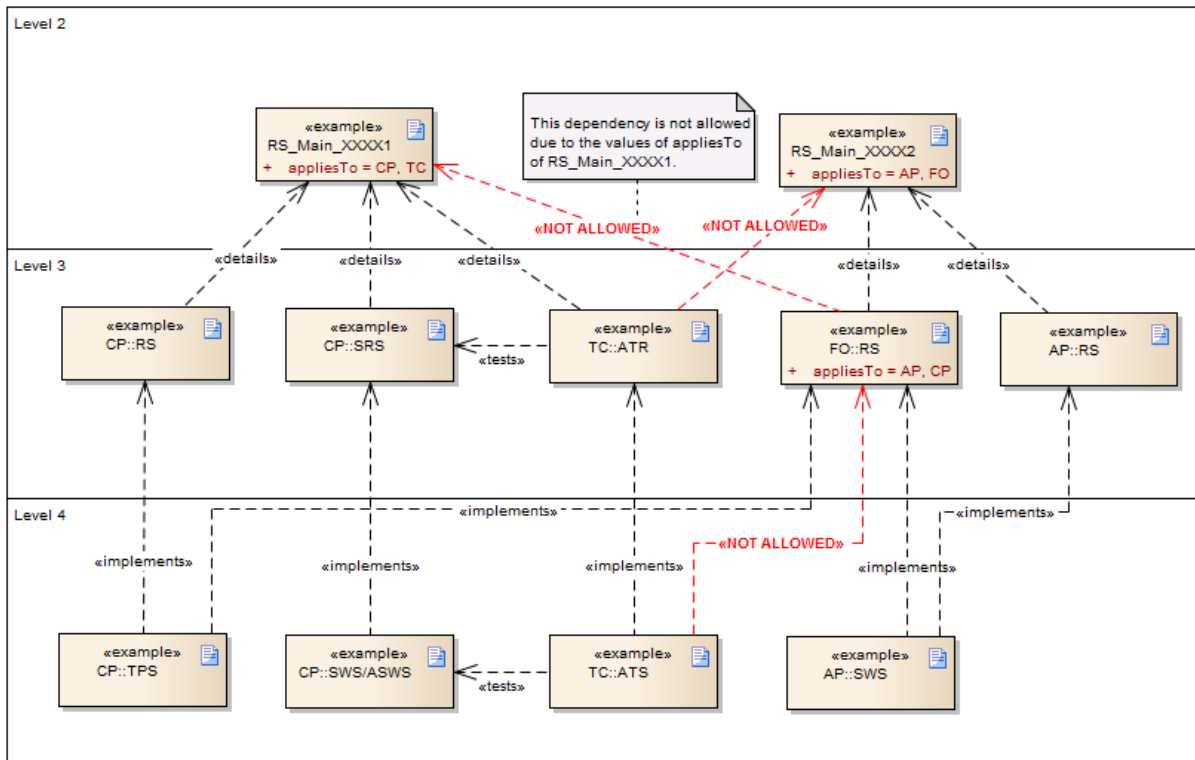
Figure 2.4: Use of appliesTo

Note: Optional requirements on level 1 to 4 of the AUTOSAR requirements hierarchy are not allowed. An optional part of an implementation is only optional for the end-user of AUTOSAR. In order to provide this option, the corresponding choice must be mandatory in the according specification. That means, a feature described as "AUTOSAR should support foobar" can never be correct, because the underlying requirements layer is always static and would have no chance to decide whether "foobar" should be part of it or not. A correct writing would be e. g. "AUTOSAR shall support optional foobar".

[TPS_STDT_00029] Representation of test items in AUTOSAR documents ⌈ AUTOSAR test items are represented using the structure of [TPS_STDT_00060] where the following attributes are presented as a table:

- Id (short name) and test item (long name) are shown in the headline.

- The test item (long name) shall be a complete English sentence.

- "implements" represents the uptrace at the end of the table

- Type, Description, Rationale, Use Case, Dependencies, Supporting Material and Tested Items are shown as table rows.

- The value of Type shall be one of "valid", "draft" or "obsolete", see [TPS_STDT_00064].

⌋*(RS_STDT_00039)*

The representation of test items [TPS_STDT_00029] can also be used in level 4 as in level 3, see figure 2.1.

The rendition is illustrated in figure 2.5.

[ATR_FOO_04711] Formal Tests shall look like this ⌈

Type:	valid
Description:	Additional text to improve the understanding of the acceptance test (optional). The description shall neither refine nor enhance the acceptance test by using key words as define below.
Rationale:	Why is this acceptance test important, what its omission could cause? We deliberately should harmonize the presentation of the AUTOSAR acceptance tests.
Use Case:	A scenario that makes the acceptance test necessary or useful. [UC_FOO_00001],[UC_FOO_00002]
Dependencies:	References to other acceptance tests in this document which this acceptance test depends on. More than one reference shall be separated by semicolon. For example see [ATR_FOO_00007], [ATR_FOO_00002]
Supporting Material:	References to other documents, models etc.
Tested Items:	[SWS_FOO_00815],[TPS_STDT_00042]

⌋(RS_BRF_00123)

Figure 2.5: Test Item Table

Note: The unicodes of the half brackets are for opening half bracket: 0x2308 and for closing half bracket: 0x230B.

`Traceable` is specialized in

- **[TPS_STDT_00059] `TraceableText`** ⌈ This represents a paragraph level text which can be referenced in order to establish requirements tracing. It is an abstract class from which particular specializations support specific kinds of tracing such as requirements / constraints. ⌋(RS_STDT_00008)

  [constr_2540] Tagged text category ⌈ The `category` of `TraceableText` shall be one of

  SPECIFICATION_ITEM The text represents a particular item in the specification. Such an item is a requirement for the implementation of the software specification.

  REQUIREMENT_ITEM The text represents a particular requirement. Such an item is applicable primarily in requirement specifications.

  CONSTRAINT_ITEM The text represents a particular constraint. Such an item is applicable primarily in template specifications. It is similar to a specification item but represents issues that may be validated automatically e.g. by a tool.

  IMPLEMENTATION_ITEM The text represents a short description of an implementation. It is applicable primarily within the `introduction` of a model element.

TEST_ITEM The text represents a short description of a test. Such an item is applicable primarily in test specifications.

SAFETY_* The text represents the type of safety requirements. The allowed values (*) are defined in [TPS_SAFEX_00102] in [4].

⌋*()*

- **[TPS_STDT_00060]** `StructuredReq` ⌈ This represents a structured requirement as it is used within AUTOSAR RS documents. ⌋*(RS_STDT_00008, RS_STDT_00009)*

Note that as `TraceableText` is aggregated in `DocumentationBlock` it also requires a proper rendition in printed documents. For an example of a proper rendition see [TPS_STDT_00001] above.

[constr_2565] Trace shall not be nested ⌈ Due to the intended atomicity of requirements respectively specification items, `Traceable` shall not be nested. ⌋*()*

[TPS_STDT_00042] namePattern for `shortName`s of `TraceableText` in Standardization Documents ⌈ The intended name pattern applicable to short names `TraceableText` (in fact representing e.g. requirement tags) in AUTOSAR standardization documents is defined as

```
{keyword(TraceCategory)}_{module}_({special}[_{index}])|{index}
```

In this pattern, the placeholders are defined as:

- `keyword(TraceCategory)` is defined in [3] in keyword set `Information-Categories`, entries with classification `TraceCategory`.

- `module` is either module abbreviation in [5] or an entry of the keyword set `DocumentAbbreviations` with classification `DocumentAbbreviation` in [3]. Inside one document only the same module abbreviation or keyword shall be used.

- `index` is a numerical index

- `special` is one of (`SPEC`, `NA`, `GEN`, `CONSTR`). Note that `special` may also have an optional index. This allows to provide different special items with more detailed information.

⌋*(RS_STDT_00009, RS_STDT_00008, RS_STDT_00001, RS_STDT_00031)*

Note that some existing specifications historically contain multiple abbreviations inside the document and do therefore not follow this pattern. These are exceptions and shall not be applied to new documents.

[TPS_STDT_00056] Identifying not applicable requirements ⌈ For those requirements which are not applicable to a particular specification, [TPS_STDT_00042] allows the `special` to be `NA`.

In order to apply this, specification item with the `shortName` e.g ([RS_STDT_NA] or even [RS_STDT_NA_00099]) may be created which traces back to the not applicable requirement items.

By this, not applicable requirements are easily identified in requirements tracing tables. Requirements tracing is complete since it also explicitly expresses the not applicable requirements. ⌋*(RS_STDT_00031)*

[TPS_STDT_00057] Identifying generally fulfilled requirements ⌈ For those requirements which are fulfilled by a generic concept, [TPS_STDT_00042] allows the `special` to be `GEN`.

In order to apply this, specification item with an appropriate `shortName` (e.g. [RS_STDT_GEN] or even [RS_STDT_GEN_00098]) may be created which traces back to the generally fulfilled requirement items.

By this, requirements considered to be fulfilled in general are easily identified in requirements tracing tables. Requirements tracing is complete since it also explicitly expresses the generally (or implicitly fulfilled) requirements. ⌋*(RS_STDT_00031)*

[TPS_STDT_00058] Identifying requirements which need more specialization ⌈ For those requirements which are fulfilled by items in a general specification together with items in individual specifications, [TPS_STDT_00042] allows the `special` to be `SPEC`.

In order to apply this, an item with an appropriate `shortName` (e.g. [RS_STDT_SPEC] or even [RS_STDT_SPEC_00092]) may be crated which traces back to the requirement items which need additional items in the individual specification.

By this,it is possible to identify the requirement items in the general specification, which need complementary items in an individual specification. This finally allows to perform a complete requirements tracing. ⌋*(RS_STDT_00031)*

Figure 2.6 illustrates a requirements tracing table which utilizes the features provided by [TPS_STDT_00056] and [TPS_STDT_00058]:

SWS CanIf

Requirements traceability to SRS BSW General

Requirement	Description	Satisfied by
[RS_BSW_001]	Requirement title …	[SWS_BSW_0100]
[RS_BSW_002]	Requirement title …	[SWS_CANIF_0815]
		[SWS_CANIF_2000]
		[SWS_BSW_SPEC]
[RS_BSW_003]	Requirement title …	[SWS_BSW_0100]
		[SWS_BSW_0105]
[RS_BSW_004]	Requirement title …	[SWS_CANIF_0158]
		[SWS_BSW_0101]
[RS_BSW_005]	Requirement title …	[SWS_CANIF_NA]
		[SWS_BSW_0102]
		[SWS_BSW_SPEC]
[RS_BSW_006]	Requirement title …	[SWS_CANIF_NA]
[RS_BSW_007]	Requirement title …	[SWS_CANIF_0784]
		[SWS_BSW_0104]
		[SWS_BSW_SPEC]
[RS_BSW_008]	Requirement title …	[SWS_CANIF_NA]

…

Requirements traceability to SRS CAN

[RS_CANIF_001]	Requirement title …	[SWS_CANIF_0434]
[RS_CANIF_002]	Requirement title …	[SWS_CANIF_0435]
[RS_CANIF_003]	Requirement title …	[SWS_CANIF_0436]

…

Figure 2.6: Example for trace table using NA and SPEC

[TPS_STDT_00089] Identifying specification items which are constraints in AUTOSAR non template documents ⌈ For those specification items which are constraints, [TPS_STDT_00042] allows the special to be `CONSTR`. In order to apply this, an item with an appropriate shortName (e.g. [SWS_Dem_CONSTR_06101]) may be created. For this case, the numerical `index` is mandatory. ⌋*(RS_STDT_00031)*

[TPS_STDT_00052] Characteristics of TraceableText ⌈ TraceableText should[1] be:

---

[1]This usage of the word "should" indicates that this is not always easy to decide. For example [TPS_STDT_00052] could also have been divided in one TraceableText per item.

- **identifiable**: `TraceableText` shall be identified by a unique short name (see [TPS_STDT_00042]). This is automatically fulfilled by applying the AUTOSAR meta model and schema.

- **specific**: `TraceableText` should be written such that the content is unambiguous and comprehensive - even if this would not result in an elegant writing style.

- **atomic**: One `TraceableText` should cover one particular issue.

- **verifiable**: The content of `TraceableText` should be written concrete such that it can be verified - not necessarily automatically but at least by human experts.

  In particular the requirement levels specified in [TPS_STDT_00053] shall be applied.

⌋*(RS_STDT_00008, RS_STDT_00009)*

[TPS_STDT_00053] Expression of obligation ⌈The following verbal forms for the expression of obligation shall be used to indicate requirements.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as follows, based on [6].

Note that the requirement level of the document in which they are used modifies the force of these words.

- MUST: This word, or the adjective "LEGALLY REQUIRED", means that the definition is an absolute requirement of the specification due to legal issues.

- MUST NOT: This phrase, or the phrase "MUST NOT", means that the definition is an absolute prohibition of the specification due to legal issues.

- SHALL: This phrase, or the adjective "REQUIRED", means that the definition is an absolute requirement of the specification.

- SHALL NOT: This phrase means that the definition is an absolute prohibition of the specification.

- SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.

- SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED", means that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.

- MAY: This word, or the adjective "OPTIONAL", means that an item is truly optional. One vendor may choose to include the item because a particular market-

place requires it or because the vendor feels that it enhances the product while another vendor may omit the same item.

An implementation, which does not include a particular option, SHALL be prepared to interoperate with another implementation, which does include the option, though perhaps with reduced functionality. In the same vein an implementation, which does include a particular option, SHALL be prepared to interoperate with another implementation, which does not include the option (except, of course, for the feature the option provides.)

⌋*(RS_STDT_00014)*

[TPS_STDT_00054] Organisation of `TraceableText` ⌈ A set of `TraceableText` within a specification shall have the following properties:

- **hierarchical structure:** Multiple `TraceableText`s shall be structured in several successive levels - this is mostly ensured by the templates for the different kind of AUTOSAR specifications.

- **completeness:** `TraceableText` at one level shall fully implement all `TraceableText` of the previous level.

- **external consistency:** Multiple `TraceableText`s shall not contradict each other.

- **no duplication of information within any level of the hierarchical structure**: The content of one `TraceableText` shall not be repeated in any other `TraceableText` within the same level of the hierarchical structure.

- **maintainability:** A set of `TraceableText` can be modified or extended, e.g. by introduction of new versions of TraceableText or by adding/removing `TraceableText`. The `shortName` of `TraceableText` shall not be reused or changed.

⌋*(RS_STDT_00008)*

The levels mentioned in [TPS_STDT_00054] are illustrated in figure 2.1.

[TPS_STDT_00050] namePattern for AUTOSAR delivered Files ⌈ The intended name pattern applied for filenames of AUTOSAR delivered files is defined as

```
AUTOSAR_{keyword(DocumentCategory)}_{DocumentName}
```

In this pattern, the placeholders are defined as:

- `keyword(DocumentCategory)` is defined in [3] in keyword set `InformationCategories`, entries with classification `DocumentCategory`.

- `DocumentName` is the `shortName` of the `Keyword` according to [3], keyword set `DocumentAbbreviation` entries with classification `DocumentAbbreviation` or the shortName of the module in [5]

⌋*(RS_STDT_00009)*
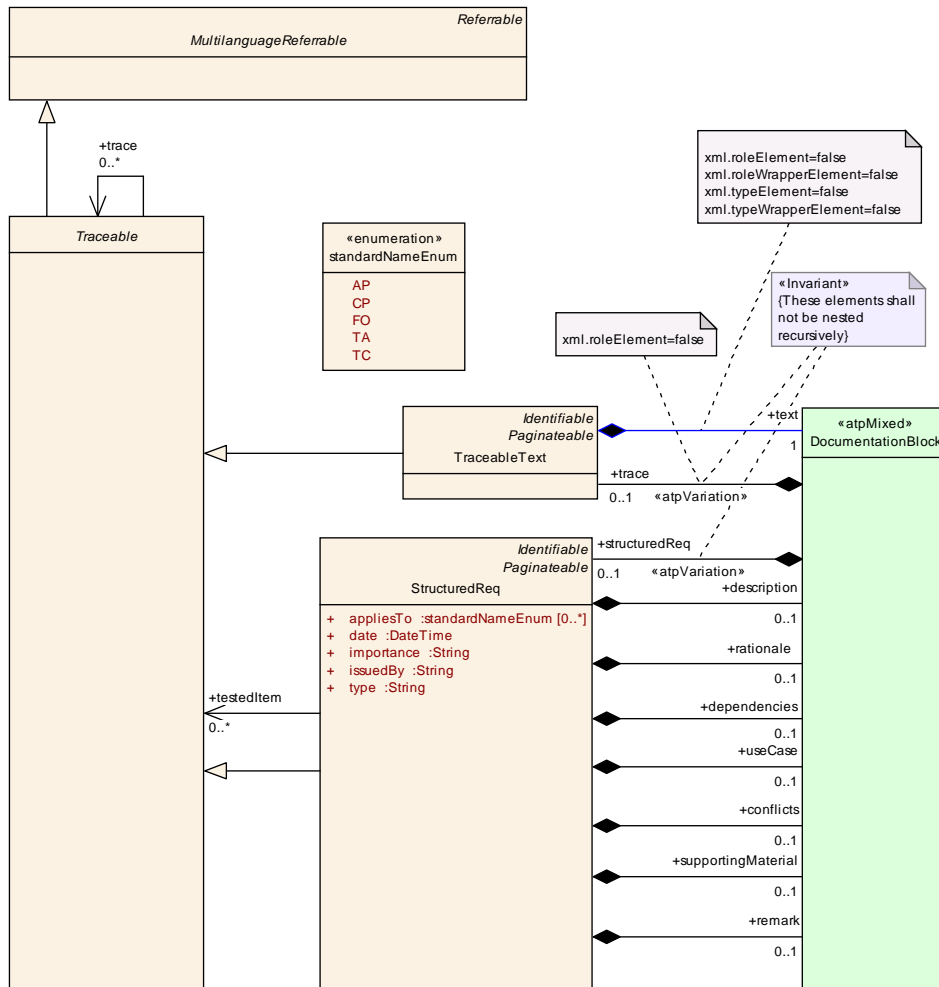
Figure 2.7: Requirements and Tracing

Class	Traceable (abstract)			
Package	M2::MSR::Documentation::BlockElements::RequirementsTracing			
Note	This meta class represents the ability to be subject to tracing within an AUTOSAR model. Note that it is expected that its subclasses inherit either from MultilanguageReferrable or from Identifiable. Nevertheless it also inherits from MultilanguageReferrable in order to provide a common reference target for all Traceables.			
Base	ARObject, MultilanguageReferrable, Referrable			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
trace	Traceable	*	ref	This assocation represents the ability to trace to upstream requirements / constraints. This supports for example the bottom up tracing ProjectObjectives <- MainRequirements <- Features <- RequirementSpecs <- BSW/AI **Tags:** xml.sequenceOffset=20

Table 2.1: Traceable

Class	TraceableText			
Package	M2::MSR::Documentation::BlockElements::RequirementsTracing			
Note	This meta-class represents the ability to denote a traceable text item such as requirements etc. The following approach appliles: • **shortName** represents the tag for tracing • **longName** represents the head line • **category** represents the kind of the tagged text			
Base	ARObject, DocumentViewSelectable, Identifiable, MultilanguageReferrable, Paginateable, Referrable, Traceable			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
text	Documentation Block	1	aggr	This represents the text to which the tag applies. **Tags:** xml.roleElement=false; xml.roleWrapper Element=false; xml.sequenceOffset=30; xml.type Element=false; xml.typeWrapperElement=false

Table 2.2: TraceableText

Class	StructuredReq			
Package	M2::MSR::Documentation::BlockElements::RequirementsTracing			
Note	This represents a structured requirement. This is intended for a case where specific requirements for features are collected. Note that this can be rendered as a labeled list.			
Base	ARObject, DocumentViewSelectable, Identifiable, MultilanguageReferrable, Paginateable, Referrable, Traceable			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
appliesTo	standardNameE num	*	attr	This attribute represents the platform the requirement is assigned to. **Tags:** xml.namePlural=APPLIES-TO-DEPENDEN CIES; xml.sequenceOffset=25
conflicts	Documentation Block	0..1	aggr	This represents an informal specification of conflicts. **Tags:** xml.sequenceOffset=40
date	DateTime	1	attr	This represents the date when the requirement was initiated. **Tags:** xml.sequenceOffset=5
dependenc ies	Documentation Block	0..1	aggr	This represents an informal specifiaction of dependencies. Note that upstream tracing should be formalized in the property trace provided by the superclass Traceable. **Tags:** xml.sequenceOffset=30

Attribute	Type	Mul.	Kind	Note
description	Documentation Block	0..1	aggr	Ths represents the general description of the requirement. **Tags:** xml.sequenceOffset=10
importance	String	1	attr	This allows to represent the importance of the requirement. **Tags:** xml.sequenceOffset=8
issuedBy	String	1	attr	This represents the person, organization or authority which issued the requirement. **Tags:** xml.sequenceOffset=6
rationale	Documentation Block	0..1	aggr	This represents the rationale of the requirement. **Tags:** xml.sequenceOffset=20
remark	Documentation Block	0..1	aggr	This represents an informal remark. Note that this is not modeled as annotation, since these remark is still essential part of the requirement. **Tags:** xml.sequenceOffset=60
supporting Material	Documentation Block	0..1	aggr	This represents an informal specifiaction of the supporting material. **Tags:** xml.sequenceOffset=50
testedItem	Traceable	*	ref	This assocation represents the ability to trace on the same specification level. This supports for example the of acceptance tests. **Tags:** xml.sequenceOffset=70
type	String	1	attr	This attribute allows to denote the type of requirement to denote for example is it an "enhancement", "new feature" etc. **Tags:** xml.sequenceOffset=7
useCase	Documentation Block	0..1	aggr	This describes the relevant use cases. Note that formal references to use cases should be done in the trace relation. **Tags:** xml.sequenceOffset=35

Table 2.3: StructuredReq

3 Life Cycle of AUTOSAR Definitions

In order to support evolution and backward compatibility of the standardized model elements like port prototype blueprints, port interfaces, keyword abbreviations, SW-Cs (in ASW) or of the API of a BSW module etc. AUTOSAR supports life cycles. The meta model and the details of the application of this meta model is specified in chapter "Life Cycle Support" of Generic Structure Template [7].

[TPS_STDT_00038] Life Cycle Support ⌈ STDT is able to express information about the state of the blueprints by references from within a `LifeCycleInfoSet`. ⌋ *(RS_STDT_00016)*

[TPS_STDT_00064] Applied Life Cycle Information Sets on AUTOSAR provided Models (M1) ⌈

The following life cycle states are applied for AUTOSAR provided model elements. They correspond to [TPS_GST_00051]:

valid This indicates that the related entity is a valid part of the document. This is the default.

draft This indicates that the related entity is introduced newly in the model but still experimental. This information is published but is subject to be changed without backward compatibility management.

obsolete This indicates that the related entity is obsolete and kept in the model for compatibility reasons. If this tag is set, the note shall express the recommended alternative solution.

preliminary This indicates that the related entity is preliminary in the model. It is subject to be changed without backwards compatibility management. An AUTOSAR release does not contain such elements. It is intended for AUTOSAR internal development.

removed This indicates that the related entity is removed from the model. It shall not be used and should not even appear in documents. An AUTOSAR release does not contain such elements. It is intended for AUTOSAR internal development.

Even if such removed elements are not included in an `.arxml` they can still be referenced in a `LifeCycleInfoSet` by using the ≪atpUriDef≫ attribute of type `Referrable`: `lcObject`, respectively `useInstead`.

shallBecomeMandatory This indicates that the related entity should be mandatory from the semantical perspective and will become mandatory in future. It is yet left optional to avoid backwards compatibility issues. Such elements should be provided whenever possible.

If an object is not referenced in a `LifeCycleInfoSet`, the related entity is a valid part of the current model. ⌋*(RS_STDT_00025)*

Note that according to [TPS_STDT_00064] if there is no life cycle information for an element then it is defined that the element is valid. In other words, in general there is no need to define a `LifeCycleInfoSet` with `defaultLcState` "valid". Nevertheless there might be use cases when it could be useful to explicitly define such a `LifeCycleInfoSet`. For example if element "x" gets life cycle state "obsolete" and subsequently this is identified as an error and the life cycle returns back to "valid". This could be documented in such a `LifeCycleInfoSet`.

Listing 3.1 provides the ARXML representation of the life cycle according to [TPS_GST_00051] respectively [TPS_STDT_00064].

Listing 3.1: AUTOSAR Standard LifeCycleStateDefinitionGroup

```xml
<!-- LifeCycleStateDefinitionGroup: AutosarLifeCycleStates -->
    <LIFE-CYCLE-STATE-DEFINITION-GROUP>
      <SHORT-NAME>AutosarLifeCycleStates</SHORT-NAME>
      <LONG-NAME>
        <L-4 L="EN">Life Cycle Definitions used in AUTOSAR
            Standards</L-4>
      </LONG-NAME>
      <DESC>
        <L-2 L="EN">This set represents the life cycle
            definitions used by AUTOSAR on M1 and M2 level. See
            also [TPS_GST_00051] respectively [TPS_GST_00064].</
            L-2>
      </DESC>
      <LC-STATES>
<!-- LifeCycleState: valid -->
        <LIFE-CYCLE-STATE>
          <SHORT-NAME>valid</SHORT-NAME>
          <DESC>
            <L-2 L="EN">This indicates that the related entity
                is a valid part of the document. This is the
                default.</L-2>
          </DESC>
        </LIFE-CYCLE-STATE>
<!-- LifeCycleState: draft -->
        <LIFE-CYCLE-STATE>
          <SHORT-NAME>draft</SHORT-NAME>
          <DESC>
            <L-2 L="EN">This indicates that the related entity
                is introduced newly in the (meta) model but
                still experimental. This information is
                published but is subject to be changed without
                backward compatibility management.</L-2>
          </DESC>
        </LIFE-CYCLE-STATE>
<!-- LifeCycleState: obsolete -->
        <LIFE-CYCLE-STATE>
          <SHORT-NAME>obsolete</SHORT-NAME>
          <DESC>
            <L-2 L="EN">This indicates that the related entity
                is obsolete and kept in the (meta) model for
                compatibility reasons. </L-2>
          </DESC>
          <INTRODUCTION>
            <P>
              <L-1 L="EN">If this life cycle state is set, the
<TT TYPE="ARMetaClassRole">LifeCycleInfo.remark</TT> shall express the
    recommended alternative solution.</L-1>
            </P>
          </INTRODUCTION>
        </LIFE-CYCLE-STATE>
<!-- LifeCycleState: preliminary -->
        <LIFE-CYCLE-STATE>
          <SHORT-NAME>preliminary</SHORT-NAME>
          <DESC>
```

Document ID 535: AUTOSAR_TPS_StandardizationTemplate.pdf

```
                    <L-2 L="EN">This indicates that the related entity
                       is preliminary in the (meta) model. It is
                       subject to be changed without backwards
                       compatibility management. An AUTOSAR release
                       does not contain such elements. It is intended
                       for AUTOSAR internal development.</L-2>
                  </DESC>
               </LIFE-CYCLE-STATE>
        <!-- LifeCycleState: removed -->
               <LIFE-CYCLE-STATE>
                  <SHORT-NAME>removed</SHORT-NAME>
                  <DESC>
                    <L-2 L="EN">This indicates that the related entity
                       is still in the (meta) model for whatever reason
                       . It shall not be used and should not even
                       appear in documents. </L-2>
                  </DESC>
                  <INTRODUCTION>
                    <P>
                      <L-1 L="EN">An AUTOSAR release does not contain
                         such elements. It is intended for AUTOSAR
                         internal development. <BR /> Removed elements
                         are not included in an .arxml delivery but can
                          be referenced in a LifeCycleInformationSet by
                         using the
<TT TYPE="ARStereotype">atpUriDef</TT> attributes of type
<TT TYPE="ARMetaClass">Referrable</TT>:
<TT TYPE="ARMetaClassRole">LifeCycleInfo.lcObject</TT>, respectively
<TT TYPE="ARMetaClassRole">LifeCycleInfo.useInstead</TT>.</L-1>
                    </P>
                  </INTRODUCTION>
               </LIFE-CYCLE-STATE>
        <!-- LifeCycleState: shallBecomeMandatory -->
               <LIFE-CYCLE-STATE>
                  <SHORT-NAME>shallBecomeMandatory</SHORT-NAME>
                  <DESC>
                    <L-2 L="EN">This indicates that the related entity
                       should be mandatory from the semantical
                       perspective and will become mandatory in future.
                        It is yet left optional to avoid backwards
                       compatibility issues. Such elements should be
                       provided whenever possible.</L-2>
                  </DESC>
               </LIFE-CYCLE-STATE>
             </LC-STATES>
           </LIFE-CYCLE-STATE-DEFINITION-GROUP>
         </ELEMENTS>
       </AR-PACKAGE>
      </AR-PACKAGES>
     </AR-PACKAGE>
    </AR-PACKAGES>
   </AR-PACKAGE>
  </AR-PACKAGES>
</AUTOSAR>
```

4 The Principles of Blueprints

[TPS_STDT_00002] The Principles of Blueprints ⌈ This chapter describes the support of the AUTOSAR meta-model for the pre-definition of model elements taken as the basis for further modeling. These pre-definitions are called blueprints. ⌋*(RS_STDT_00001)*

For example, an authoring tool provides the such predefined `PortInterface` as a kind of toolbox from which the definitions can be copied to a project.
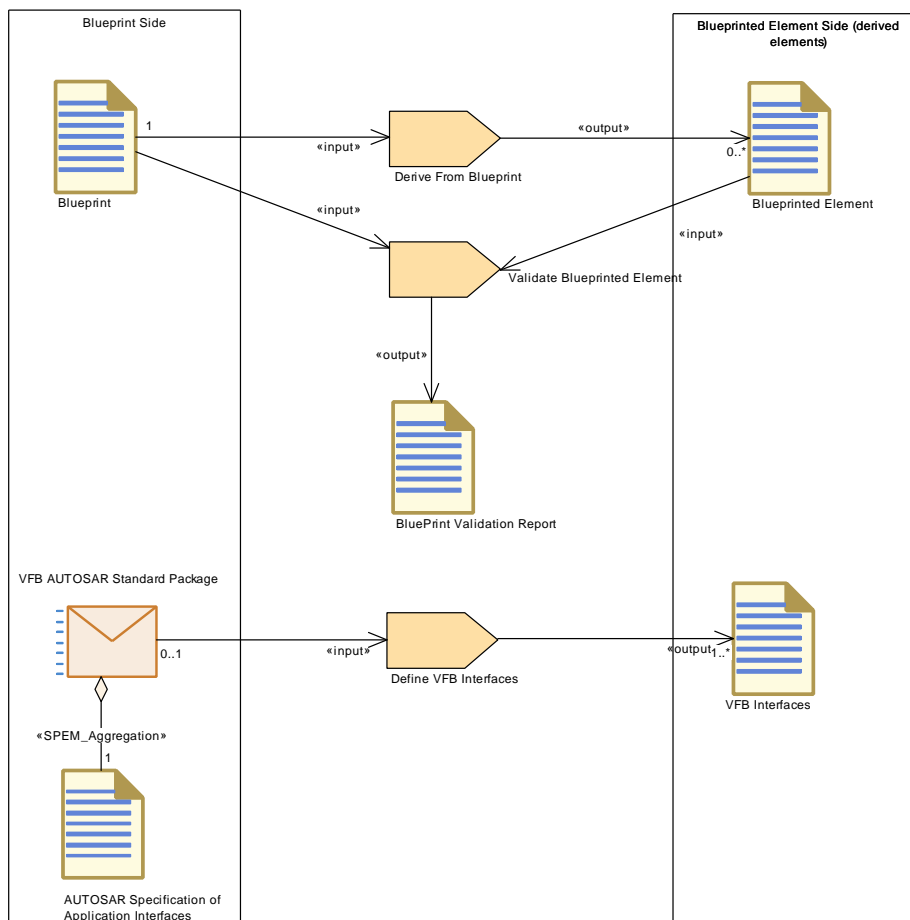
Figure 4.1: Blueprint methodology approach

Figure 4.1 illustrates the usecase. The blueprint is on one hand used as an input to derive objects (DeriveFromBlueprint) and later also used to validate the derived objects. As an example the figure shows that the application interfaces are used to derive VFB interfaces (namely `PortInterface`s).

4.1 Abstract pattern for Blueprints

The blueprint approach is represented by the abstract blueprint structure as shown in figure 4.2. It is based on three entities:

- **Blueprint**, represented by `AtpBlueprint`, acts as the predefinition of the element. Basically it follows the same structure as the derived elements.

  But there might be additional elements to support the fact that it is a blueprint. An example for this is that `PortPrototypeBlueprint` also specifies `initValue`s which is not the case for `PortPrototype` which get their initial values from appropriate `ComSpec`s.

- **Blueprinted Element**, represented by `AtpBlueprintable`, acts as the element which was derived from the Blueprint. These elements are derived from blueprints mainly by copy and refine. This "refine" may add further attribute values, update `shortName` etc. The details of possible refinements are specified for each blueprint individually.

  Note that the subsequent processing of blueprinted elements (e.g. RTE generation) do not refer to the blueprints anymore.

- **Blueprint Mapping**, represented by `AtpBlueprintMapping`, acts as a reference between blueprints and their derived elements. The main purpose of this blueprint mapping is to

  – provide the ability to validate for each derived element that they conform to the blueprint.

  – reflect the fact that the derived elements are part of a common concept.
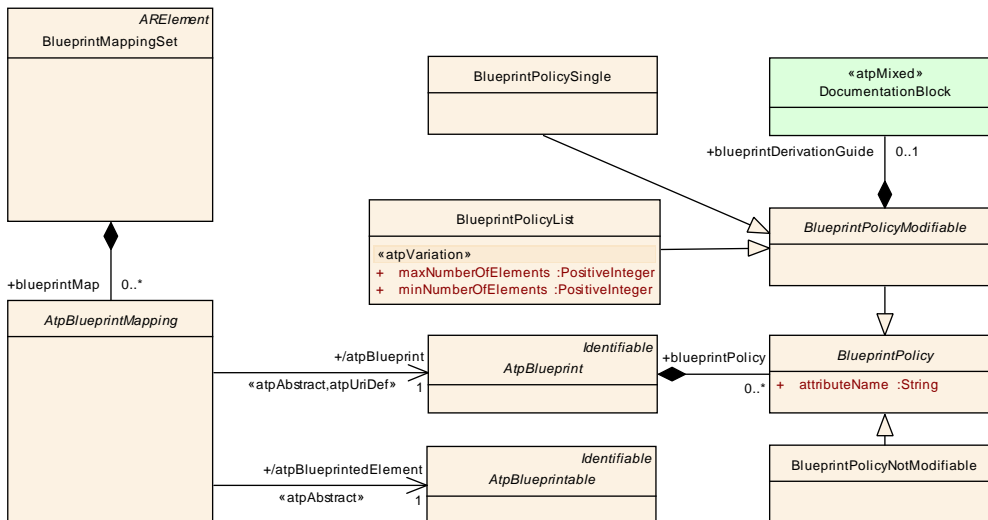
Figure 4.2: Abstract Blueprint Structure

Meta-classes for elements eligible for blueprinting are defined as specializations of `AtpBlueprintable` while meta-classes for blueprints are defined as specializations of `AtpBlueprint`. An example is given in figure 4.3.
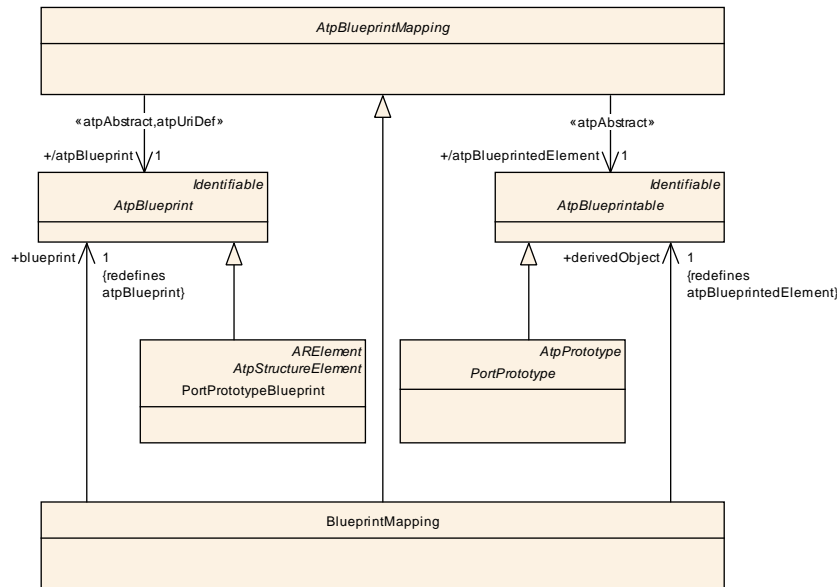
Figure 4.3: Port Blueprints as an example for separate meta-classes for Blueprint and blueprinted Element

[TPS_STDT_00072] Same Meta Class For Blueprints and Derived Objects ⌈ For most of the elements eligible for blueprinting, no extra meta-class is required because the same meta-class applies for blueprints and blueprinted elements. The meta-class of such an element inherits from both `AtpBlueprint` and `AtpBlueprintable`. ⌋ *(RS_STDT_00017)* An example is given in figure 4.4.

[TPS_STDT_00041] Constraints may be violated in Blueprints ⌈ For blueprints using the same meta-class as the derived objects, the constraints defined for these objects may be violated by the blueprints such as:

- Required attributes may be missing.

- Referenced objects may not exist. Strictly speaking, references in blueprints can all be considered as ≪atpUriDef≫

⌋*(RS_STDT_00002, RS_STDT_00006, RS_STDT_00007)*
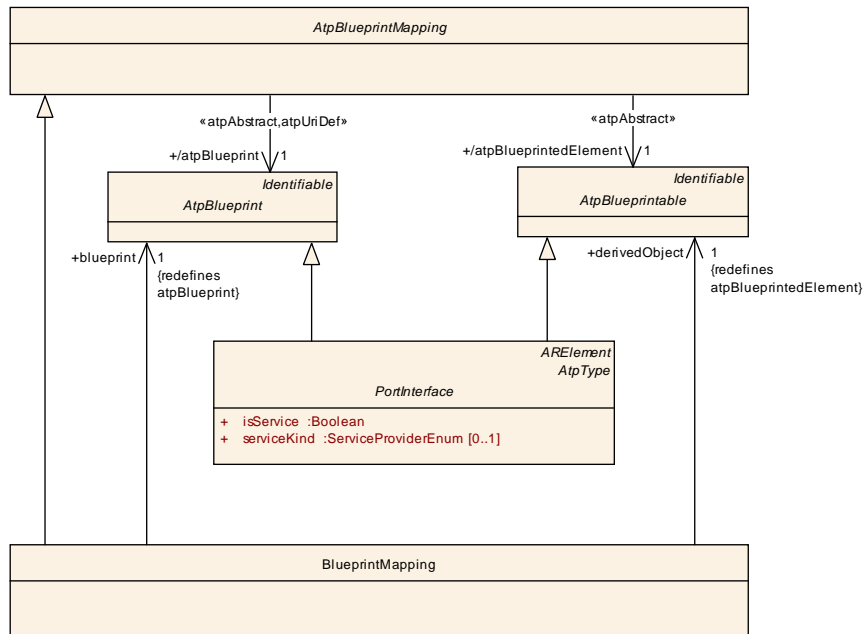
Figure 4.4: PortInterface Blueprints as an example for using the same meta-class for Blueprint and blueprinted Element

[TPS_STDT_00033] Recognize Blueprints ⌈ According to [7] the blueprints reside in a package of `category` "BLUEPRINT". Downstream AUTOSAR Tools such as RTE-generator shall ignore Elements living in a package of `category` "BLUEPRINT". ⌋ *(RS_STDT_00006, RS_STDT_00007)*

Blueprints are specializations of `AtpBlueprint`. Introduction of standardization therefore does not introduce compatibility problems to existing templates. Note that since AUTOSAR 4.0.3 `AtpBlueprint.shortNamePattern` is replaced by `Identifier.namePattern` resp. `CIdentifier.namePattern`.

[TPS_STDT_00032] BlueprintPolicy ⌈ Blueprintable elements shall be characterized by BlueprintPolicy to indicate whether they will be modifiable or not modifiable.

- `BlueprintPolicyNotModifiable` means, that the related attribute is not modifiable during the blueprinting (see listing 4.1).

- `BlueprintPolicyList` means, that the related attribute is modifiable during the blueprinting. It applies only to an attribute with upper multiplicity greater than 1 (see listing 4.2).

- `BlueprintPolicySingle` means, that the related attribute is modifiable during the blueprinting. It applies only to an attribute with upper multiplicity equal 1 (see listing 4.3).

⌋*(RS_STDT_00040)*

[constr_2590] One BlueprintPolicy is allowed ⌈ For each attribute of a blueprint, at most one `BlueprintPolicy` is allowed. ⌋*()*

[constr_2591] BlueprintPolicyNotModifiable ⌈ If `BlueprintPolicyNotModifiable` is assigned to an attribute, then during blueprinting it is not allowed to modify the value of the attribute and all it contained content. ⌋*()*

[constr_2592] No BlueprintPolicy ⌈ If no `BlueprintPolicy` is assigned to an attribute, then arbitrary modifications are allowed while deriving from the blueprint. ⌋ *()*

[constr_2593] Expression for identifying the attribute a BlueprintPolicy relates to ⌈ The expression language for identifying the related attribute of a `BlueprintPolicy` is a subset version of xpath, see [8]. For navigation over the model we use the names as they are used in XML. ⌋*()*

[TPS_STDT_00039] Xpath Expressions for `BlueprintPolicy` ⌈ The `BlueprintPolicy` uses a subset of xpath expressions described in Table 4.1. Other xpath expressions shall not be use to avoid complexity. The root node is the blueprint owning the `BlueprintPolicy`. ⌋*(RS_STDT_00040)*

Path Expressions	Description
nodename	Selects all nodes with the name "nodename"
/	Selects from the root node
@	Selects attributes
@<attribute>='<value>'	Selects an element node, which has the <attribute> set to <value>
text()='<value>'	Selects an element node, which contains the text <value>
*	Matches any element node
[n]	Selects the n-th element node

Table 4.1: Allowed xpath expressions in `BlueprintPolicy`

The xpath expression [n] in Table 4.1 starts with [1] due to the XML Path Language Specification [8]. The use of [n] is only allowed for ordered elements. One `BlueprintPolicy` can refine more than one attribute.

In listing 4.1 the root node is selected by the nodename (COMPU-INTERNAL-TO-PHYS). In listing 4.2 the root node is selected by nodename/nodename/* (COMPU-INTERNAL-TO-PHYS/COMPU-SCALES/*).

Listing 4.1: Example for BlueprintPolicyNotModifiable

```
<COMPU-METHOD>
  <SHORT-NAME>Dem_DebounceResetStatusType</SHORT-NAME>
  <CATEGORY>TEXTTABLE</CATEGORY>
  <BLUEPRINT-POLICYS>
    <BLUEPRINT-POLICY-NOT-MODIFIABLE>
      <ATTRIBUTE-NAME>COMPU-INTERNAL-TO-PHYS</ATTRIBUTE-NAME>
    </BLUEPRINT-POLICY-NOT-MODIFIABLE>
  </BLUEPRINT-POLICYS>
  <COMPU-INTERNAL-TO-PHYS>
    <COMPU-SCALES>
      <COMPU-SCALE>
        <LOWER-LIMIT INTERVAL-TYPE="CLOSED">0x00</LOWER-LIMIT>
        <UPPER-LIMIT INTERVAL-TYPE="CLOSED">0x00</UPPER-LIMIT>
```

```xml
        <COMPU-CONST>
          <VT>DEM_DEBOUNCE_STATUS_FREEZE</VT>
        </COMPU-CONST>
      </COMPU-SCALE>
      <COMPU-SCALE>
        <LOWER-LIMIT INTERVAL-TYPE="CLOSED">0x01</LOWER-LIMIT>
        <UPPER-LIMIT INTERVAL-TYPE="CLOSED">0x01</UPPER-LIMIT>
        <COMPU-CONST>
          <VT>DEM_DEBOUNCE_STATUS_RESET</VT>
        </COMPU-CONST>
      </COMPU-SCALE>
    </COMPU-SCALES>
  </COMPU-INTERNAL-TO-PHYS>
</COMPU-METHOD>
```

Listing 4.2: Example for BlueprintPolicyList

```xml
<COMPU-METHOD>
  <SHORT-NAME>Dcm_SecLevelType</SHORT-NAME>
  <CATEGORY>TEXTTABLE</CATEGORY>
  <BLUEPRINT-POLICYS>
    <BLUEPRINT-POLICY-LIST>
      <ATTRIBUTE-NAME>COMPU-INTERNAL-TO-PHYS/COMPU-SCALES/*</ATTRIBUTE-
        NAME>
      <BLUEPRINT-DERIVATION-GUIDE>
        <P>
          <L-1 L="EN">0x00 is locked</L-1>
        </P>
        <P>
          <L-1 L="EN">0x01...0x3F is configuration dependent</L-1>
        </P>
        <P>
          <L-1 L="EN">0x40...0xFF is Reserved by Document</L-1>
        </P>
      </BLUEPRINT-DERIVATION-GUIDE>
      <MAX-NUMBER-OF-ELEMENTS>3</MAX-NUMBER-OF-ELEMENTS>
    </BLUEPRINT-POLICY-LIST>
  </BLUEPRINT-POLICYS>
  <COMPU-INTERNAL-TO-PHYS>
    <COMPU-SCALES>
      <COMPU-SCALE>
        <LOWER-LIMIT INTERVAL-TYPE="CLOSED">0x00</LOWER-LIMIT>
        <UPPER-LIMIT INTERVAL-TYPE="CLOSED">0x00</UPPER-LIMIT>
        <COMPU-CONST>
          <VT>DCM_SEC_LEV_LOCKED</VT>
        </COMPU-CONST>
      </COMPU-SCALE>
    </COMPU-SCALES>
  </COMPU-INTERNAL-TO-PHYS>
</COMPU-METHOD>
```

The listing 4.3 illustrates the use of `BlueprintPolicySingle`.

Listing 4.3: Example for BlueprintPolicySingle

```xml
<PORT-PROTOTYPE-BLUEPRINT>
  <SHORT-NAME NAME-PATTERN="{anyName}">AFbForCmft</SHORT-NAME>
```

```
<LONG-NAME>
  <L-4 L="EN">Acceleration Feedback for Comfort</L-4>
</LONG-NAME>
<DESC>
  <L-2 L="EN">Cluster of information regarding acceleration and
    acceleration saturation feedbacks from Vehicle Longitudinal
    Control (VLC) to Adaptive Cruise Control (ACC). This information
    is used for comfort reasons.</L-2>
</DESC>
<BLUEPRINT-POLICYS>
  <BLUEPRINT-POLICY-SINGLE>
    <ATTRIBUTE-NAME>INTERFACE-REF</ATTRIBUTE-NAME>
    <BLUEPRINT-DERIVATION-GUIDE>
      <P>
        <L-1 L="EN">Shall only refer to an interface of vendor xyz
          with the same shortname.</L-1>
      </P>
    </BLUEPRINT-DERIVATION-GUIDE>
  </BLUEPRINT-POLICY-SINGLE>
</BLUEPRINT-POLICYS>
<INTERFACE-REF DEST="SENDER-RECEIVER-INTERFACE">/AUTOSAR/
  AISpecification/PortInterfaces_Blueprint/AFbForCmft1</INTERFACE-REF
  >
</PORT-PROTOTYPE-BLUEPRINT>
```

In listing 4.4 the `BlueprintPolicySingle` selects an element node with attribute which equals a defined string (PORTS/P-PORT-PROTOTYPE/SHORT-NAME[@NAME-PATTERN='{Name}_AsymDecrypt']).

Listing 4.4: Example for BlueprintPolicySingle with attribute name pattern

```
<BLUEPRINT-POLICY-SINGLE>
  <ATTRIBUTE-NAME>PORTS/P-PORT-PROTOTYPE/SHORT-NAME[@NAME-
    PATTERN='{Name}_AsymDecrypt']</ATTRIBUTE-NAME>
  <BLUEPRINT-DERIVATION-GUIDE>
    <P>
      <L-1 L="EN">Name = {ecuc(Csm/CsmAsymDecrypt/
        CsmAsymDecryptConfig.SHORT-NAME)}</L-1>
    </P>
  </BLUEPRINT-DERIVATION-GUIDE>
</BLUEPRINT-POLICY-SINGLE>
```

This results in the selection of the element node illustrated in listing 4.5.

Listing 4.5: Selected element node <SHORT-NAME>

```
<P-PORT-PROTOTYPE>
  <SHORT-NAME NAME-PATTERN="{Name}_AsymDecrypt">AsymDecrypt</
    SHORT-NAME>
  <PROVIDED-INTERFACE-TREF DEST="CLIENT-SERVER-INTERFACE">/
    AUTOSAR/Csm/ClientServerInterfaces_Blueprint/
    CsmAsymDecrypt</PROVIDED-INTERFACE-TREF>
</P-PORT-PROTOTYPE>
```

In listing 4.6 the `BlueprintPolicySingle` selects an element node which contains a defined text pattern (OPERATIONS/CLIENT-SERVER-OPERATION[SHORT-

Document ID 535: AUTOSAR_TPS_StandardizationTemplate.pdf

NAME/text()="ReadData"]/ARGUMENTS/ARGUMENT-DATA-PROTOTYPE[SHORT-NAME/text()="Data"]).

Listing 4.6: Example for BlueprintPolicySingle with text pattern

```
<BLUEPRINT-POLICY-SINGLE>
    <ATTRIBUTE-NAME>OPERATIONS/CLIENT-SERVER-OPERATION[SHORT-NAME
        /text()="ReadData"]/ARGUMENTS/ARGUMENT-DATA-PROTOTYPE[
        SHORT-NAME/text()="Data"]</ATTRIBUTE-NAME>
    <BLUEPRINT-DERIVATION-GUIDE>
        <P>
            <L-1 L="EN">Data = {ecuc(Dem/DemGeneral/
                DemDataElementClass.SHORT-NAME)}</L-1>
        </P>
    </BLUEPRINT-DERIVATION-GUIDE>
</BLUEPRINT-POLICY-SINGLE>
```

This results in the selection of the element node (ARGUMENTS/ARGUMENT-DATA-PROTOTYPE/SHORT-NAME) with SHORT-NAME equal to 'Data' in case (CLIENT-SERVER-OPERATION/SHORT-NAME) is equal to 'ReadData', see listing 4.7.

Listing 4.7: Example for BlueprintPolicySingle with text pattern

```
<OPERATIONS>
    <CLIENT-SERVER-OPERATION>
        <SHORT-NAME>ReadData</SHORT-NAME>
        <INTRODUCTION>
            <P>
                <L-1 L="EN">The server is not allowed to return
                    E_NOT_OK, but shall always provide a valid data
                    value (e.g. a default/replacement value in an error-
                    case) to Dcm/Dem nevertheless the signature of the
                    operation includes E_NOT_OK to ensure compatibility
                    between server runnable and RTE Call API, since the
                    RTE may return negative Std_Return values in certain
                     cases (e.g. partition of server stopped)</L-1>
            </P>
        </INTRODUCTION>
        <ARGUMENTS>
            <ARGUMENT-DATA-PROTOTYPE>
                <SHORT-NAME>Data</SHORT-NAME>
                <TYPE-TREF DEST="IMPLEMENTATION-DATA-TYPE">/AUTOSAR/Dem
                    /ImplementationDataTypes_Blueprint/DataArrayType</
                    TYPE-TREF>
                <DIRECTION>OUT</DIRECTION>
            </ARGUMENT-DATA-PROTOTYPE>
        </ARGUMENTS>
        <POSSIBLE-ERROR-REFS>
            <POSSIBLE-ERROR-REF DEST="APPLICATION-ERROR">/AUTOSAR/Dem/
                ClientServerInterfaces_Blueprint/DataServices/E_OK</
                POSSIBLE-ERROR-REF>
            <POSSIBLE-ERROR-REF DEST="APPLICATION-ERROR">/AUTOSAR/Dem/
                ClientServerInterfaces_Blueprint/DataServices/E_NOT_OK<
                /POSSIBLE-ERROR-REF>
        </POSSIBLE-ERROR-REFS>
    </CLIENT-SERVER-OPERATION>
</OPERATIONS>
```

Class	AtpBlueprint (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::AbstractBlueprintStructure			
Note	This meta-class represents the ability to act as a Blueprint. As this class is an abstract one, particular blueprint meta-classes inherit from this one.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
blueprintPolicy	BlueprintPolicy	*	aggr	This role indicates whether the blueprintable element will be modifiable or not motifiable.

Table 4.2: AtpBlueprint

Class	AtpBlueprintable (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::AbstractBlueprintStructure			
Note	This meta-class represents the ability to be derived from a Blueprint. As this class is an abstract one, particular blueprintable meta-classes inherit from this one.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table 4.3: AtpBlueprintable

Class	AtpBlueprintMapping (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::AbstractBlueprintStructure			
Note	This meta-class represents the ability to express a particular mapping between a blueprint and an element derived from this blueprint. Particular mappings are defined by specializations of this meta-class.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
atpBlueprint	AtpBlueprint	1	ref	This represents the blueprint. **Stereotypes:** atpAbstract; atpUriDef **Tags:** xml.sequenceOffset=50
atpBlueprintedElement	AtpBlueprintable	1	ref	This represents the bluprinted elements which shall be mapped to the blueprint. **Stereotypes:** atpAbstract **Tags:** xml.sequenceOffset=60

Table 4.4: AtpBlueprintMapping

Class	BlueprintPolicy (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::AbstractBlueprintStructure			
Note	This meta-class represents the ability to indicate whether blueprintable elements will be modifiable or not modifiable.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note

Attribute	Type	Mul.	Kind	Note
attributeName	String	1	attr	This identifies the related attribute of a BlueprintPolicy. For navigation over the model a subset of xpath expressions is used.

Table 4.5: BlueprintPolicy

Class	BlueprintPolicyList			
Package	M2::AUTOSARTemplates::StandardizationTemplate::AbstractBlueprintStructure			
Note	The class represents that the related attribute is modifiable during the blueprinting. It applies only to attribute with upper multiplicity greater than 1.			
Base	ARObject, BlueprintPolicy, BlueprintPolicyModifiable			
Attribute	Type	Mul.	Kind	Note
maxNumberOfElements	PositiveInteger	1	attr	Maximum number of elements in list. If the maximum number is not constraint it shall be set to "undefined". **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=blueprintDerivation Time
minNumberOfElements	PositiveInteger	1	attr	Minimum number of elements in the list. If the minimum number is not constraint it shall be set to "undefined". **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=blueprintDerivation Time

Table 4.6: BlueprintPolicyList

Class	BlueprintPolicyModifiable (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::AbstractBlueprintStructure			
Note	The class represents that the related attribute is modifiable during the blueprinting.			
Base	ARObject, BlueprintPolicy			
Attribute	Type	Mul.	Kind	Note
blueprintDerivationGuide	Documentation Block	0..1	aggr	This role offers the possibility to give addtional information to the policy.

Table 4.7: BlueprintPolicyModifiable

Class	BlueprintPolicyNotModifiable			
Package	M2::AUTOSARTemplates::StandardizationTemplate::AbstractBlueprintStructure			
Note	The class represents that the related attribute is not modifiable during the blueprinting.			
Base	ARObject, BlueprintPolicy			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table 4.8: BlueprintPolicyNotModifiable

Class	BlueprintPolicySingle			
Package	M2::AUTOSARTemplates::StandardizationTemplate::AbstractBlueprintStructure			
Note	The class represents that the related attribute is modifiable during the blueprinting. It applies only to attribute with upper multiplicity equal 1.			
Base	ARObject, BlueprintPolicy, BlueprintPolicyModifiable			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table 4.9: BlueprintPolicySingle

4.2 Mapping of Blueprints to blueprinted Elements

In many cases it will be necessary to identify the relationship of a blueprinted element (e.g. `PortPrototype`) to the corresponding blueprint (e.g. `PortPrototypeBlueprint`) after the blueprinted element has been created according to the blueprint.

For this purpose it would theoretically be possible to establish a reference from `AtpBlueprintable` to `AtpBlueprint` that identifies the pair of related model artifacts. However, this kind of information is relevant only in a narrow scope and does - as mentioned before - not impact the downstream model handling.

Therefore, a `AtpBlueprintMapping` is introduced which refers to both `AtpBlueprintable` and `AtpBlueprint` (see figure 4.2). The `AtpBlueprintMapping` is in turn aggregated at a container for the creation of blueprint mappings, the `BlueprintMappingSet`.

In previous AUTOSAR Releases a specialization of `AtpBlueprintMapping` was created for each particular meta class eligible for blueprinting. This has been replaced by one particular specialization (`BlueprintMapping`)[1].

---

[1]For compatibility reasons, the abstract patten was not changed. The previous specializations `PortInterfaceBlueprintMapping` and `PortPrototypeBlueprintMapping` are removed.
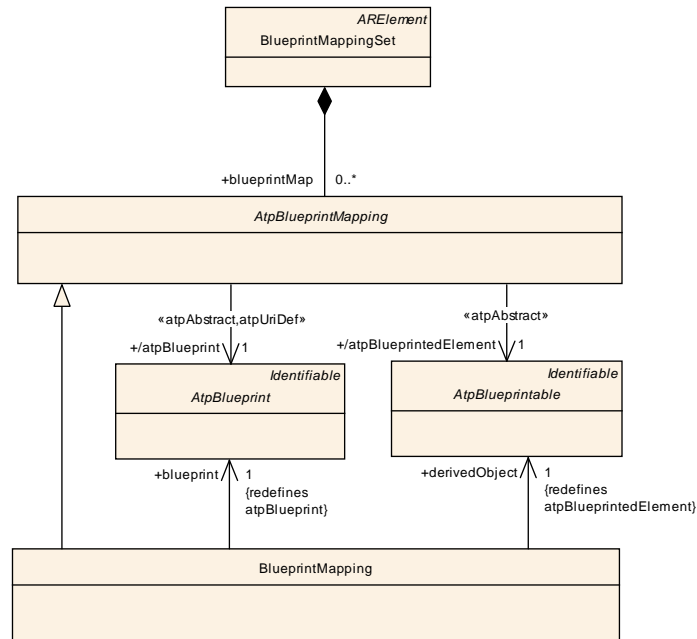
Figure 4.5: Mapping of Derived Objects and their Blueprints

[constr_2566] Blueprintmapping shall map appropriate elements ⌈ BlueprintMapping shall map elements which represent a valid pair of blueprint / derived object. In most of the cases this means that blueprint and derivedObject shall refer to objects of the same meta-class. ⌋*()*

Class	BlueprintMappingSet			
Package	M2::AUTOSARTemplates::StandardizationTemplate::BlueprintMapping			
Note	This represents a container of mappings between "actual" model elements and the "blueprint" that has been taken for their creation. **Tags:** atp.recommendedPackage=BlueprintMappingSets			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
blueprintMap	AtpBlueprintMapping	*	aggr	This represents a particular blueprint map in the set.

Table 4.10: BlueprintMappingSet

4.3 General Rules for Compliance of blueprint and blueprinted element

[TPS_STDT_00005] Compliance with Blueprints ⌈ Constraints [constr_2554] and [TPS_STDT_00087] apply in general for the compliance of blueprints with the derived objects. ⌋*(RS_STDT_00017)*

[constr_2554] Derived objects shall match the blueprints ⌈ Unless specified explicitly otherwise, the attributes of the blueprint shall appear in the derived objects.

As an exception `namePattern` may **not** be copied. ⌋*()*

[TPS_STDT_00087] Derived objects may have more attributes than the blueprints ⌈ Unless specified explicitly otherwise, derived objects may have more attributes than the blueprints. Such attributes can be

- additional values if the upper multiplicity of the attribute in the meta-model is greater than 1

- those specified by the related templates but not specified in the blueprint

⌋*(RS_STDT_00017)*

[TPS_STDT_00085] Compatibility of `longName`, `desc` and `introduction` of blueprint and blueprinted element ⌈ Elements derived from blueprints are allowed to

- change `longName`

- change `desc`

- change `introduction`

⌋*(RS_STDT_00017)*

Note that [TPS_STDT_00085] includes the ability to add text in a further language.

Note that `introduction` should not be used to describe the derivation of objects from the blueprint. This is done in `blueprintCondition` resp. `blueprintValue`. See [TPS_STDT_00048] for details.

[TPS_STDT_00086] Specify a name pattern in blueprints ⌈ For each blueprint, a `namePattern` shall be specified if the `shortName` respectively a `symbol` is not fixed but intended to be defined when objects are derived from a blueprint. This is used to verify the appropriate naming of the derived objects ([constr_2553]). ⌋ *(RS_STDT_00017)*

[constr_2553] `shortName` shall follow the pattern defined in the Blueprint ⌈ The `shortName` respectively `symbol` of the derived objects shall follow the pattern defined in `namePattern` of the blueprint according to [TPS_STDT_00086] ⌋*()*

[constr_2570] No Blueprints in system descriptions ⌈ There shall be no blueprints in system descriptions. In consequence of this blueprint elements shall be referenced only from blueprints and `AtpBlueprintMapping`s. Due to ≪atpUriDef≫, the references from `AtpBlueprintMapping` do not need to be resolved in system descriptions. ⌋*()*

[constr_2571] Outgoing references from Blueprints ⌈ Note that outgoing references from Blueprints are basically not limited. Practically, references to objects living in a package of category EXAMPLE should not occur. ⌋*()*

Reason for [constr_2571] is the fact that these examples then also shall exist in the target system description but not as example. In such a case the example would take the role of a blueprint.

Figure 4.6 illustrates a scenario with standardized objects, blueprints and project related objects.
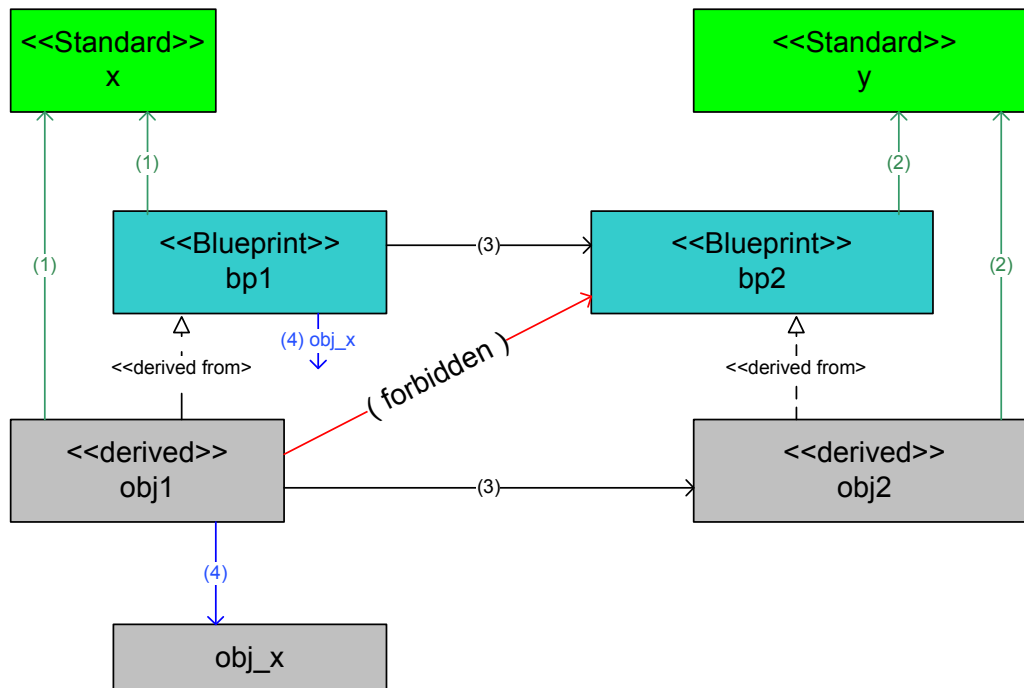
Figure 4.6: Relations between Blueprints, "Derived Objects" and "Standardized Objects"

This diagram in particular illustrates how references in blueprints shall be handled:

[TPS_STDT_00051] Handling references when deriving objects from blueprints ⌈

- Blueprints may reference standardized objects. These references also exist in the derived objects (1), (2).

- Blueprints may reference other blueprints (3). These references need to be replaced in order to meet [constr_2546]. Therefore a reference from a derived object to a blueprint is not allowed.

- Blueprints may contain references to arbitrary objects (4). According to [TPS_STDT_00041] it is allowed that these objects even do not exist. Nevertheless to meet [constr_2554] such references shall be copied to the derived objects and the referenced objects shall exist in the target system description.

⌋*(RS_STDT_00013, RS_STDT_00017)*

[TPS_STDT_00034] Integrity of Blueprints ⌈ The integrity of blueprints can be established by applying references to blueprints of related objects. For example, a blueprint of a `BswModuleDescription` may refer to a blueprint of `BswModuleEntry`. ⌋*(RS_STDT_00027)*

[constr_2546] References in derived model elements ⌈ Model elements derived from blueprints shall never refer to model elements that are blueprints. ⌋*()*

Note: A blueprint may refer to another blueprint. When deriving objects such a reference shall be replaced such that the new reference target is an object derived from the corresponding reference target in the blueprint.

[TPS_STDT_00065] Nested Blueprint Can be Used as Blueprint of its own ⌈ If specialization of `AtpBlueprint` aggregates specialization of `AtpBlueprint`, then the such aggregated specialization of `AtpBlueprint` acts as a blueprint on its own and can be derived beyond the context of objects derived from the aggregating specialization of `AtpBlueprint`. This definition allows to create blueprints which are not specializations of `ARElement`.

In other words, If a blueprint contains blueprints, the "inner" blueprints can be derived independent from derived objects of the "outer" blueprint. ⌋*(RS_STDT_00001, RS_STDT_00033)*

See chapter 5.8 for an use case of [TPS_STDT_00065].

[TPS_STDT_00047] Ignore Blueprint Attributes in Non Blueprints ⌈ AUTOSAR Tools which do not process blueprints such as RTE-generator shall ignore `Identifier.namePattern` resp. `CIdentifier.namePattern`.

The attributes `Identifier.namePattern` resp. `CIdentifier.namePattern` should be removed when deriving objects from blueprints. ⌋*(RS_STDT_00003, RS_STDT_00004, RS_STDT_00006, RS_STDT_00007)*

[TPS_STDT_00048] Express Decisions when Deriving Objects ⌈ Applying `VariationPoint` is a suitable way to express intended decisions to be made when deriving objects from blueprints. In this case the value of the UML tag `vh.latestBindingTime` is `blueprintDerivationTime` and `VariationPoint.blueprintCondition` respectively `AttributeValueVariationPoint.blueprintValue` shall be used to express the intended derivation. ⌋*(RS_STDT_00008, RS_STDT_00018, RS_STDT_00019)*

[TPS_STDT_00028] Resolving `VariationPoint` in Blueprints ⌈ If a `VariationPoint` has only `blueprintValue` respectively `blueprintCondition` but not `swSyscond` nor `postBuildVariantCondition` it shall be resolved when deriving elements. ⌋*(RS_STDT_00014, RS_STDT_00015, RS_STDT_00019, RS_STDT_00020)*

Please refer to Generic Structure Template [7] for the following aspects:

- Even if `BindingTimeEnum` does not contain the value `blueprintDerivationTime`, there are still `VariationPoint`s which shall be bound on blueprint derivation. This is specified as `blueprintDerivationTime` in the UML tag `vh.latestBindingTime` at the variation point in the meta model.

- In [constr_2537] `VariationPoint` is limited to `SwComponentType`, `BswModuleDescription`, `Documentation`, even if the meta model supports variation point on any `PackageableElement`.

  [constr_2564] `VariationPoint` in Blueprints of `PackageableElement` ⌈ To support standardization, constraint [constr_2537] in [7] is relaxed for blueprints. This means in particular, that all `PackageableElement`s which inherit from `AtpBlueprint` and live in a package of category BLUEPRINT may have a `VariationPoint`.

  In this case `vh.latestBindingTime` is considered as `blueprintDerivationTime` even if the meta model still states `systemDesignTime` for `PackageableElement`. ⌋*()*

  See chapter 5 for such elements.

- See [constr_2557]: System configurations shall not contain `VariationPoint`s with `vh.latestBindingTime` set to `blueprintDerivationTime`.

- [constr_2558]: If `vh.latestBindingTime` is `blueprintDerivationTime` then there shall only be `blueprintCondition`/`blueprintValue`.

- See [constr_2559]: `VariationPoint`s shall not be nested. In particular this means that there shall not exist a `VariationPoint` within the `DocumentationBlock` in the role `blueprintCondition` in a `VariationPoint`.

- See [constr_2567]: Attribute Value Blueprints should contain `undefined`.
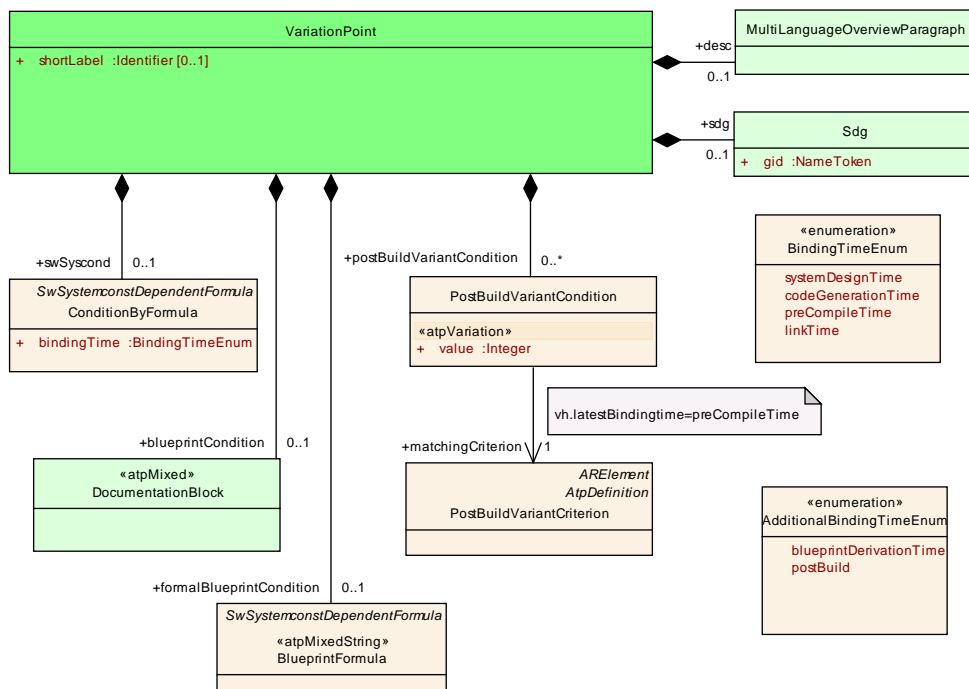
Figure 4.7: Variation Point

Class	VariationPoint			
Package	M2::AUTOSARTemplates::GenericStructure::VariantHandling			
Note	This meta-class represents the ability to express a "structural variation point". The container of the variation point is part of the selected variant if swSyscond evaluates to true and each postBuildVariantCriterion is fulfilled.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
desc	MultiLanguage OverviewParagr aph	0..1	aggr	This allows to describe shortly the purpose of the variation point. Tags: xml.sequenceOffset=20
blueprintC ondition	Documentation Block	0..1	aggr	This represents a description that documents how the variation point shall be resolved when deriving objects from the blueprint. Note that variationPoints are not allowed within a blueprintCondition. Tags: xml.sequenceOffset=28
formalBlue printConditi on	BlueprintFormul a	0..1	aggr	This denotes a formal blueprintCondition. This shall be not in contradiction with blueprintCondition. It is recommended only to use one of the two. Tags: xml.sequenceOffset=29
postBuildV ariantCond ition	PostBuildVarian tCondition	*	aggr	This is the set of post build variant conditions which all shall be fulfilled in order to (postbuild) bind the variation point. Tags: xml.sequenceOffset=40
sdg	Sdg	0..1	aggr	An optional special data group is attached to every variation point. These data can be used by external software systems to attach application specific data. For example, a variant management system might add an identifier, an URL or a specific classifier. Tags: xml.sequenceOffset=50
shortLabel	Identifier	0..1	attr	This provides a name to the particular variation point to support the RTE generator. It is necessary for supporting splitable aggregations and if binding time is later than codeGenerationTime, as well as some RTE conditions. It needs to be unique within the enclosing Identifiables with the same ShortName. Tags: xml.sequenceOffset=10
swSyscon d	ConditionByFor mula	0..1	aggr	This condition acts as Binding Function for the VariationPoint. Note that the mulitplicity is 0..1 in order to support pure postBuild variants. Tags: xml.sequenceOffset=30

Table 4.11: VariationPoint

[TPS_STDT_00030] Blueprint of `VariationPoint` ⌈ A blueprint may contain `VariationPoint` with `vh.latestBindingTime` set to `blueprintDerivationTime`. These are considered as kind of blueprint of variation points which shall be handled when deriving objects. The following options apply for the container of the `VariationPoint` according to the information provided in `VariationPoint.blueprintCondition`:

- is resolved manually when deriving objects.

- is resolved by a module generator. The resolver approach is not formalized but hard coded in the module generator. Note that in this case it is also likely that multiple objects are created by the module generator. This shall also be noted in the `blueprintCondition`.

- is converted to a subsequent VariationPoint

⌋*(RS_STDT_00020)*

[TPS_STDT_00044] Transferring `VariationPoint` ⌈ Unless specified explicitly otherwise, `VariationPoint`s with `vh.latestBindingTime` **not** set to `BlueprintDerivationTime` should be transferred to the derived objects (see also [TPS_STDT_00087]). Thereby the `shortLabel` of the `VariationPoint` may be adapted according to the description in the `blueprintCondition`. ⌋ *(RS_STDT_00020)*

[constr_2556] No Blueprint Motivated `VariationPoint`s in AUTOSAR Descriptions ⌈ AUTOSAR descriptions which are not blueprints shall not have `blueprintCondition` nor `blueprintValue`. ⌋*()*

[constr_2569] Purely Bluprint Motivated `VariationPoint`s ⌈ `VariationPoint`s with `vh.latestBindingTime` set to `blueprintDerivationTime` shall have only `blueprintCondition` respectively `blueprintValue`. ⌋*()*

[TPS_STDT_00045] Transferring Objects in General ⌈ Objects resp. references without `VariationPoint` shall be transferred to the derived objects. Thereby the `namePattern`s of the referenced Blueprints also apply for rewriting the shortName path in the reference. ⌋*(RS_STDT_00020)*

For more details about `VariationPoint` refer to [7], as all constraints are summarized there.

[TPS_STDT_00046] Configuration dependent properties ⌈ Some data types specify configuration-dependent properties like limits, base types etc.

This is supported by an additional attribute `blueprintValue` in the `AttributeValueVariationPoint`. This attribute correlates to `blueprintCondition` in `VariationPoint`. ⌋*(RS_STDT_00020)*

An example for [TPS_STDT_00046] is:

```
NvM_BlockIdType Range:  0..2\^(16- NvMDatasetSelectionBits)-1
Dem_RatioIdType Type: uint8, uint16
```
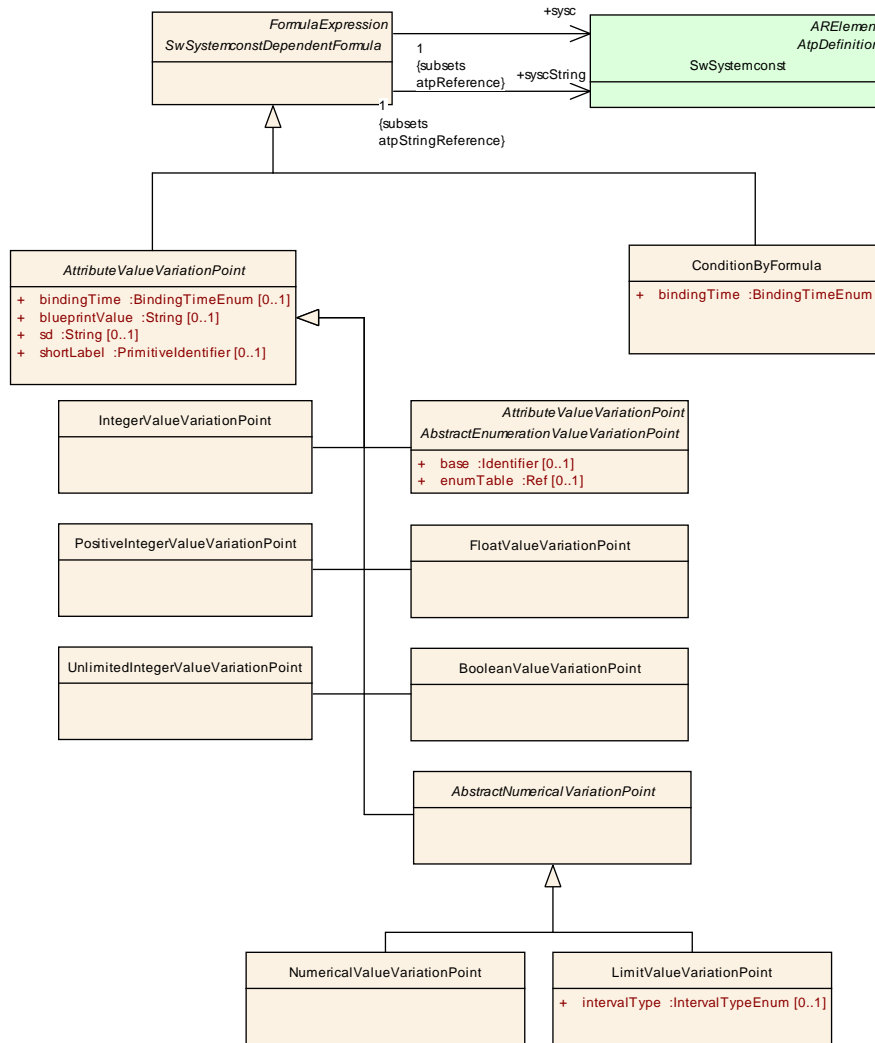
Figure 4.8: Attribute Value Variation Point

Class	≪`atpMixedString`≫ **AttributeValueVariationPoint (abstract)**			
Package	M2::AUTOSARTemplates::GenericStructure::VariantHandling::AttributeValueVariation Points			
Note	This class represents the ability to derive the value of the Attribute from a system constant (by SwSystemconstDependentFormula). It also provides a bindingTime.			
Base	ARObject, FormulaExpression, SwSystemconstDependentFormula			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
bindingTim e	BindingTimeEn um	0..1	attr	This is the binding time in which the attribute value needs to be bound. If this attribute is missing, the attribute is not a variation point. In particular this means that It needs to be a single value according to the type specified in the pure model. It is an error if it is still a formula. **Tags:** xml.attribute=true

Attribute	Type	Mul.	Kind	Note
blueprintValue	String	0..1	attr	This represents a description that documents how the value shall be defined when deriving objects from the blueprint. **Tags:** xml.attribute=true
sd	String	0..1	attr	This special data is provided to allow synchronization of Attribute value variation points with variant management systems. The usage is subject of agreement between the involved parties. **Tags:** xml.attribute=true
shortLabel	PrimitiveIdentifier	0..1	attr	This allows to identify the variation point. It is also intended to allow RTE support for CompileTime Variation points. **Tags:** xml.attribute=true

Table 4.12: AttributeValueVariationPoint

4.4 Applicable patterns to define names when deriving objects from blueprints

[TPS_STDT_00003] Applying **namePattern** ⌈ When deriving an element from a blueprint it is often the case that a particular pattern shall be used to determine the shortName respectively the symbol of the object. This use case is supported by the attribute namePattern in Identifier resp. CIdentifier. ⌋(RS_STDT_00004, RS_STDT_00008, RS_STDT_00019, RS_STDT_00021)

Primitive	Identifier
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::PrimitiveTypes
Note	An Identifier is a string with a number of constraints on its appearance, satisfying the requirements typical programming languages define for their Identifiers. This datatype represents a string, that can be used as a c-Identifier. It shall start with a letter, may consist of letters, digits and underscores. **Tags:** xml.xsd.customType=IDENTIFIER; xml.xsd.maxLength=128; xml.xsd.pattern=[a-zA-Z][a-zA-Z0-9_]*; xml.xsd.type=string
Attribute	**Datatype** **Mul.** **Kind** **Note**

Attribute	Datatype	Mul.	Kind	Note
namePatte rn	String	0..1	attr	This attribute represents a pattern which shall be used to define the value of the identifier if the identifier in question is part of a blueprint. For more details refer to TPS_StandardizationTemplate. **Tags:** xml.attribute=true

Table 4.13: Identifier

Primitive	CIdentifier			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Primitive Types			
Note	This datatype represents a string, that follows the rules of C-identifiers. **Tags:** xml.xsd.customType=C-IDENTIFIER; xml.xsd.pattern=[a-zA-Z_][a-zA-Z0-9_]*; xml.xsd.type=string			
Attribute	**Datatype**	**Mul.**	**Kind**	**Note**
namePatte rn	String	0..1	attr	This attribute represents a pattern which shall be used to define the value of the identifier if the CIdentifier in question is part of a blueprint. For more details refer to TPS_StandardizationTemplate. **Tags:** xml.attribute=true

Table 4.14: CIdentifier

[TPS_STDT_00055] General Syntax for Name Patterns ⌈ The name pattern uses the syntax described in Listing 4.8 defined according to ANTLR [9]. ⌋(*RS_STDT_00004*)

Listing 4.8: Grammar for name pattern

```
grammar NamePattern;

options { language = Ruby;
          output = AST; }

namePattern
        : (fixedName | placeholder | separator)+ ;

subPattern
  : '('  (fixedName | placeholder | separator )+  ')' ('?' | '*' | '+')? ;

placeholder  : '{'
                ('anyName' |
                 'anyNamePart' |
                 'blueprintName' |
                 'capitalizedCallbackName' |
                 'capitalizedMip' |
                 'codePeriode' |
```

```
                    'componentName' |
                    'componentTypeName' |
                    'componentPrototypeName' |
                    'ecucValue' '(' ecucName ')' |
                    'index' |
                    'initPolicy' |
                    'keyword' '(' kwClass ')' |
                    'Mip' |
                    'modeName' |
                    'nameSpace' |
                    'portDir' |
                    'typeId'  |
                    subPattern
                  )
              '}' ;

fixedName :  MyName;

kwClass :    MyName;

separator
  :    Separator ;

pathSeparator
        : PathSeparator ;

ecucName:    ( anyNamePart | pathSeparator)+;

anyNamePart :   MyName (separator MyName)*;

MyName     :   ( 'a'..'z' | ('A'..'Z') | ('0'..'9') | '-' )*;


Separator :  '_' ;

PathSeparator : '/' ;
```

Example 4.1 illustrates valid name patterns. Note that {blueprintName} etc. denotes a placeholder.

Example 4.1

```
{blueprintName}_{anyName}

{portDir}_{blueprintName}_{keyword(Qualifier)}_{componentName}_{index}
  --> example for a match:  R_EngN_Max_Dem_3

{componentName}_{ecucValue(item1)}

h_b_{(a_{index}_b_{componentName}_{(x_{ecucValue(hugo)})*})*}
```

The semantics of the placeholder is defined as follows:

anyName This represents a string which is valid `shortName` according to `Identifier`

anyNamePart This represents a string [a-zA-Z0-9_]* which is valid part of a `shortName`.

> Hint: The place holder "anyNamePart" shall not be used at the beginning of a `shortName` pattern to avoid invalid `shortName`s.

blueprintName This represents the `shortName` / `shortLabel` / `symbol` of the applied blueprint

capitalizedCallbackName This represents the name of the callback function including module prefix, but written in upper case.

capitalizedMip This represents the capitalized module implementation prefix according to [SWS_BSW_00102]. All characters are converted to uppercase.

codePeriode This represents the period time value and unit. Units are: US micro seconds, MS milli seconds, S second. For example: 100US, 10MS, 1S.

componentName This represents the `shortName` of the BSW module resp. ASW SwComponentType / ASW component prototype related to the derived object. "Related" mainly could be both, aggregating or referencing.

> **[TPS_STDT_00036] Placeholder for Module / Component** ⌈ The placeholder `componentName` in particular supports multiple derivation of a `PortPrototypeBlueprint` in the context of different software component types resp. modules. ⌋*(RS_STDT_00021)*

componentTypeName This represents the `shortName` of the dedicated `SwComponentType`.

componentPrototypeName This represents the `shortName` of the dedicated `SwComponentPrototype`.

ecucValue [TPS_STDT_00040] Influence of ECUC ⌈ This indicates an influence of the ECU configuration. This placeholder takes an argument which is intended as a keyword reflecting the kind of influence. More details shall be specified in the `blueprintCondition` where the argument mentioned before can be taken for reference. ⌋*(RS_STDT_00002, RS_STDT_00010)*

index This represents a numerical index applicable for example to arrays.

initPolicy This represents the initialization policy of variables according to `SectionInitializationPolicyType` where the dashes are replaced by underscores, e.g. NO_INIT, CLEARED, POWER_ON_CLEARED, INIT, POWER_ON_INIT.

keyword [TPS_STDT_00004] Abbreviated Name ⌈ This represents the `abbrName` of a keyword acting as a name part of the short name. The eligible keywords can be classified (using the argument `kwClass`). This classification shall match

with one of the `classification` of the applied keyword. ⌋*(RS_STDT_00005, RS_STDT_00042)*

Mip This represents the module implementation prefix according to [SWS_BSW_00102].

modeName This represents the shortName of the mode e.g. `Dcm_{modeName}ModeEntry`

portDir This represents the direction of a port.

> **[TPS_STDT_00037] Port Direction** ⌈ The placeholder `portDir` in particular supports the case that the same blueprint is used for P-Port as well as for an R-Port. The values represented by this placeholder is `P` for P-Port respectively `R` for R-Port. ⌋*(RS_STDT_00021)*

typeId This represents an indicator based on the type of the object.

4.5 Applicable patterns to define blueprints expressions when deriving objects from blueprints

[TPS_STDT_00006] Applying Expression Pattern ⌈ When deriving an element from a blueprint it is often the case that a particular pattern shall be used to determine the value and or the condition of the object. This use case is supported by the attribute `blueprintValue` resp. `blueprintCondition`. ⌋*(RS_STDT_00019)*

[TPS_STDT_00010] General Syntax for Expression Patterns ⌈ The expression pattern uses the syntax of the Formula Language as defined in [TPS_GST_00012]. ⌋ *(RS_STDT_00019)*

[TPS_STDT_00021] Specialization of `BlueprintFormula` ⌈ These specialization(s) express the extension of the Formula Language to provide formalized `blueprintValue` resp. `blueprintCondition`:

- ecuc: queries to the values described for ECUC-DEFINITION-ELEMENT. Depending on the ECUC-DEFINITION-ELEMENT a value or a string or an object is the result, see [TPS_GST_00094]

- sysc: queries to the values assigned to SW-SYSTEMCONST

- syscString: indicates that the referenced system constant shall be evaluated as a string according to [TPS_SWCT_01431]

- <VERBATIM>: defines the ability to specify non formula parts

- ->: Reference Operator; a -> b the value of object 'b' as specified in [TPS_GST_00094] which is pointed to by 'a'

⌋*(RS_STDT_00019)*
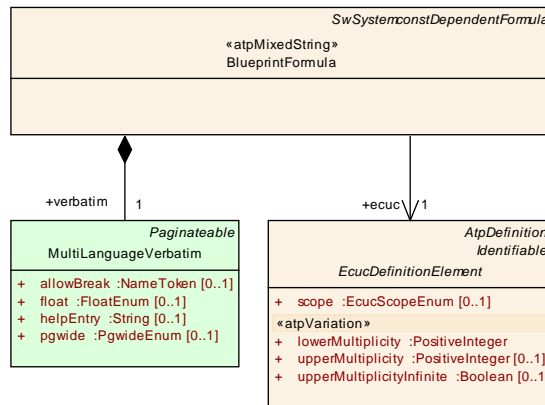
Figure 4.9: Blueprint Formula

Listing 4.9 illustrates valid expression patterns. Note that blueprintValue, blueprintCondition etc. denotes a placeholder.

```
{blueprintCondition}:
blueprintCondition = <ECUC-REF DEST="ECUC-ENUMERATION-PARAM-DEF">
                     NvM/NvMCommon/NvMApiConfigClass
                     </ECUC-REF>
```

Listing 4.9: Blueprint Formula taken from AUTOSAR_MOD_BSWServiceInterfaces_Blueprint.arxml

```
<FORMAL-BLUEPRINT-CONDITION>
  (<ECUC-REF DEST="ECUC-ENUMERATION-PARAM-DEF">/AUTOSAR/EcucDefs/NvM/
    NvMCommon/NvMApiConfigClass</ECUC-REF>== "NVM_API_CONFIG_CLASS_2")
  ||
  (<ECUC-REF DEST="ECUC-ENUMERATION-PARAM-DEF">/AUTOSAR/EcucDefs/NvM/
    NvMCommon/NvMApiConfigClass</ECUC-REF>== "NVM_API_CONFIG_CLASS_3")
  &amp;&amp;
  <VERBATIM>
    <L-5 L="EN" xml:space="preserve">only permanent RAM block or explicit
        synchronization is used</L-5>
  </VERBATIM>
</FORMAL-BLUEPRINT-CONDITION>
```

In listing 4.10 the use of the Reference Operator is illustrated. The Reference Operator is inserted as a XML entity.

Listing 4.10: Use of Reference Operator

```
<VARIATION-POINT>
  <FORMAL-BLUEPRINT-CONDITION>
    (<ECUC-REF DEST="ECUC-ENUMERATION-PARAM-DEF">/AUTOSAR/EcucDefs/Dcm/
      DcmConfigSet/DcmDsp/DcmDspData/DcmDspDataUsePort</ECUC-REF> ==
      USE_DATA_SYNCH_CLIENT_SERVER) &amp;&amp;
    (<ECUC-REF DEST="ECUC-REFERENCE-DEF">/AUTOSAR/EcucDefs/Dcm/DcmConfigSet
      /DcmDsp/DcmDspData/DcmDspDataInfoRef</ECUC-REF>-&gt;<ECUC-REF DEST=
      "ECUC-BOOLEAN-PARAM-DEF">/AUTOSAR/EcucDefs/Dcm/DcmConfigSet/DcmDsp/
      DcmDspDataInfo/DcmDspDataFixedLength</ECUC-REF> == false)
  </FORMAL-BLUEPRINT-CONDITION>
</VARIATION-POINT>
```

4.6 Ecu Configuration Parameters and Blueprints

[TPS_STDT_00025] Deriving VSMD from STMD Uses its own Mechanism ⌈ Basically the Standard Module Definitions (STMD) specified by AUTOSAR according to [10] could also be considered as blueprints. On the other hand, the relationship between vendor specific module definitions (VSMD) is a very strict one and was there before the general concept of Blueprints was introduced. Therefore for sake of compatibility this relationship is still maintained using `refinedModuleDef`.

Nevertheless for company specific applications there is some support for ECU configuration in Standardization Template.⌋*(RS_STDT_00022, RS_STDT_00010)*

See chapter 5.13 resp. chapter 5.14 for more details.

5 Blueprintables defined in AUTOSAR Meta Model

The following sub chapters specify the particular model elements for which blueprints are supported.

5.1 Blueprinting AccessControl

[TPS_STDT_00062] Blueprinting Elements of AccessControl ⌈ `AclObjectSet`, `AclOperation`, `AclPermission`, `AclRole` can be blueprinted. ⌋ *(RS_STDT_00032)*

5.2 Blueprinting AliasNameSet

[TPS_STDT_00011] Blueprinting `AliasNameSet` ⌈ `AliasNameSet` can be blueprinted. ⌋*(RS_STDT_00023)*

5.3 Blueprinting ApplicationDataType

[TPS_STDT_00023] Blueprinting `ApplicationDataType` ⌈ `ApplicationDataType` can be blueprinted. ⌋*(RS_STDT_00028, RS_STDT_00029)*

5.4 Blueprinting ARPackage

[TPS_STDT_00013] Blueprinting `ARPackage` ⌈ `ARPackage` can be blueprinted. Main use case is to support predefined package structures, e.g. those specified in [7]. ⌋*(RS_STDT_00013, RS_STDT_00030)*

5.5 Blueprinting BswModuleDescription

[TPS_STDT_00027] Blueprinting `BswModuleDescription` ⌈ `BswModuleDescription` can be blueprinted. ⌋*(RS_STDT_00001)*

Blueprints for `BswModuleDescription` are used in particular to describe dependencies to other modules. Note that in this case all references to other modules and module entries are targeting blueprints of the intended module. These references need to be replaced when deriving objects from the blueprint of `BswModuleDescription`.

A blueprint of `BswModuleDescription` shall specify the references to the standard- or blueprint- API elements, in particular

- `BswModuleDescription`.`implementedEntry`

- `BswModuleDescription`.`expectedEntry`

Nevertheless, it is allowed that derived `BswModuleDescription` adds further ones of these references.

Furthermore, optional elements like callbacks often come in 0..* multiplicity. In this case, the blueprint should specify one callback reference (to one blueprint BswModuleEntry) and express the open multiplicity in its `namePattern` respectively in the `VariationPoint`.`blueprintCondition` as illustrated in Figure 5.1.
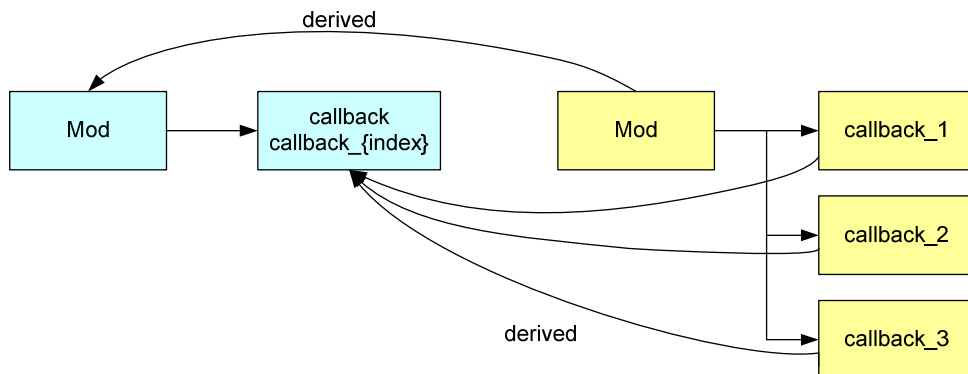
Figure 5.1: Multiply derived Objects

[constr_2563] `BswModuleDescription` **blueprints should not have a** `BswInternalBehavior` ⌈ A `BswModuleDescription` blueprint should not have a `BswInternalBehavior` since this is a matter of implementation and not subject to standardization. Exceptions might exist in vendor internal applications. ⌋*()*

5.6 Blueprinting BswModuleEntry

[TPS_STDT_00014] Blueprinting `BswModuleEntry` ⌈ `BswModuleEntry` can be blueprinted. ⌋*(RS_STDT_00002, RS_STDT_00018, RS_STDT_00029)*

The meta-class `BswModuleEntry` and its composites (`SwServiceArg`) contain optional as well as mandatory elements which are never or only sometimes standardized, e.g. executionContext, swServiceImplPolicy, parts of SwServiceArg.swDataDefProps. Nevertheless Standardization Template does not explicitly specify constraint which attributes shall, may or shall not be defined in the blueprint (see also [TPS_STDT_00049]).

5.7 Blueprinting BswEntryRelationshipSet

[TPS_STDT_00090] Blueprinting `BswEntryRelationshipSet` ⌈ `BswEntryRelationshipSet` can be blueprinted. ⌋(*RS_STDT_00002, RS_STDT_00018, RS_STDT_00029*)

[TPS_STDT_00091] Blueprinting `BswEntryRelationshipSet` ⌈ The `BswEntryRelationshipSet` describes a collection of `BswEntryRelationship`s. A `BswEntryRelationship` describes a relationship between two `BswModuleEntry`s and the type of relationship. This is typically used to express that a concrete `BswModuleEntry` is derived from an abstract `BswModuleEntry`. In this case the `bswEntryRelationshipType` is set to `derivedFrom`, the `BswEntryRelationship.from` references the abstract `BswModuleEntry` and the `BswEntryRelationship.to` references the concrete `BswModuleEntry`. ⌋(*RS_STDT_00002, RS_STDT_00018*)
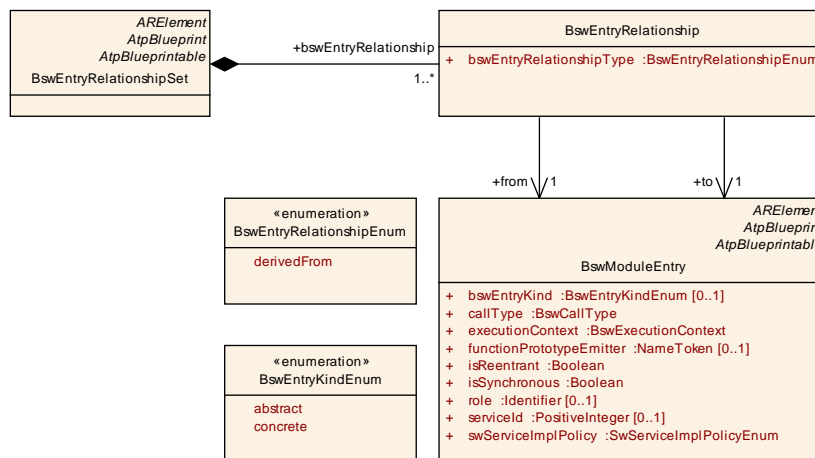
Figure 5.2: BswEntryRelationshipSet

Class	BswEntryRelationshipSet
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswInterfaces
Note	Describes a set of relationships between two BswModuleEntrys. **Tags:** atp.recommendedPackage=BswEntryRelationshipSets
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable
Attribute	*Type*	*Mul.*	*Kind*	*Note*

Attribute	Type	Mul.	Kind	Note
bswEntryRelationship	BswEntryRelationship	1..*	aggr	Relationship between two BswModuleEntrys.

Table 5.1: BswEntryRelationshipSet

Class	BswEntryRelationship			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswInterfaces			
Note	Describes a relationship between two BswModuleEntrys and the type of relationship.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
bswEntryRelationshipType	BswEntryRelationshipEnum	1	attr	Denotes the type of the relationship. **Tags:** xml.sequenceOffset=5
from	BswModuleEntry	1	ref	Type of relationship that refers to the abstract BswModuleEntry. Please notice that in this case the bswEntryRelationshipType shall be set to drivedFrom.
to	BswModuleEntry	1	ref	Type of relationship that refers to the concrete BswModuleEntry

Table 5.2: BswEntryRelationship

Enumeration	BswEntryRelationshipEnum
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswInterfaces
Note	
Literal	Description
derivedFrom	Describes that the BswModuleEntry referenced as "to" needs to have the same signature as the "abstract" BswModuleEntry referenced as "from". **Tags:** atp.EnumerationValue=0

Table 5.3: BswEntryRelationshipEnum

5.8 Blueprinting BuildActionManifest

[TPS_STDT_00063] Blueprinting `BuildActionManifest` ⌈ `BuildActionManifest` can be blueprinted. [TPS_STDT_00065] applies such that blueprints of `BuildAction` and `BuildActionEnvironment`s are aggregated in a blueprint of `BuildActionManifest`. ⌋*(RS_STDT_00033)*

5.9 Blueprinting CompuMethod

[TPS_STDT_00015] Blueprinting `CompuMethod` ⌈ `CompuMethod` can be blueprinted. ⌋*(RS_STDT_00029)*

Sometimes it is required to extend a standardized enumeration with vendor specific elements.

For example [SWS_RamTst_00192] states: If vendor specific algorithms were defined the enumeration fields of RamTst_AlgorithmType should be extended accordingly.

[TPS_STDT_00049] Blueprinting Enumerators ⌈ Extensions of enumerator values shall be expressed in the blueprint of the related `CompuMethod` by the `Variation-Point` at `CompuScale`. ⌋(*RS_STDT_00002*, *RS_STDT_00029*)
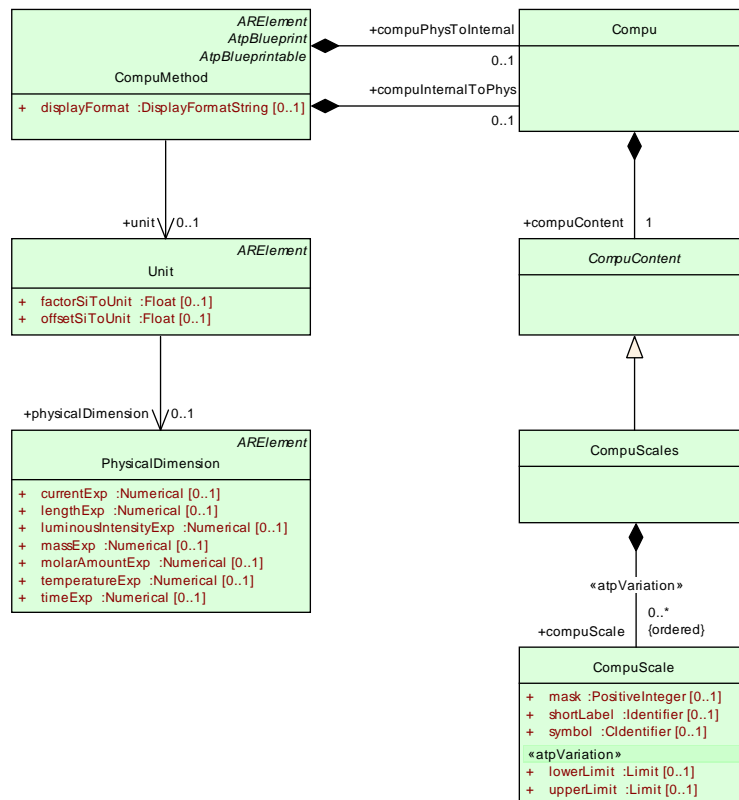
Figure 5.3: A **`CompuMethod`** and its attributes define data semantics

5.10 Blueprinting ConsistencyNeeds

[TPS_STDT_00071] Blueprinting `ConsistencyNeeds` ⌈ `ConsistencyNeeds` can be blueprinted. But as it is not derived from `ARElement`, all such blueprints are aggregated by `ConsistencyNeedsBlueprintSet`. This allows to apply [TPS_STDT_00072]. ⌋(*RS_STDT_00034*)
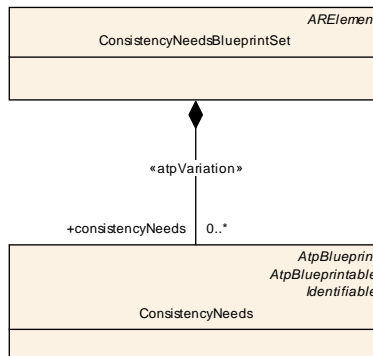
Figure 5.4: Blueprinting `ConsistencyNeeds`
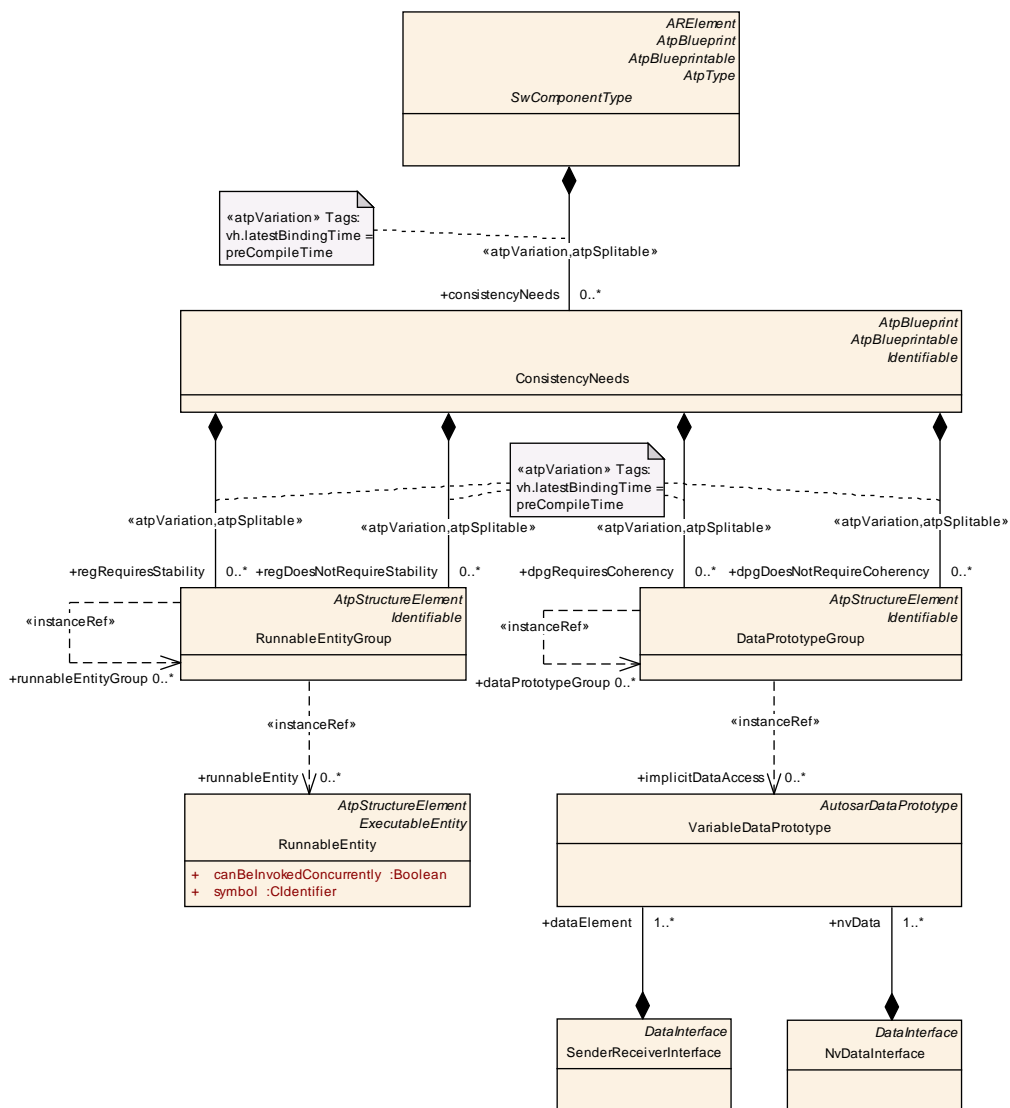
Figure 5.5: `ConsistencyNeeds`

[TPS_STDT_00073] Early definition of ConsistencyNeeds ⌈ Grouping of Data shall be possible before the `RunnableEntity`s with all the details (data access points) are known. In a top down approach the grouping of DataPrototypes can already be used

to design the system in a way that consistency properties are guaranteed and that consistency is not required for unrelated DataPrototypes.

Therefore the `DataPrototypeGroup` in a `ConsistencyNeeds` (Blueprint) can reference `VariableDataPrototype`s of `PortInterface`s without any further context information. ⌟*(RS_STDT_00034)*

[TPS_STDT_00074] Categorization of Blueprints of `ConsistencyNeeds` ⌈ Since a `ConsistencyNeeds`(Blueprint) can be designed before the software component is known in all details it is required to denote the purpose of the `DataPrototypeGroup` and the `RunnableEntityGroup` of a `ConsistencyNeeds`(Blueprint). Therefore a set of `category` values is predefined which supports the "abstract" blueprinting of `ConsistencyNeeds`. ⌟*(RS_STDT_00034)*

[TPS_STDT_00075] Categories for `DataPrototypeGroup` in a Blueprint of `ConsistencyNeeds` ⌈

ALL_PROVIDE_DATA_OF_COMPONENT `DataPrototypeGroup` of the `ConsistencyNeeds` shall contain all `VariableDataPrototype`s instantiated in provide ports of the software component.

ALL_REQUIRE_DATA_OF_COMPONENT `DataPrototypeGroup` of the `ConsistencyNeeds` shall contain all `VariableDataPrototype`s instantiated in require ports of the software component.

ALL_PROVIDE_AND_REQUIRE_DATA_OF_COMPONENT `DataPrototypeGroup` of the `ConsistencyNeeds` shall contain all `VariableDataPrototype`s instantiated in provide and require ports of the software component.

ALL_PROVIDE_DATA_OF_RUNNABLE_GROUP `DataPrototypeGroup` of the `ConsistencyNeeds` shall contain all `VariableDataPrototype`s where any `RunnableEntity` in the attached RunnableEntityGroup has a implicit write access to it.

ALL_REQUIRE_DATA_OF_RUNNABLE_GROUP `DataPrototypeGroup` of the `ConsistencyNeeds` shall contain all `VariableDataPrototype`s where any `RunnableEntity` in the attached RunnableEntityGroup has a implicit read access to it.

ALL_PROVIDE_AND_REQUIRE_PORTS_OF_RUNNABLE_GROUP `DataPrototypeGroup` of the `ConsistencyNeeds` shall contain all `VariableDataPrototype`s where any `RunnableEntity` in the attached RunnableEntityGroup has a implicit write or read access to it.

EXPLICIT_DATA_PROTOTYPE_GROUP `DataPrototypeGroup` of the `ConsistencyNeeds` shall contain `VariableDataPrototype`s according functional requirements

⌟*(RS_STDT_00034)*

[TPS_STDT_00076] Categories for `RunnableEntityGroup` in a Blueprint of `ConsistencyNeeds` ⌈

ALL_RUNNABLES_OF_COMPONENT `RunnableEntityGroup` of the `Consisten-cyNeeds` shall contain all `RunnableEntity`s of the software component.

ALL_RUNNABLES_WRITING_TO_DATA_PROTOTYP_GROUP `RunnableEntityGroup` of the `ConsistencyNeeds` shall contain all `RunnableEntity`s with a implicit write access to any of the `VariableDataPrototype`s in the attached `DataPrototypeGroup`.

ALL_RUNNABLES_READING_FROM_DATA_PROTOTYPE_GROUP `RunnableEntityGroup` of the `ConsistencyNeeds` shall contain all `RunnableEntity`s with a implicit read access to any of the `VariableDataPrototype`s in the attached `DataPrototypeGroup`.

ALL_RUNNABLES_WRITING_TO_OR_READING_FROM_DATA_PROTOTYPE_GROUP RunnableEntityGroup of the ConsistencyNeed shall contain all `RunnableEntity`s with a implicit write or read access to any of the `VariableDataPrototype`s in the attached `DataPrototypeGroup`.

EXPLICIT_RUNNABLE_ENTITY_GROUP `RunnableEntityGroup` of the `ConsistencyNeeds` shall contain `RunnableEntity`s according functional requirements

⌋*(RS_STDT_00034)*

5.11 Blueprinting DataConstr

[TPS_STDT_00016] Blueprinting `DataConstr` ⌈ `DataConstr` can be blueprinted. ⌋ *(RS_STDT_00029)*

5.12 Blueprinting DataTypeMappingSet

[TPS_STDT_00017] Blueprinting `DataTypeMappingSet` ⌈ `DataTypeMappingSet` can be blueprinted. ⌋*(RS_STDT_00029)*

5.13 Blueprinting EcucDefinitionCollection

[TPS_STDT_00018] Blueprinting `EcucDefinitionCollection` ⌈ `EcucDefinitionCollection` can be blueprinted. ⌋*(RS_STDT_00029)*

5.14 Blueprinting EcucModuleDef

[TPS_STDT_00019] Blueprinting `EcucModuleDef` ⌈ `EcucModuleDef` can be blueprinted. ⌋*(RS_STDT_00029)*

Note that this is intended for company internal use. Please refer to chapter 4.6.

5.15 Blueprinting FlatMap

[TPS_STDT_00035] Blueprinting `FlatMap` ⌈ `FlatMap` can be blueprinted. ⌋ *(RS_STDT_00029)*

Usecase for blueprints of `FlatMap` is given in [11].

5.16 Blueprinting ImplementationDataType

[TPS_STDT_00020] Blueprinting `ImplementationDataType` ⌈ `ImplementationDataType` can be blueprinted. ⌋*(RS_STDT_00029)*

5.17 Blueprinting KeywordSet

[TPS_STDT_00077] Blueprinting `KeywordSet` ⌈ `KeywordSet` can be blueprinted. The following derivation rules apply:

- No keywords may be removed from or added to the `KeywordSet`
- The `shortName` of `Keyword` shall not be changed or extended
- [TPS_STDT_00085] applies except that `longName` of `Keyword` shall not be changed, but it is allowed to add representations in further languages.
- The `abbrName` shall not be changed or extended(AbbrName)
- The `classification` of a `Keyword` shall not be changed but it is allowed to provide additional `classification`.

⌋*(RS_STDT_00035)*

5.18 Blueprinting LifeCycleStateDefinitionGroups and LifeCycleStates

[TPS_STDT_00043] Blueprinting `LifeCycleStateDefinitionGroup` ⌈ `LifeCycleStateDefinitionGroup` and `LifeCycleState` can be blueprinted. [TPS_STDT_00065] applies such that blueprints of `LifeCycleState` are aggregated in a blueprint of `LifeCycleStateDefinitionGroup`. ⌋*(RS_STDT_00025)*

5.19 Blueprinting ModeDeclarationGroup

[TPS_STDT_00031] Blueprinting `ModeDeclarationGroup` ⌈ `ModeDeclarationGroup` can be blueprinted. ⌋*(RS_STDT_00024)*

5.20 Blueprinting PortPrototype

One of the major activities of the AUTOSAR initiative is the standardization of application interfaces. That is, in terms of the AUTOSAR meta-model the standardization mainly applies to the definition of `PortPrototype`s for specific purposes.

Due to the structure of the AUTOSAR meta-model it is not possible to merely express a standardized `PortPrototype` because for good reasons the latter does not exist on its own but is always owned by a `SwComponentType`.

Therefore, in the past the standardization of "application interfaces" involuntarily also involved the creation of `SwComponentType`s. This unnecessary complexity can be overcome by the usage of a `PortPrototypeBlueprint`.

[TPS_STDT_00007] Blueprinting `PortPrototype` ⌈ `PortPrototype` can be blueprinted by the specific meta class `PortPrototypeBlueprint`. ⌋ *(RS_STDT_00003)*

Figure 5.6: Mapping of Port Prototype Blueprints
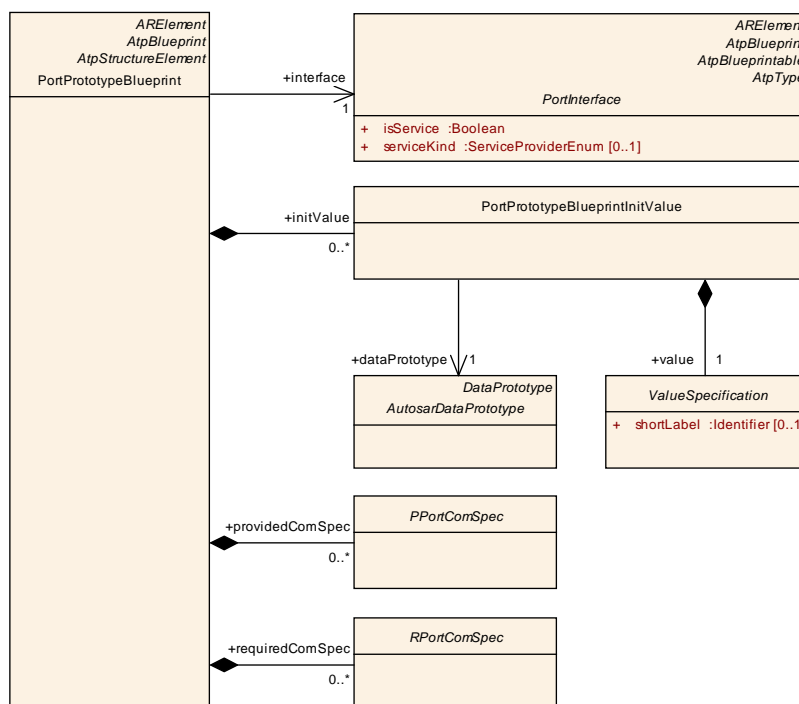
Figure 5.7: Blueprinting Port Prototype

A `PortPrototypeBlueprint` has the following characteristics:

- It is an `ARElement` and does therefore not require any element other than an `ARPackage` as context. It is therefore not necessary to involve "auxiliary" model elements into the definition of a standardized "application interface" for the mere purpose of conforming to the AUTOSAR meta-model.

- It acts as a "blueprint" for the creation of `PortPrototype`s. That is, probably supported by the used authoring tool, the user picks a specific `PortPrototypeBlueprint` and creates a `PortPrototype` out of it. The structure of the created `PortPrototype` is indistinguishable from a `PortPrototype` created without taking a `PortPrototypeBlueprint` as a blueprint. An `PortPrototypeBlueprint` can be taken as the blueprint for as many `PortPrototype`s as required.

- It is possible to define additional attributes that are taken over to the created `PortPrototype`. For example, in some cases the definition of an initial value[1] is part of the definition of a standardized "application interface". Therefore, `PortPrototypeBlueprint` also supports the definition of an `initValue`, which needs to be moved to the appropriate `ComSpec`s.

- It has a reference to the corresponding `PortInterface`. If the referenced `PortInterface` is not a blueprint, it can directly be taken over by the `PortPrototype` created out of the `PortPrototypeBlueprint` such that the new `PortPrototype` references the `PortInterface`. If the referenced `PortIn-`

---

[1]AUTOSAR does not standardize init values for application interfaces, but it is supported for vendor internal use.

`terface` is a blueprint, it is necessary to derive a `PortInterface` and reference this in the `PortPrototype`.

- It does not make any assumptions whether the `PortPrototype` created out of it will be a `PPortPrototype` or an `RPortPrototype`.

- It can basically be used for all kinds of `PortInterface`s, i.e. it is not constrained to e.g. `SenderReceiverInterface`s although this kind of `PortInterface` will most likely get a significant share of the usage of `PortPrototypeBlueprint`

- It can only be used for the standardization of "application interfaces". A `PortPrototypeBlueprint` does not play any role in the formal description of any `SwComponentType` or related model artifacts (see also [TPS_STDT_00044]).

[TPS_STDT_00061] `PortPrototypeBlueprint` can own both `RPortComSpec`s and `PPortComSpec`s ⌈ `PortPrototypeBlueprint` can own both `RPortComSpec`s and `PPortComSpec`s at the same time. The different ComSpecs are applicable for the derived `PPortPrototype`s, `RPortPrototype`s and `PRPortPrototype`s according the given communication direction. The [constr_1043] (PortInterface vs. ComSpec) in Software Component Template ([1]) is also applicable in this context. ⌋ *(RS_STDT_00003)*

[TPS_STDT_00082] Multiple existence of initValue in the context of a `PortPrototypeBlueprint` ⌈ If an initValue exists on the `NonqueuedReceiverComSpec` or at the `NonqueuedSenderComSpec` the `initValue`s at `PortPrototypeBlueprint` shall be ignored. ⌋ *(RS_STDT_00003)*

In this context [TPS_SWCT_01219] needs also be respected for a valid blueprint.

Listing 5.1: PortPrototypeBlueprint with ProvidedComSpecs

```xml
<PORT-PROTOTYPE-BLUEPRINT>
  <SHORT-NAME NAME-PATTERN="{anyName}">ALgtOnDoorAtFrntLe</SHORT-NAME>
  <LONG-NAME>
    <L-4 L="EN">Acceleration Longitudinal on Door at Front Left</L-4>
  </LONG-NAME>
  <DESC>
    <L-2 L="EN">Longitudinal high-g acceleration measured in front left
      door of vehicle (locking in driving direction)</L-2>
  </DESC>
  <INTERFACE-REF DEST="SENDER-RECEIVER-INTERFACE">/AUTOSAR/AISpecification
    /PortInterfaces_Blueprint/AExtForOccptPedSfty1</INTERFACE-REF>
  <PROVIDED-COM-SPECS>
    <NONQUEUED-SENDER-COM-SPEC>
      <NETWORK-REPRESENTATION>
        <SW-DATA-DEF-PROPS-VARIANTS>
          <SW-DATA-DEF-PROPS-CONDITIONAL>
            <BASE-TYPE-REF DEST="SW-BASE-TYPE">/AUTOSAR/Platform/
              BaseTypes_Blueprint/nineBitMsbFirst1c</BASE-TYPE-REF>
            <COMPU-METHOD-REF DEST="COMPU-METHOD">AccelerationOnBus</COMPU
              -METHOD-REF>
          </SW-DATA-DEF-PROPS-CONDITIONAL>
```

```
        </SW-DATA-DEF-PROPS-VARIANTS>
      </NETWORK-REPRESENTATION>
      <INIT-VALUE>
        <APPLICATION-VALUE-SPECIFICATION>
          <CATEGORY>VALUE</CATEGORY>
          <SW-VALUE-CONT>
            <SW-VALUES-PHYS>
              <V>42</V>
            </SW-VALUES-PHYS>
          </SW-VALUE-CONT>
        </APPLICATION-VALUE-SPECIFICATION>
      </INIT-VALUE>
    </NONQUEUED-SENDER-COM-SPEC>
  </PROVIDED-COM-SPECS>
</PORT-PROTOTYPE-BLUEPRINT>
```
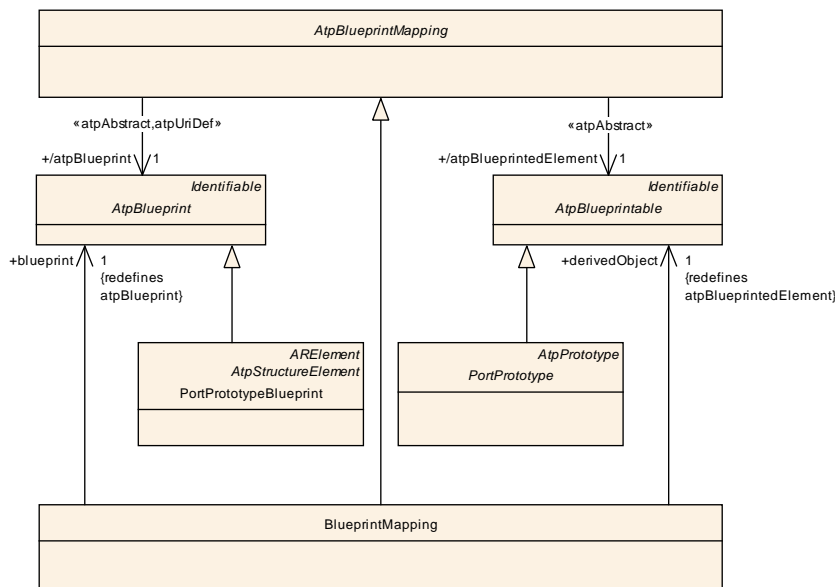
Class	PortPrototypeBlueprint			
Package	M2::AUTOSARTemplates::StandardizationTemplate::BlueprintDedicated::Port ProtoypeBlueprint			
Note	This meta-class represents the ability to express a blueprint of a PortPrototype by referring to a particular PortInterface. This blueprint can then be used as a guidance to create particular PortPrototypes which are defined according to this blueprint. By this it is possible to standardize application interfaces without the need to also standardize software-components with PortPrototypes typed by the standardized PortInterfaces. **Tags:** atp.recommendedPackage=PortPrototypeBlueprints			
Base	ARElement, ARObject, AtpBlueprint, AtpClassifier, AtpFeature, AtpStructureElement, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
initValue	PortPrototypeBlueprintInitValue	*	aggr	This specifies the init values for the dataElements in the particular PortPrototypeBlueprint.
interface	PortInterface	1	ref	This is the interface for which the blueprint is defined. It may be a blueprint itself or a standardized PortInterface
providedComSpec	PPortComSpec	*	aggr	Provided communication attributes per interface element (data element or operation).
requiredComSpec	RPortComSpec	*	aggr	Required communication attributes, one for each interface element.

Table 5.4: PortPrototypeBlueprint

Class	PortPrototypeBlueprintInitValue			
Package	M2::AUTOSARTemplates::StandardizationTemplate::BlueprintDedicated::Port ProtoypeBlueprint			
Note	This meta-class represents the ability to express init values in PortPrototypeBlueprints. These init values act as a kind of blueprint from which for example proper ComSpecs can be derived.			
Base	ARObject			
Attribute	**Type**	**Mul.**	**Kind**	**Note**

Attribute	Type	Mul.	Kind	Note
dataPrototype	AutosarDataPrototype	1	ref	This is the data prototype for which the init value applies **Tags:** xml.sequenceOffset=30
value	ValueSpecification	1	aggr	This is the init value for the particular data prototype. **Tags:** xml.sequenceOffset=40

Table 5.5: PortPrototypeBlueprintInitValue

As an AUTOSAR model taken for downstream model handling (e.g. generation of an RTE) requires the usage of complete `PortInterface`s it is necessary to derive an "actual" `PortInterface` out of a blueprinted `PortInterface` defined in the standardization process.

[TPS_STDT_00008] Compatibility of `PortPrototype` with Blueprint ⌈ [constr_2526], [constr_2527], [constr_2528] and [constr_2529] apply for the compatibility of `PortPrototype`s and `PortPrototypeBlueprint`s ⌋*(RS_STDT_00017)*

[constr_2526] `PortInterface` need to be compatible to the blueprints ⌈ `PortInterface` shall be compatible to their respective blueprints according to the compatibility rules. ⌋*()*

[constr_2527] Blueprints shall live in package of a proper category ⌈ As explained in detail in the [7], model artifacts (in this case `PortPrototypeBlueprint` and incompletely specified `PortInterface`s) created for the purpose of becoming blueprints shall reside in an `ARPackage` of category `BLUEPRINT`. ⌋*()*

[constr_2528] `PortPrototype`s shall not refer to blueprints of a `PortInterface` ⌈ A port `PortPrototype` shall not reference a `PortInterface` which lives in a package of category BLUEPRINT. ⌋*()*

[constr_2529] `PortPrototypeBlueprint`s and derived `PortPrototype`s shall reference proper `PortInterface`s ⌈ A `PortPrototypeBlueprint` may reference a blueprint of `PortInterface`. According to [constr_2570], a system description shall not contain blueprints. Therefore the reference to the `PortInterface` may need to be rewritten when a `PortPrototype` is derived from the blueprint.

In this case the `PortInterface` referenced by the derived `PortPrototype` shall be compatible to the `PortInterface` (which is a blueprint) referenced by the `PortPrototypeBlueprint`.

According to [constr_2526] this can be ensured if the `PortInterface` referenced by the `PortPrototypeBlueprint` is the blueprint of the `PortInterface` referenced by the respective `PortPrototype`. ⌋*()*

Note that [constr_2529] is obviously also fulfilled if the `PortPrototypeBlueprint` and the derived `PortPrototype` reference a STANDARD `PortInterface` (which lives in a `ARPackage` of `category` "STANDARD").

5.21 Blueprinting PortInterface

[TPS_STDT_00066] Blueprinting `PortInterface` ⌈ `PortInterface` can be blueprinted. ⌋*(RS_STDT_00026)*

[constr_2500] `PortInterface`s shall be of same kind ⌈ Both objects (`PortInterface`s) referenced by a blueprint mapping for port interfaces (represented by `BlueprintMapping`) shall be of the same kind (e.g. both shall be `SenderReceiverInterface`s). In other words both interfaces shall be instances of the same meta class. ⌋*()*

Note that [constr_2500] is a special case of [constr_2566].

5.22 Blueprinting PortInterfaceMapping and PortInterfaceMappingSet

[TPS_STDT_00009] Blueprinting `PortInterfaceMapping` and `PortInterfaceMappingSet` ⌈ `PortInterfaceMapping` can be blueprinted. [TPS_STDT_00065] applies such that the blueprints of `PortInterfaceMapping` are aggregated in a blueprint of `PortInterfaceMappingSet`. ⌋*(RS_STDT_00026)*

The intended use cases for blueprinting `PortInterfaceMapping` are illustrated by figure 5.8. This diagram shows an `PortInterface`(Blueprint) (*M*), and two ports typed by `PortInterface` (*S*) respectively by `PortInterface`(*R*). (*S*) and (*R*) are mapped to the blueprint (*M*) by a `PortInterfaceMapping`(Blueprint) (*SMMap* and *RMMap*). From this, it is possible to

1. derive `PortInterfaceMapping` (*SRMap*) between (*S* and *R*) which is then derived from two blueprints (*SMMap* and *RMMap*)

2. propose connectors between two components using the interfaces (*S* and *R*)
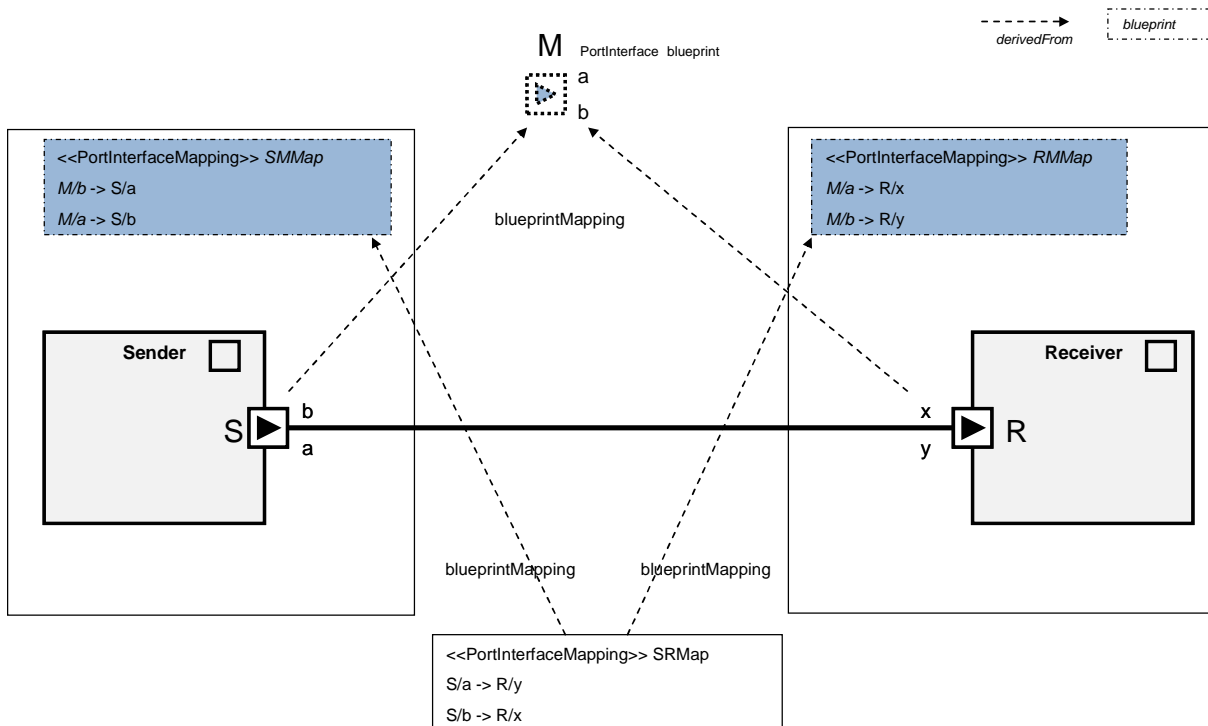
Figure 5.8: Deriving PortInterfaceMapping (1)

The intended derived objects can be determined according to the following steps:

1. find all `PortInterface`(blueprint)s within the `BlueprintMapping`s of `PortInterface`s containing *S* or *R* (in our example it would be *M*)

2. find all `PortInterfaceMapping`(Blueprint)s containing one of the `PortInterface`(Blueprint)s from step 1 and one of the `PortInterface`s *S* and *R* (in our example it would be *SMMap* and *RMMap*)

3. derive a non blueprint `PortInterfaceMapping` between *S* and R from the ones found in step 2. Note that all `PortInterfaceMapping`s found so far have a "blueprint reference" and a "non blueprint reference".

   Take one of the `PortInterfaceMapping`(Blueprint)s from step 2 and replace the "blueprint reference" by the corresponding "non blueprint reference" of the other `PortInterfaceMapping`(Blueprint)

   ```
   M/b (blueprint in SMMap) -> S/a  <->  M/b (blueprint in RMmap) -> R/y
   M/a (blueprint in SMMap) -> S/b  <->  M/a (blueprint in RMmap) -> R/x
   ```

   For example *M/b* would be substituted by *R/y* and *M/a* by *R/x* resulting in the final mapping (*S/a → R/y*, *S/b → R/x*).

   Same result is achieved if *M/b* would be substituted by *S/a* and *M/a* by *S/b* resulting in the final mapping (*S/a → R/y*, *S/b → R/x*).

   Implicit mappings (i.e. if data element names between `PortInterface` and `PortInterface`(blueprint) are identical then no `PortInterfaceMap-`

`ping`(blueprint) is needed) have to be considered too (for example by creating "temporary" mappings).

4. Create `BlueprintMapping`s for the created `PortInterfaceMapping` (*SRMap*) in step 3 to the involved `PortInterfaceMapping`(blueprints) (*SMMap* and *RMMap*).

The scenario is shown in the now following listings:

- Listing 5.2 shows the definitions e.g. given by AUTOSAR.

- Listing 5.3 shows the part of LeftCompany

- Listing 5.4 shows the part of RightCompany

- Listing 5.5 shows the part of the integration in a Project

Listing 5.2: Scenario for Blueprints of PortInterfaceMapping (1)

```xml
<AR-PACKAGE>
  <SHORT-NAME>AUTOSAR</SHORT-NAME>
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>PortInterfaces_Blueprint</SHORT-NAME>
      <CATEGORY>BLUEPRINT</CATEGORY>
      <ELEMENTS>
        <SENDER-RECEIVER-INTERFACE>
          <SHORT-NAME NAME-PATTERN="{anyName}">M</SHORT-NAME>
          <DATA-ELEMENTS>
            <VARIABLE-DATA-PROTOTYPE>
              <SHORT-NAME NAME-PATTERN="{anyName}">a</SHORT-NAME>
            </VARIABLE-DATA-PROTOTYPE>
            <VARIABLE-DATA-PROTOTYPE>
              <SHORT-NAME NAME-PATTERN="{anyName}">b</SHORT-NAME>
            </VARIABLE-DATA-PROTOTYPE>
          </DATA-ELEMENTS>
        </SENDER-RECEIVER-INTERFACE>
      </ELEMENTS>
    </AR-PACKAGE>
  </AR-PACKAGES>
</AR-PACKAGE>
```

Listing 5.3 shows that "LeftCompany" has created the `PortInterface` named *S* derived from the `PortInterface`(Blueprint) *M*. Thereby the description **how** this takes place is given in the blueprint of an appropriate `PortInterfaceMapping` named *SMMap*.

Listing 5.3: Scenario for Blueprints of PortInterfaceMapping (2)

```xml
<AR-PACKAGE>
  <SHORT-NAME>LeftCompany</SHORT-NAME>
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>PortInterfaces</SHORT-NAME>
      <ELEMENTS>
        <SENDER-RECEIVER-INTERFACE>
```

```
                    <SHORT-NAME>S</SHORT-NAME>
                    <DATA-ELEMENTS>
                      <VARIABLE-DATA-PROTOTYPE>
                        <SHORT-NAME>b</SHORT-NAME>
                      </VARIABLE-DATA-PROTOTYPE>
                      <VARIABLE-DATA-PROTOTYPE>
                        <SHORT-NAME>a</SHORT-NAME>
                      </VARIABLE-DATA-PROTOTYPE>
                    </DATA-ELEMENTS>
                  </SENDER-RECEIVER-INTERFACE>
                </ELEMENTS>
              </AR-PACKAGE>
              <AR-PACKAGE>
                <SHORT-NAME>BlueprintMappingSets</SHORT-NAME>
                <ELEMENTS>
                  <BLUEPRINT-MAPPING-SET>
                    <SHORT-NAME>S_isDerivedFrom_M</SHORT-NAME>
                    <DESC>
                      <L-2 L="EN">This states <E>that</E> S is derived from M</L
                        -2>
                    </DESC>
                    <BLUEPRINT-MAPS>
                      <BLUEPRINT-MAPPING>
                        <BLUEPRINT-REF DEST="PORT-INTERFACE">/AUTOSAR/
                          PortInterfaces_Blueprint/M</BLUEPRINT-REF>
                        <DERIVED-OBJECT-REF DEST="PORT-INTERFACE">/LeftCompany/
                          PortInterfaces/S</DERIVED-OBJECT-REF>
                      </BLUEPRINT-MAPPING>
                    </BLUEPRINT-MAPS>
                  </BLUEPRINT-MAPPING-SET>
                </ELEMENTS>
              </AR-PACKAGE>
              <AR-PACKAGE>
                <SHORT-NAME>PortInterfaceMappingSets_Blueprint</SHORT-NAME>
                <CATEGORY>BLUEPRINT</CATEGORY>
                <ELEMENTS>
                  <PORT-INTERFACE-MAPPING-SET>
                    <SHORT-NAME NAME-PATTERN="{anyName}">BP</SHORT-NAME>
                    <DESC>
                      <L-2 L="EN"></L-2>
                    </DESC>
                    <PORT-INTERFACE-MAPPINGS>
                      <VARIABLE-AND-PARAMETER-INTERFACE-MAPPING>
                        <SHORT-NAME NAME-PATTERN="{anyName}">SMMap</SHORT-NAME>
                        <DESC>
                          <L-2 L="EN">This defines <E>how</E> S is derived (and
                            therefore mapped to) from M</L-2>
                        </DESC>
                        <DATA-MAPPINGS>
                          <DATA-PROTOTYPE-MAPPING>
                            <FIRST-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                              PROTOTYPE">/AUTOSAR/PortInterfaces_Blueprint/M/a</
                              FIRST-DATA-PROTOTYPE-REF>
                            <SECOND-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                              PROTOTYPE">/LeftCompany/PortInterfaces/S/b</SECOND
                              -DATA-PROTOTYPE-REF>
```

```
        </DATA-PROTOTYPE-MAPPING>
        <DATA-PROTOTYPE-MAPPING>
          <FIRST-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
              PROTOTYPE">/AUTOSAR/PortInterfaces_Blueprint/M/b</
              FIRST-DATA-PROTOTYPE-REF>
          <SECOND-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
              PROTOTYPE">/LeftCompany/PortInterfaces/S/a</SECOND
              -DATA-PROTOTYPE-REF>
        </DATA-PROTOTYPE-MAPPING>
      </DATA-MAPPINGS>
    </VARIABLE-AND-PARAMETER-INTERFACE-MAPPING>
  </PORT-INTERFACE-MAPPINGS>
</PORT-INTERFACE-MAPPING-SET>
        </ELEMENTS>
      </AR-PACKAGE>
    </AR-PACKAGES>
  </AR-PACKAGE>
```

Listing 5.4 shows that "RightCompany" has crated the `PortInterface` named *R* derived from the `PortInterface`(Blueprint) *M*. Thereby the description **how** this takes place is given in the blueprint of an appropriate `PortInterfaceMapping` named *RMMap*.

Listing 5.4: Scenario for Blueprints of PortInterfaceMapping (3)

```
<AR-PACKAGE>
  <SHORT-NAME>RightCompany</SHORT-NAME>
  <AR-PACKAGES>
    <AR-PACKAGE>
      <SHORT-NAME>PortInterfaces</SHORT-NAME>
      <ELEMENTS>
        <SENDER-RECEIVER-INTERFACE>
          <SHORT-NAME>R</SHORT-NAME>
          <DATA-ELEMENTS>
            <VARIABLE-DATA-PROTOTYPE>
              <SHORT-NAME>x</SHORT-NAME>
            </VARIABLE-DATA-PROTOTYPE>
            <VARIABLE-DATA-PROTOTYPE>
              <SHORT-NAME>y</SHORT-NAME>
            </VARIABLE-DATA-PROTOTYPE>
          </DATA-ELEMENTS>
        </SENDER-RECEIVER-INTERFACE>
      </ELEMENTS>
    </AR-PACKAGE>
    <AR-PACKAGE>
      <SHORT-NAME>BlueprintMappingSets</SHORT-NAME>
      <ELEMENTS>
        <BLUEPRINT-MAPPING-SET>
          <SHORT-NAME>R_isDerivedFrom_M</SHORT-NAME>
          <DESC>
            <L-2 L="EN">This states <E>that</E> S is derived from M</L
                -2>
          </DESC>
          <BLUEPRINT-MAPS>
            <BLUEPRINT-MAPPING>
```

```
                <BLUEPRINT-REF DEST="PORT-INTERFACE">/AUTOSAR/
                    PortInterfaces_Blueprint/M</BLUEPRINT-REF>
                <DERIVED-OBJECT-REF DEST="PORT-INTERFACE">/RightCompany/
                    PortInterfaces/R</DERIVED-OBJECT-REF>
              </BLUEPRINT-MAPPING>
            </BLUEPRINT-MAPS>
          </BLUEPRINT-MAPPING-SET>
        </ELEMENTS>
      </AR-PACKAGE>
      <AR-PACKAGE>
        <SHORT-NAME>PortInterfaceMappingSets_Blueprint</SHORT-NAME>
        <CATEGORY>BLUEPRINT</CATEGORY>
        <ELEMENTS>
          <PORT-INTERFACE-MAPPING-SET>
            <SHORT-NAME NAME-PATTERN="{anyName}">BP</SHORT-NAME>
            <PORT-INTERFACE-MAPPINGS>
              <VARIABLE-AND-PARAMETER-INTERFACE-MAPPING>
                <SHORT-NAME NAME-PATTERN="{anyName}">RMMap</SHORT-NAME>
                <DESC>
                  <L-2 L="EN">This defines <E>how</E> R is derived (and
                      therefore mapped to) from M</L-2>
                </DESC>
                <DATA-MAPPINGS>
                  <DATA-PROTOTYPE-MAPPING>
                    <FIRST-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                        PROTOTYPE">/AUTOSAR/PortInterfaces_Blueprint/M/a</
                        FIRST-DATA-PROTOTYPE-REF>
                    <SECOND-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                        PROTOTYPE">/RightCompany/PortInterfaces/R/x</
                        SECOND-DATA-PROTOTYPE-REF>
                  </DATA-PROTOTYPE-MAPPING>
                  <DATA-PROTOTYPE-MAPPING>
                    <FIRST-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                        PROTOTYPE">/AUTOSAR/PortInterfaces_Blueprint/M/b</
                        FIRST-DATA-PROTOTYPE-REF>
                    <SECOND-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                        PROTOTYPE">/RightCompany/PortInterfaces/R/y</
                        SECOND-DATA-PROTOTYPE-REF>
                  </DATA-PROTOTYPE-MAPPING>
                </DATA-MAPPINGS>
              </VARIABLE-AND-PARAMETER-INTERFACE-MAPPING>
            </PORT-INTERFACE-MAPPINGS>
          </PORT-INTERFACE-MAPPING-SET>
        </ELEMENTS>
      </AR-PACKAGE>
    </AR-PACKAGES>
  </AR-PACKAGE>
```

Listing 5.5 shows that "Project" used contributions from "RightCompany" and "Left-Company". Thereby it maps *S* to *R* in `PortInterfaceMapping` *SRMap*. This is derived from two blueprints (*SMMap* and *SRMap*).

Listing 5.5: Scenario for Blueprints of PortInterfaceMapping (4)

```
<AR-PACKAGE>
  <SHORT-NAME>Project</SHORT-NAME>
```

```xml
<AR-PACKAGES>
  <AR-PACKAGE>
    <SHORT-NAME>PortInterfaceMappingSets</SHORT-NAME>
    <ELEMENTS>
      <PORT-INTERFACE-MAPPING-SET>
        <SHORT-NAME>Set1</SHORT-NAME>
        <PORT-INTERFACE-MAPPINGS>
          <VARIABLE-AND-PARAMETER-INTERFACE-MAPPING>
            <SHORT-NAME>SRMap</SHORT-NAME>
            <DESC>
              <L-2 L="EN">This defines <E>how</E> S is mapped R</L-2>
            </DESC>
            <DATA-MAPPINGS>
              <DATA-PROTOTYPE-MAPPING>
                <FIRST-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                    PROTOTYPE">/LeftCompany/PortInterfaces/S/b</FIRST-
                    DATA-PROTOTYPE-REF>
                <SECOND-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                    PROTOTYPE">/RightCompany/PortInterfaces/R/x</
                    SECOND-DATA-PROTOTYPE-REF>
              </DATA-PROTOTYPE-MAPPING>
              <DATA-PROTOTYPE-MAPPING>
                <FIRST-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                    PROTOTYPE">/LeftCompany/PortInterfaces/S/a</FIRST-
                    DATA-PROTOTYPE-REF>
                <SECOND-DATA-PROTOTYPE-REF DEST="VARIABLE-DATA-
                    PROTOTYPE">/RightCompany/PortInterfaces/R/y</
                    SECOND-DATA-PROTOTYPE-REF>
              </DATA-PROTOTYPE-MAPPING>
            </DATA-MAPPINGS>
          </VARIABLE-AND-PARAMETER-INTERFACE-MAPPING>
        </PORT-INTERFACE-MAPPINGS>
      </PORT-INTERFACE-MAPPING-SET>
    </ELEMENTS>
  </AR-PACKAGE>
  <AR-PACKAGE>
    <SHORT-NAME>BlueprintMappingSets</SHORT-NAME>
    <ELEMENTS>
      <BLUEPRINT-MAPPING-SET>
        <SHORT-NAME>ProjectMap1</SHORT-NAME>
        <DESC>
          <L-2 L="EN">This states <E>that</E> SRMap is derived from
              SMMap and RMMap simultaneously</L-2>
        </DESC>
        <BLUEPRINT-MAPS>
          <BLUEPRINT-MAPPING>
            <BLUEPRINT-REF DEST="PORT-INTERFACE-MAPPING">/LeftCompany
                /PortInterfaceMappingSets_Blueprint/BP/SMMap</
                BLUEPRINT-REF>
            <DERIVED-OBJECT-REF DEST="PORT-INTERFACE-MAPPING">/
                Project/PortInterfaceMappingSets/Set1/SRMap</DERIVED-
                OBJECT-REF>
          </BLUEPRINT-MAPPING>
          <BLUEPRINT-MAPPING>
```

```
<BLUEPRINT-REF DEST="PORT-INTERFACE-MAPPING">/
    RightCompany/PortInterfaceMappingSets_Blueprint/BP/
    RMMap</BLUEPRINT-REF>
<DERIVED-OBJECT-REF DEST="PORT-INTERFACE-MAPPING">/
    Project/PortInterfaceMappingSets/Set1/SRMap</DERIVED-
    OBJECT-REF>
        </BLUEPRINT-MAPPING>
      </BLUEPRINT-MAPS>
    </BLUEPRINT-MAPPING-SET>
  </ELEMENTS>
</AR-PACKAGE>
</AR-PACKAGES>
</AR-PACKAGE>
```

5.23 Blueprinting SwBaseType

[TPS_STDT_00022] Blueprinting `SwBaseType` ⌈ `SwBaseType` can be blueprinted. ⌋ *(RS_STDT_00029)*

5.24 Blueprinting SwComponentType

[TPS_STDT_00024] Blueprinting `SwComponentType` ⌈ `SwComponentType` can be blueprinted. ⌋*(RS_STDT_00011, RS_STDT_00012)*

[constr_2568] `SwComponentType`s shall be of same kind ⌈ Both objects (`SwComponentType`s) referenced by a blueprint mapping for port interfaces (represented by `BlueprintMapping`) shall be of the same kind (e.g. both shall be `AtomicSwComponentType`s). In other words both components shall be instances of the same meta class. ⌋*()*

Note that [constr_2568] is a special case of [constr_2566].

5.25 Blueprinting SwAddrMethods

**[TPS_STDT_00026] Blueprinting `SwAddrMethod`** ⌈ `SwAddrMethod` can be blueprinted. ⌋*(RS_STDT_00029)*

5.26 Blueprinting VfbTiming

[TPS_STDT_00079] Blueprinting `VfbTiming` ⌈ `VfbTiming` can be blueprinted. ⌋ *(RS_STDT_00029)*

One of the essential purposes of blueprinting VFB Timing is enabling one to specify temporal characteristics of interfaces specified in the AUTOSAR Application Interface

Table [12]. In particular, one likes to specify timing constraints imposed on sampling rate, recurrence, age, latency, etc. for such interfaces.

Figure 5.9 shows the basic structure of a VFB Timing Blueprint and how the specified timing elements reference other blueprint elements, specifically the elements `Port-PrototypeBlueprint` and port interface elements which are referenced by the element `PortInterface`; like variable data prototypes (data elements), client-server operations, mode declarations, and triggers.
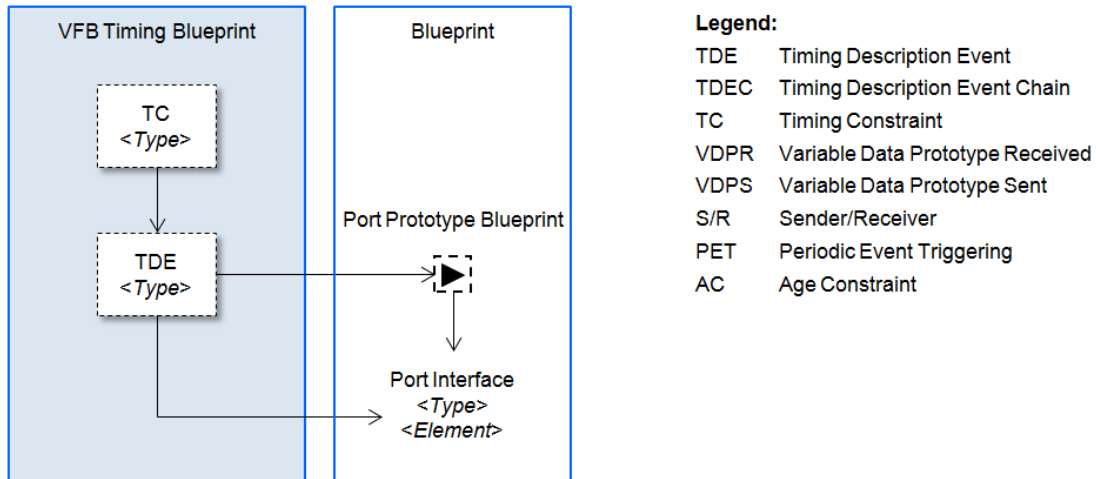
Figure 5.9: VFB Timing Blueprint

A VFB Timing Blueprint consists of timing descriptions events related to the AUTOSAR VFB view, timing description event chains, and timing constraints as defined in the "AUTOSAR Specification of Timing Extensions" [13].

A VFB Timing references the software component it is associated with. In case of a VFB Timing Blueprint this reference need not to be set, but in the derived VFB Timing the `VfbTiming.component` shall be set properly. In addition, any reference to `PortPrototypeBlueprint` shall be replaced by the corresponding reference to the `PortPrototype`.

The following constraints apply to VFB Timing Blueprints and shall be considered when creating such blueprints.

[constr_2589] In VFB Timing Blueprint `TDEventVfbPort` shall reference `Port-PrototypeBlueprint` ⌈ In a VFB Timing Blueprint `TDEventVfbPort` shall reference `PortPrototypeBlueprint`. In other words, a VFB Timing Description Event specified in a VFB Timing Blueprint shall always reference a Port Prototype Blueprint. ⌋*()*

5.26.1   Example

In this subsection an example for a VFB Timing Blueprint is given. It is based on contents of the AUTOSAR document "Explanation of Application Interfaces of the Powertrain Domain" [14].
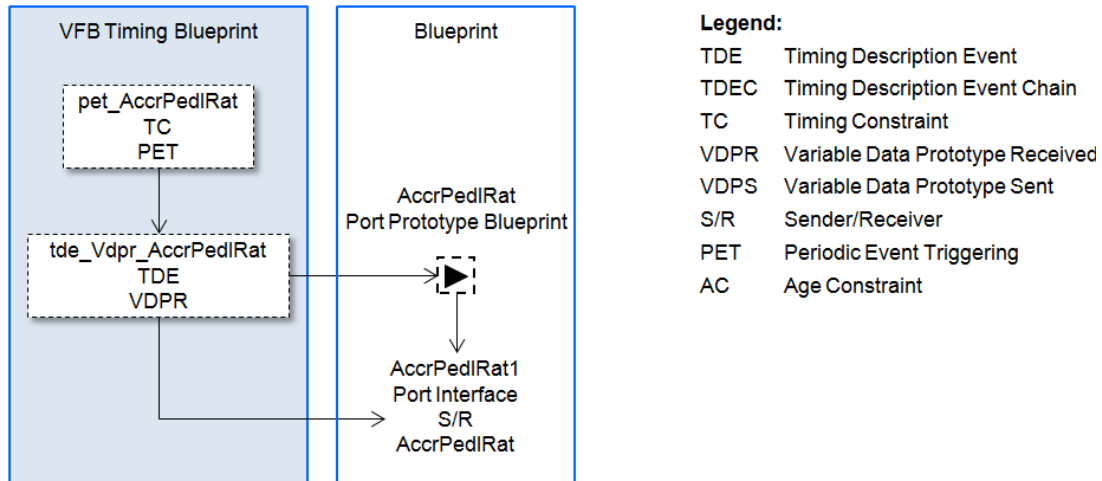
Figure 5.10: VFB Timing Blueprint Simple Example

As sketched in Figure 5.10 a VFB Timing Blueprint is specified. This blueprint consists of a timing description event called "tde_Vdpr_AccrPedlRat" that references the port prototype blueprint called "AccrPedlRat"; and also references the variable data prototype called "AccrPedlRat" of the port interface called "AccrPedlRat1". The latter is referenced by the mentioned port prototype blueprint, too. In addition, a timing constraint, specifically a periodic event triggering constraint, is imposed on the timing description event. In essence, this timing model specifies that the variable data prototype called "AccrPedlRat" shall be received at a rate given by the periodic event triggering constraint.

The listing 5.6 provides the corresponding contents of the ARXML file related to the example shown in Figure 5.10, but contains further timing description events and an additional age timing constraint imposed on the reception of the specific variable data prototype.

Listing 5.6: Example for VFB Timing Blueprint

```
<AR-PACKAGES>
  <AR-PACKAGE>
    <SHORT-NAME NAME-PATTERN="{anyName}">VfbTimingBlueprint</SHORT-NAME>
    <CATEGORY>BLUEPRINT</CATEGORY>
    <ELEMENTS>
      <VFB-TIMING>
        <SHORT-NAME>vfbTiming_AccrPedlRat</SHORT-NAME>
        <TIMING-DESCRIPTIONS>
          <TD-EVENT-VARIABLE-DATA-PROTOTYPE>
            <SHORT-NAME>tde_Vdps_AccrPedlRat</SHORT-NAME>
            <IS-EXTERNAL>false</IS-EXTERNAL>
            <PORT-PROTOTYPE-BLUEPRINT-REF DEST="PORT-PROTOTYPE-BLUEPRINT"
              >/AUTOSAR/AISpecification/
```

```xml
                    PortPrototypeBlueprints_Blueprint/AccrPedlRat</PORT-
                    PROTOTYPE-BLUEPRINT-REF>
                <DATA-ELEMENT-REF DEST="VARIABLE-DATA-PROTOTYPE">/AUTOSAR/
                    AISpecification/PortInterfaces_Blueprint/AccrPedlRat1/
                    AccrPedlRat</DATA-ELEMENT-REF>
                <TD-EVENT-VARIABLE-DATA-PROTOTYPE-TYPE>VARIABLE-DATA-
                    PROTOTYPE-SENT</TD-EVENT-VARIABLE-DATA-PROTOTYPE-TYPE>
            </TD-EVENT-VARIABLE-DATA-PROTOTYPE>
            <TD-EVENT-VARIABLE-DATA-PROTOTYPE>
                <SHORT-NAME>tde_Vdpr_AccrPedlRat</SHORT-NAME>
                <IS-EXTERNAL>false</IS-EXTERNAL>
                <PORT-PROTOTYPE-BLUEPRINT-REF DEST="PORT-PROTOTYPE-BLUEPRINT"
                    >/AUTOSAR/AISpecification/
                    PortPrototypeBlueprints_Blueprint/AccrPedlRat</PORT-
                    PROTOTYPE-BLUEPRINT-REF>
                <DATA-ELEMENT-REF DEST="VARIABLE-DATA-PROTOTYPE">/AUTOSAR/
                    AISpecification/PortInterfaces_Blueprint/AccrPedlRat1/
                    AccrPedlRat</DATA-ELEMENT-REF>
                <TD-EVENT-VARIABLE-DATA-PROTOTYPE-TYPE>VARIABLE-DATA-
                    PROTOTYPE-RECEIVED</TD-EVENT-VARIABLE-DATA-PROTOTYPE-TYPE>
            </TD-EVENT-VARIABLE-DATA-PROTOTYPE>
            <TD-EVENT-VARIABLE-DATA-PROTOTYPE>
                <SHORT-NAME>tde_Vdp_AccrPedlRat</SHORT-NAME>
                <IS-EXTERNAL>false</IS-EXTERNAL>
                <PORT-PROTOTYPE-BLUEPRINT-REF DEST="PORT-PROTOTYPE-BLUEPRINT"
                    >/AUTOSAR/AISpecification/
                    PortPrototypeBlueprints_Blueprint/AccrPedlRat</PORT-
                    PROTOTYPE-BLUEPRINT-REF>
                <DATA-ELEMENT-REF DEST="VARIABLE-DATA-PROTOTYPE">/AUTOSAR/
                    AISpecification/PortInterfaces_Blueprint/AccrPedlRat1/
                    AccrPedlRat</DATA-ELEMENT-REF>
            </TD-EVENT-VARIABLE-DATA-PROTOTYPE>
        </TIMING-DESCRIPTIONS>
        <TIMING-REQUIREMENTS>
            <PERIODIC-EVENT-TRIGGERING>
                <SHORT-NAME>pet_AccrPedlRat</SHORT-NAME>
                <EVENT-REF DEST="TD-EVENT-VARIABLE-DATA-PROTOTYPE">/
                    VfbTimingBlueprint/vfbTiming_AccrPedlRat/
                    tde_Vdp_AccrPedlRat</EVENT-REF>
                <JITTER>
                    <CSE-CODE>0</CSE-CODE>
                    <CSE-CODE-FACTOR>1</CSE-CODE-FACTOR>
                </JITTER>
                <PERIOD>
                    <CSE-CODE>0</CSE-CODE>
                    <CSE-CODE-FACTOR>10</CSE-CODE-FACTOR>
                </PERIOD>
            </PERIODIC-EVENT-TRIGGERING>
            <AGE-CONSTRAINT>
                <SHORT-NAME>ac_AccrPedlRat</SHORT-NAME>
                <MAXIMUM>
                    <CSE-CODE>0</CSE-CODE>
                    <CSE-CODE-FACTOR>10</CSE-CODE-FACTOR>
                </MAXIMUM>
```

```
                    <SCOPE-REF DEST="TD-EVENT-VARIABLE-DATA-PROTOTYPE">/
                        VfbTimingBlueprint/vfbTiming_AccrPedlRat/
                        tde_Vdpr_AccrPedlRat</SCOPE-REF>
                  </AGE-CONSTRAINT>
                </TIMING-REQUIREMENTS>
              </VFB-TIMING>
            </ELEMENTS>
          </AR-PACKAGE>
        </AR-PACKAGES>
```

Figure 5.11 shows the VFB Timing Blueprint and the derived VFB Timing for a specific software component called "SW-C_A".

Figure 5.11: Deriving a VFB Timing Blueprint

5.27 Blueprinting ClientServerInterfaceToBswModuleEntry-BlueprintMapping

[TPS_STDT_00083] Blueprinting `ClientServerInterfaceToBswModuleEntryBlueprintMapping` ⌈ `ClientServerInterfaceToBswModuleEntryBlueprintMapping` can be blueprinted. ⌋ *(RS_STDT_00029)*

[TPS_STDT_00084] `ClientServerOperationBlueprintMapping` predetermines the implementation of an `ClientServerOperation` ⌈ A `ClientServerOperationBlueprintMapping` expresses the intended implementation of a

`ClientServerOperation` by a specific `BswModuleEntry` under consideration of the expected usage of `PortDefinedArgumentValue`s. ⌋*(RS_STDT_00029)*

Figure 5.12: Client Server Operation Blueprint Mapping

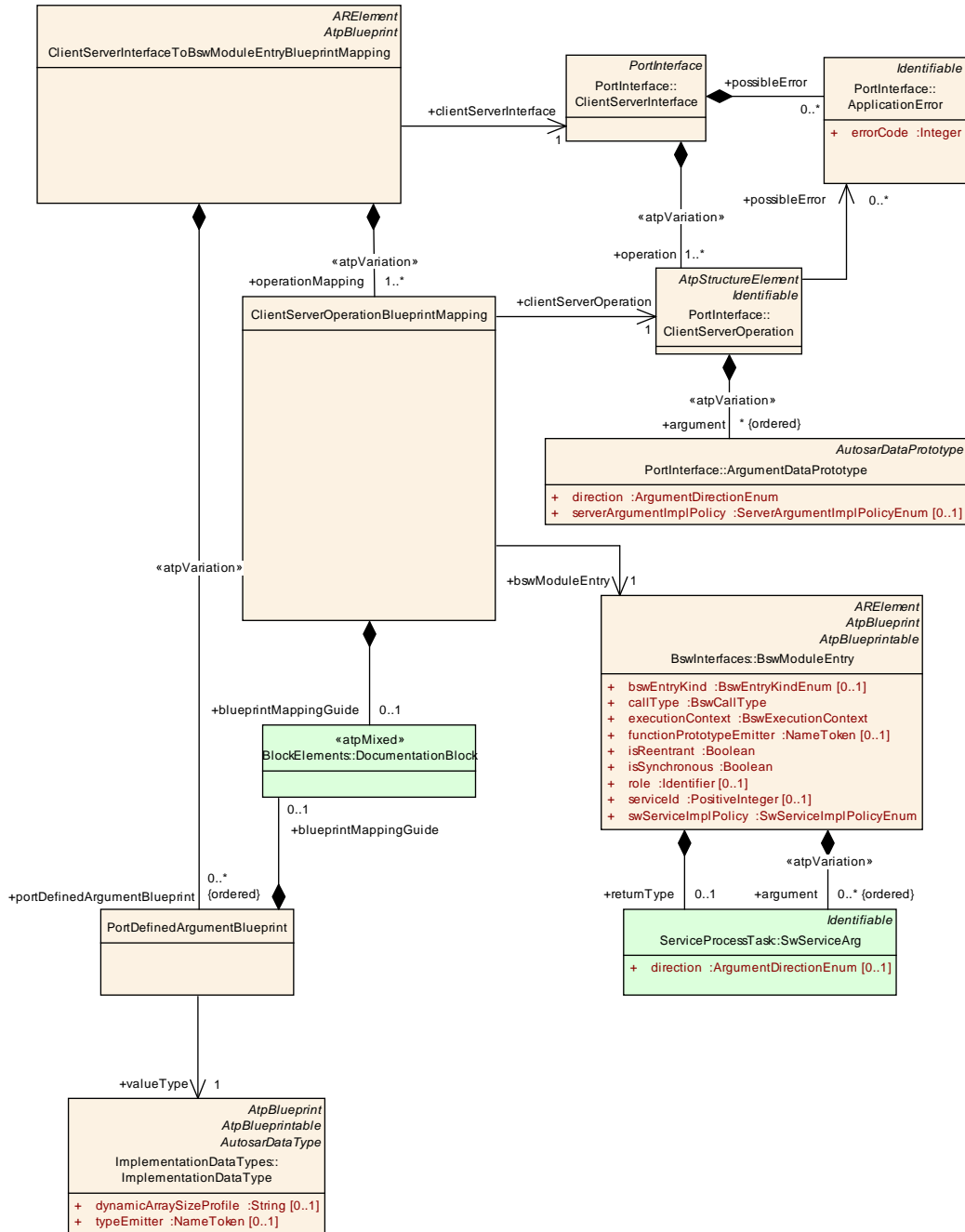| Class	ClientServerOperationBlueprintMapping			
Package	M2::AUTOSARTemplates::StandardizationTemplate::ClientServerInterfaceToBswModuleEntryMapping			
Note	This class describes a specific mapping between a ClientServerOperation in a ClientServerInterface blueprint and a BswModuleEntry blueprint.			
Base	ARObject			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
blueprintMappingGuide	Documentation Block	0..1	aggr	This attribute offers the possibility to provide additional information with respect to the mapping.
bswModuleEntry	BswModuleEntry	1	ref	The referenced BswModuleEntry represents the BswModuleEntry the mapping is dedicated to.
clientServerOperation	ClientServerOperation	1	ref	The referenced ClientServerOperation represents the client server operation the mapping is dedicated to.

Table 5.6: ClientServerOperationBlueprintMapping

The `ClientServerOperationBlueprintMapping` can be used to ensure and/or track the compatibility of `BswModuleEntry`s which are supposed to implement `ClientServerOperation`s. It can already be defined in an early phase of the methodology when interfaces are defined. Thereby the `ClientServerOperationBlueprintMapping` can already be defined without all implementation details of the later required `SwComponentType`, `SwcInternalBehavior`, `BswModuleDescription`, `BswInternalBehavior` and `SwcBswMapping`.

Please note that the `ClientServerInterfaceToBswModuleEntryBlueprintMapping` has no direct impact to the later generated RTE. The setup of the RTE is solely determined by the derived objects of `ClientServerOperation`, `BswModuleEntry` and the completed software component descriptions and basic software module descriptions respectively.

Such a mapping enables the formal check whether the number of arguments and the data types of arguments of the operation + additional `PortDefinedArgumentValue`s matches the signature of the `BswModuleEntry`.

[constr_2597] `ClientServerOperationBlueprintMapping` constraints number of arguments ⌈ The number of arguments of the `BswModuleEntry` referenced by a `bswModuleEntry` shall be identical to the number of portDefinedArgumentBlueprints of the owning `ClientServerInterfaceToBswModuleEntryBlueprintMapping` plus the number of `ArgumentDataPrototype`s aggregated in the role argument of the `clientServerOperation` ⌋()

[constr_2598] `ClientServerOperationBlueprintMapping` constraints the types of arguments ⌈ The arguments in the ordered lists `bswModuleEntry` and the matching arguments in the set union of the ordered lists `portDefinedArgumentBlueprint` plus `clientServerOperation` shall result in the identical C data type definitions. ⌋()

6 Keywords

[TPS_STDT_00012] Defining Keywords ⌈ The meta-class `KeywordSet` can be used to define sets of `Keyword`s. The purpose of a `Keyword` is to contribute parts of names for AUTOSAR model elements. ⌋*(RS_STDT_00005, RS_STDT_00008, RS_STDT_00042)*

Keywords are referenced to be part of name pattern as specified in Chapter 4.4.

As an example, the `shortName` "CmftMngt" is composed out of two `Keyword`s with the `abbrName` "Cmft" and "Mngt".
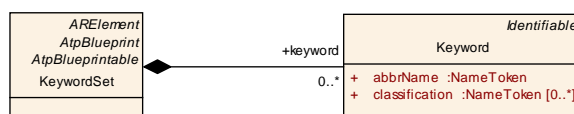
Figure 6.1: Keyword and KeywordSet

[TPS_STDT_00069] Attributes of Keyword ⌈ The meta-class `Keyword` is derived from `Identifiable`. The attributes of `Identifiable` shall be applied for `Keyword` as follows.

shortName represents the unique name of the keyword. In the example above it would be "Cmft". Note that this is used only for identifying the keyword. The contributed name part is taken from `abbrName`.

longName represents the long form of the keyword, typically its an unabbreviated technical term. In the example above it would be "Comfort".

desc represents the definition of the keyword in terms of a verbal description allowing to identify whether the keyword applies for a specific case. In the example above the description would be "This keyword is used to express something as comfortable or convenient".

introduction represents a verbal description of a use case. This can be used for additional explanations or examples.

⌋*(RS_STDT_00005, RS_STDT_00042)*

Class	KeywordSet			
Package	M2::AUTOSARTemplates::StandardizationTemplate::Keyword			
Note	This meta--class represents the ability to collect a set of predefined keywords. **Tags:** atp.recommendedPackage=KeywordSets			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
keyword	Keyword	*	aggr	This is one particular keyword in the keyword set.

Table 6.1: KeywordSet

Class	Keyword			
Package	M2::AUTOSARTemplates::StandardizationTemplate::Keyword			
Note	This meta-class represents the ability to predefine keywords which may subsequently be used to construct names following a given naming convention, e.g. the AUTOSAR naming conventions. Note that such names is not only shortName. It could be symbol, or even longName. Application of keywords is not limited to particular names.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
abbrName	NameToken	1	attr	This attribute specifies an abbreviated name of a keyword. This abbreviation may e.g. be used for constructing valid shortNames according to the AUTOSAR naming conventions. Unlike shortName, it may contain any name token. E.g. it may consist of digits only.
classificati on	NameToken	*	attr	This attribute allows to attach classification to the Keyword such as MEAN, ACTION, CONDITION, INDEX, PREPOSITION

Table 6.2: Keyword

[TPS_STDT_00070] Classification of Keywords ⌈ The attribute `classification` depends on the applied naming convention. ⌋*(RS_STDT_00005, RS_STDT_00042)*

For example, the values could be according to table 2 of [15] such as `Action-PhysicalType`, `Condition-Qualifier`, `Index`, `Mean-Environment-Device`, `Preposition`.

Listing 6.1 illustrates an example how to use `Keyword`. More elaborate usage can be seen in [3].

Listing 6.1: example for keywords

```xml
<?xml version="1.0" encoding="UTF-8"?>
<AUTOSAR xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http:
   //autosar.org/schema/r4.0" xsi:schemaLocation="http://autosar.org/schema
   /r4.0_AUTOSAR_4-1-3.xsd">
  <AR-PACKAGES>
   <AR-PACKAGE>
     <SHORT-NAME>AUTOSAR</SHORT-NAME>
     <AR-PACKAGES>
       <AR-PACKAGE>
         <SHORT-NAME>AISpecification</SHORT-NAME>
         <AR-PACKAGES>
           <AR-PACKAGE>
             <SHORT-NAME>KeywordSets</SHORT-NAME>
             <ELEMENTS>
               <KEYWORD-SET>
                 <SHORT-NAME>KeywordList</SHORT-NAME>
                 <KEYWORDS>
                   <KEYWORD>
                      <SHORT-NAME>Cmft</SHORT-NAME>
```

```
                    <LONG-NAME>
                      <L-4 L="EN">Comfort</L-4>
                    </LONG-NAME>
                    <DESC>
                      <L-2 L="EN">comfort. this keyword is used to
                          express something as comfortable or convenient</
                          L-2>
                    </DESC>
                    <ABBR-NAME>Cmft</ABBR-NAME>
                    <CLASSIFICATIONS>
                      <CLASSIFICATION>Condition-Qualifier</CLASSIFICATION
                          >
                    </CLASSIFICATIONS>
                  </KEYWORD>
                </KEYWORDS>
              </KEYWORD-SET>
            </ELEMENTS>
          </AR-PACKAGE>
        </AR-PACKAGES>
      </AR-PACKAGE>
    </AR-PACKAGES>
  </AR-PACKAGE>
  </AR-PACKAGES>
</AUTOSAR>
```

[TPS_STDT_00068] Expressing "stem"-Relation of Keywords ⌈ There are key-words which basically stem from the same root. This relationship is expressed by an `Collection` where the `elementRole` is named `DECLINATION_OF`. The root is denoted `sourceElement`. The declinations are denoted in `element`. The root is not a declination of itself, and therefore is not mentioned as an `element` again. ⌋ *(RS_STDT_00005, RS_STDT_00042)*

As an example for [TPS_STDT_00068] the keywords `Drvr, Drvg` stem from `Drv`[1]. This is delivered according to the example in Listing 6.2

Listing 6.2: Example for Stem Relation of Keywords

```
<COLLECTION>
  <SHORT-NAME>Drv_declinations</SHORT-NAME>
  <CATEGORY>RELATION</CATEGORY>
  <ELEMENT-ROLE>DECLINATION_OF</ELEMENT-ROLE>
  <ELEMENT-REFS>
    <ELEMENT-REF BASE="KW" DEST="KEYWORD">KeywordList/Drvr</ELEMENT-REF>
    <ELEMENT-REF BASE="KW" DEST="KEYWORD">KeywordList/Drvg</ELEMENT-REF>
  </ELEMENT-REFS>
  <SOURCE-ELEMENT-REFS>
    <SOURCE-ELEMENT-REF BASE="KW" DEST="KEYWORD">KeywordList/Drv</SOURCE-
        ELEMENT-REF>
  </SOURCE-ELEMENT-REFS>
</COLLECTION>
```

---

[1]Note that `Drv` is not an `element` of this `Collection` since it is not a declination of itself.

7 Deriving from AUTOSAR-provided Blueprints

Model elements provided by AUTOSAR are mainly provided as blueprints. This holds true in particular for the Application Interfaces [12] but also for the Software Specifications of the BSW layer. These AUTOSAR delivered model elements follow the package structure specified in [TPS_GST_00080].

Figure 7.1 illustrates the methodology to define data types for BSW module. The `BSW Standard Package` contains blueprints. In the above scenario, [TPS_STDT_00067] shall be followed but of course also holds true for the data types of other modules.
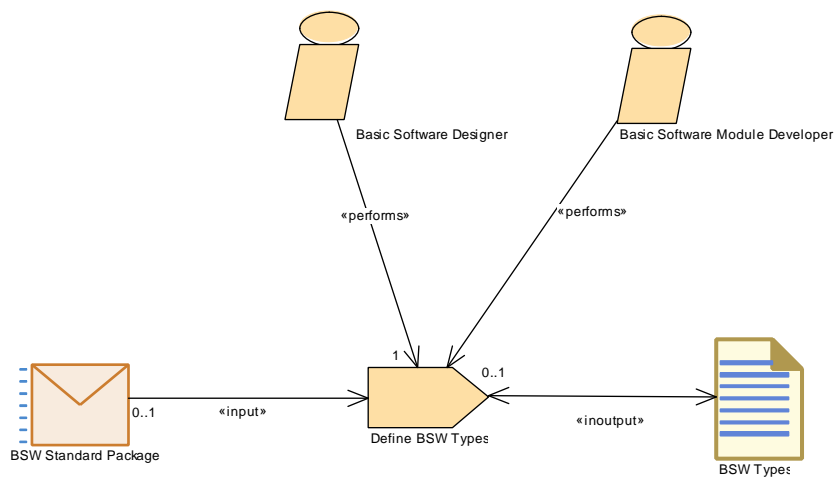
Figure 7.1: Define Bsw Types

[TPS_STDT_00067] Standardized Path for Standardized Elements ⌈ Objects derived from standardized blueprints, shall follow a package path as specified in [TPS_GST_00083]. That is, providers of Software components can rely that all AUTOSAR defined model elements can be accessed through a predicable path. ⌋*(RS_STDT_00001, RS_STDT_00002, RS_STDT_00014, RS_STDT_00028, RS_STDT_00030)*

For example the Platformtypes [16] blueprinted in

```
/AUTOSAR/Platform/ImplementationDatatypes_Blueprint/uint8
```

shall be implemented in (and therefore safely be accessible through)

```
/AUTOSAR_Platform/ImplementationDatatypes/uint8
```

8 Description of Data Exchange Points

8.1 Overview

Figure 8.1: Overview of Description of Data Exchange Point

[TPS_STDT_00100] Motivation of Description of Data Exchange Points ⌈
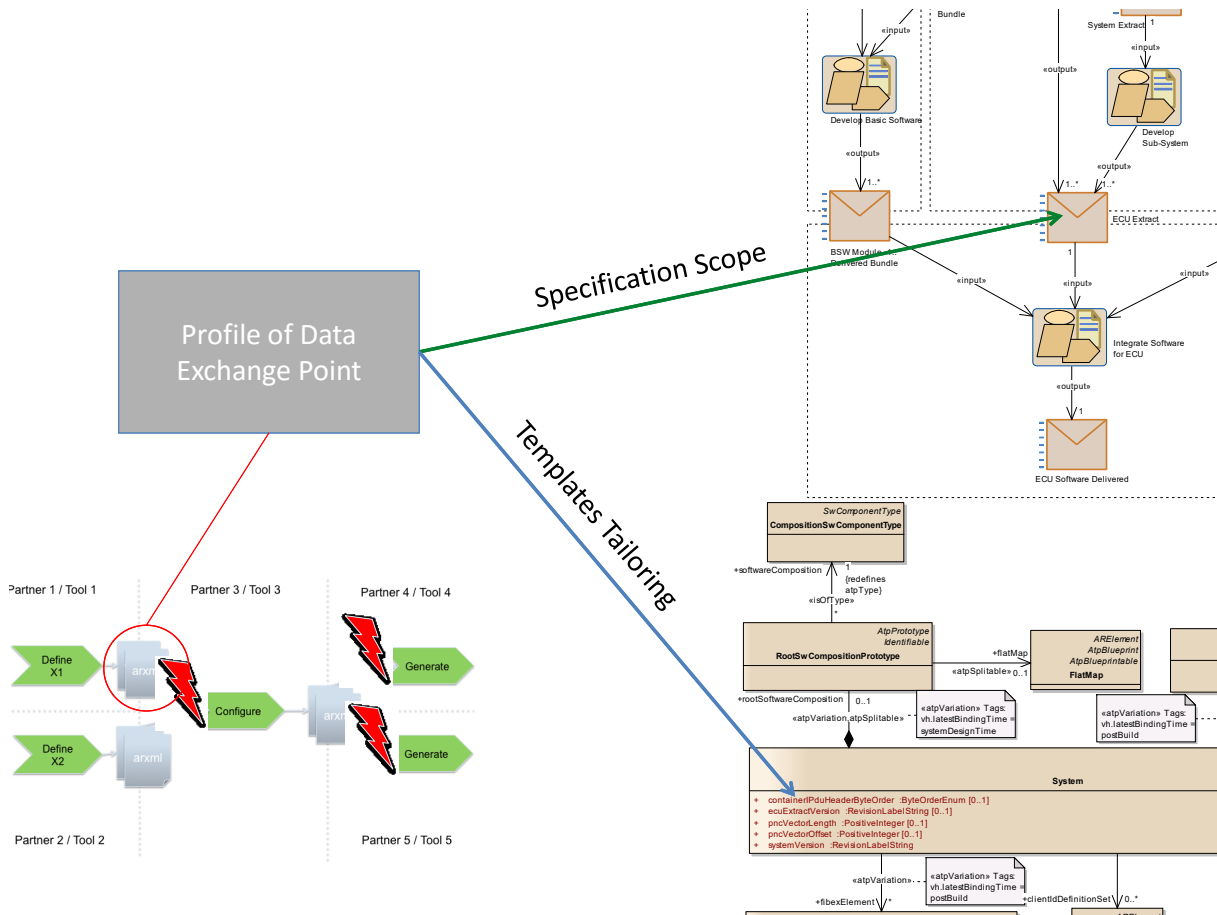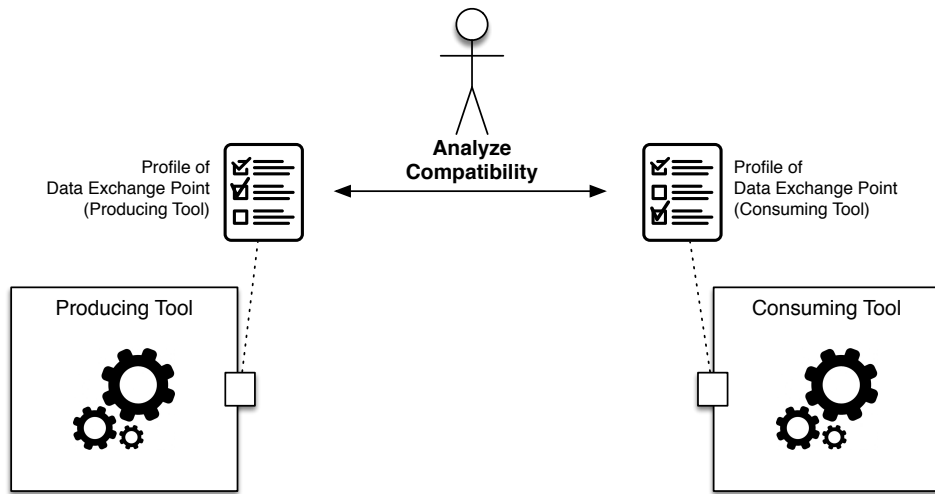`Profiles of Data Exchange Point`s intend to improve the interoperability between tools by describing which data is expected for a given activity or task in the methodology (see figure 8.1). ⌋*(RS_STDT_00102, RS_STDT_00103)*

Figure 8.2: Documentation and Analysis of Data Interface of Tools

[TPS_STDT_00115] Analysis of Tool Compatibility ⌈ `Profile of Data Exchange Point`s enable structured documentation of the subset of the AUTOSAR standard that is supported or explicitly not supported by a tool (see figure 8.2).
In other words: the profile describes the data interface of the tool. The availability of profiles enables initial checks of compatibility of tools before actual AUTOSAR models are available (e.g. due to IP issues, new features that are not yet implemented, ...). Commonalities usually show low risk of interoperability issues. Differences or undefined information show potential high risk of interoperability issues.
The formalized description of Data Exchange Points additionally enables tool support for finding locations with high risk of interoperability issues. However, the interpretation of the results requires engineering know how and interaction between tool vendors and users. ⌋*(RS_STDT_00117, RS_STDT_00118)*

[TPS_STDT_00116] Limitation of Analysis of `Profile of Data Exchange Points` ⌈
The analysis of the compatibility of two or more `Profile of Data Exchange Point`s has the goal to identify potential interoperability issues. The analysis of profiles can help identifying some issues. However, the analysis cannot guarantee the absence of interoperability issues. This analysis does not replace other interoperability check mechanisms such as the creation and processing of example AUTOSAR models that make use of the intended features (reference models). ⌋*(RS_STDT_00117, RS_STDT_00118)*
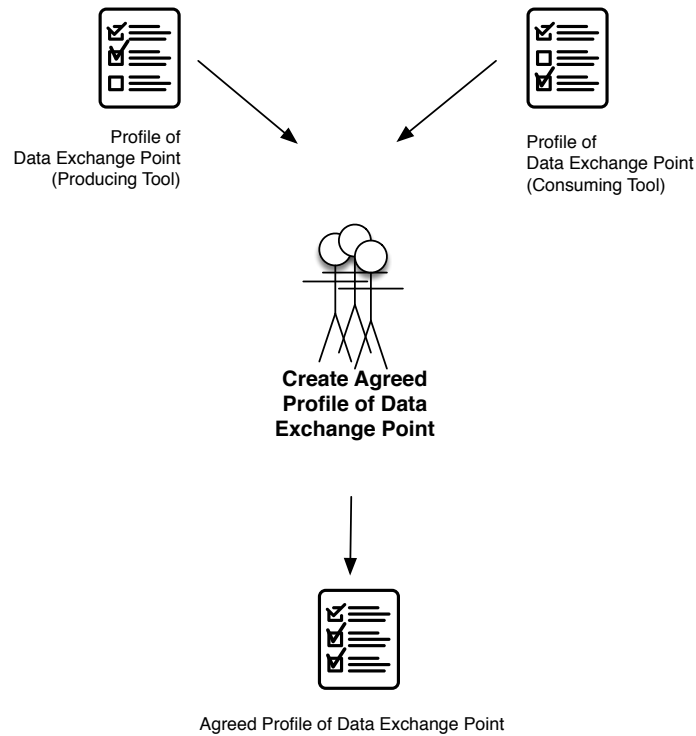
Figure 8.3: Creation of an agreed Profile of Data Exchange Point

[TPS_STDT_00117] Agreed Profile of Data Exchange Point ⌈
The result of the analysis and negotiation of `Profile of Data Exchange Point`s can be documented as an `Agreed Profile of Data Exchange Point` (see figure 8.3). Usage scenarios for the `Agreed Profile for Data Exchange` include:

- Validation of the AUTOSAR models that are created by the producing tool with respect to compliance with the agreed contract. This validation can, for instance, be used as a quality gate before the actual AUTOSAR model is passed to the consuming tool.

- A `Profile of Data Exchange Point` can be used as a specification for intended future functionality. Tool vendors can analyze the `Agreed Profile for Data Exchange` in order to identify features that are not yet implemented.
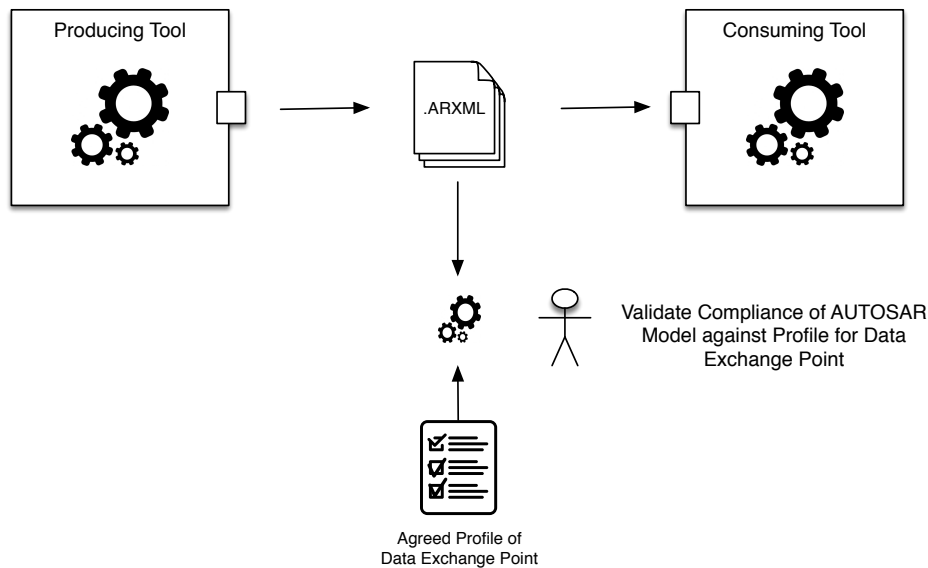
⌋*(RS_STDT_00121)*

Figure 8.4: Validation of Compliance of `AUTOSAR Model`s with Profile of Data Exchange Point

[TPS_STDT_00118] Compliance with Profile of Data Exchange Point ⌈
A `Profile of Data Exchange Point` can tailor the AUTOSAR Data Format for a specific Data Exchange Point. This tailoring of `Data Format Element`s (Meta-Classes, Attributes, Constraints, Sdg usage) specifies a subset of the meta model that is relevant for this specific Data Exchange Point and defines which AUTOSAR and custom validation rules have to be evaluated. An `AUTOSAR Model` complies with a `Profile of Data Exchange Point` if all validation rules evaluate to true. (see figure 8.4) ⌋*(RS_STDT_00121)*

Note: The following patterns, meta classes and attributes focus on the description of self-contained `Profile of Data Exchange Point`s. Support for authoring of profiles such as the composition of a profile out of profile assets is not yet covered.

8.2 General Patterns

8.2.1 Top Level Data Structure

[TPS_STDT_00120] Purpose of `DataExchangePoint` ⌈ For a given `Data Exchange Point` the `DataExchangePoint` specifies the following aspects:

- Short description of the data exchange point using `longName`, `desc` and `introduction` (inherited from `Identifiable`).

- The `Baseline` of the AUTOSAR standard that is referenced by the profile

- High-Level specification of the data exchange point by selection of the relevant parts of the `AUTOSAR Specification`s. See section 8.3.

- Detailed tailoring of the `AUTOSAR Data Format` (Meta-Classes, Attributes, Constraints, Special Data Group Definitions). See section 8.4.

⌋*(RS_STDT_00101)*

The aspects that are described by the `DataExchangePoint` are located on the Meta Level (M2 as described in [7] and [17]). On this level we can find the AUTOSAR Meta Model and the AUTOSAR XML Schema. Although a `Profile of Data Exchange Point` specifies information on M2 level we reuse the approach for the specification of the `Profile of Data Exchange Point` language that is already used by the AUTOSAR Template specifications. Using this approach, we can store a `Profile of Data Exchange Point` in a .arml file and we can reuse existing meta classes such as `ARPackage`, `Documentation`, `Identifiable`, etc.
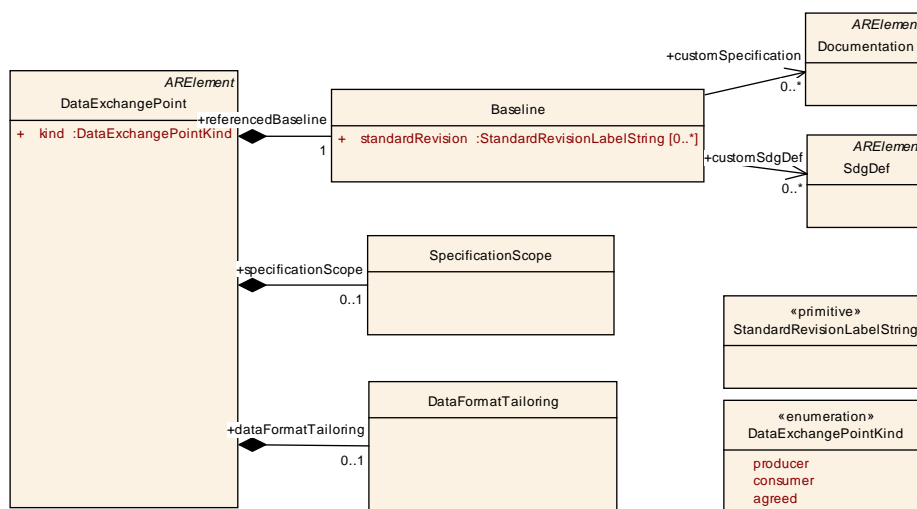
Figure 8.5: Overview of Data Exchange Point

[TPS_STDT_00121] High-level Overview Description of `DataExchangePoint` ⌈ The high-level overview description is provided by means of its attributes `longName`, `desc` and `introduction`. ⌋*(RS_STDT_00101, RS_STDT_00104)*

[TPS_STDT_00122] Purpose of `Baseline` ⌈ `Baseline` specifies a baseline of the AUTOSAR standard that is used as a reference for all references to AUTOSAR Specification Elements in this `DataExchangePoint`. The baseline is specified by listing the AUTOSAR standards and their revisions. Custom defined functionality and deviations are described using the `Documentation` M1 Documentation capabilities. ⌋*(RS_STDT_00105)*

[constr_2609] Single revision per AUTOSAR standard ⌈ The `standardRevision` may only contain a single revision per AUTOSAR standard. E.g. it is allowed to combine the AUTOSAR standards "Foundation" in revision 1.0.0 with the "Classic Platform" in revision 4.3.0. However, it is not allowed to reference the revisions 4.2.2 and 4.3.0 of the "Classic Platform" in the same `Baseline`. ⌋*()*

Class	DataExchangePoint			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint			
Note	The Data Exchange Point describes the relationship between a work product and its intended use in the methodology with a tailoring of the AUTOSAR templates. An informal description is provided by the 'desc' and 'introduction' attributes of the DataExchangePoint. The informal description SHOULD include the subject that is described by this data exchange point. E.g. • producible data of tool A, version x • consumable data of tool B, version y • agreed profile between partner A and partner B in project xyz **Tags:** atp.recommendedPackage=DataExchangePoints			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
dataFormatTailoring	DataFormatTailoring	0..1	aggr	tailoring to the Autosar Exchange Data Format The subset and tailoring of the templates specifications (Meta-Classes, Attributes, Sdgs, Constraints, SpecItems) **Tags:** xml.sequenceOffset=40
kind	DataExchangePointKind	1	attr	Specifies the kind of this DataExchangePoint. It provides information if this DataExchangePoint represents • the output of a tool that produce data, • the input of a tool that consumes data or • an agreed profile
referencedBaseline	Baseline	1	aggr	The baseline of the AUTOSAR standard that is used as a reference within this Data Exchange Point. **Tags:** xml.sequenceOffset=10
specificationScope	SpecificationScope	0..1	aggr	The speficication of the relevant subset of Autosar standardized and custom specifications. **Tags:** xml.sequenceOffset=30

Table 8.1: DataExchangePoint

Class	Baseline			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint			
Note	Specification of the baseline of the AUTOSAR standard this Data Exchange Point relates to. The baseline is specified by listing the AUTOSAR products and their revisions. Custom defined functionality and deviations to the standard can be provided as well. All references to specification elements in this Data Exchange Point refer to specification elements that are part of this specification baseline.			
Base	ARObject			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
customSdg Def	SdgDef	*	ref	Reference to custom SdgDefs that extend the data format of this baseline, **Tags:** xml.sequenceOffset=30
customSpe cification	Documentation	*	ref	Reference tof custom specifications that extend this baseline, **Tags:** xml.sequenceOffset=20
standardR evision	StandardRevisi onLabelString	*	attr	Specifies a combination of revisions of AUTOSAR standards that are used as the specification baseline of this Data Exchange Point. All standard specification elements that are referenced by this Profile of Data Exchange Point have to be part of specifications that belong to the defined AUTOSAR standards. **Tags:** xml.sequenceOffset=10

Table 8.2: Baseline

Primitive	StandardRevisionLabelString
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint
Note	Specifies a revision of an AUTOSAR standard. The label is composed out of an abbreviation of the standard and an identification of the revision: "<standard_abbr> R<major>.<minor>.<revision>" <standard_abbr> is one of: • FO - Foundation • CP - Classic Platform • AP - Adaptive Platform • TC - Acceptance Tests for Classic Platform **Tags:** xml.xsd.customType=STANDARD-REVISION-LABEL-STRING; xml.xsd.pattern=(FO|CP|TC|AP) R[0-9]+\.[0-9]+\.[0-9]+([\._;].*)?; xml.xsd.type=string

Table 8.3: StandardRevisionLabelString

Enumeration	DataExchangePointKind

Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint
Note	Specifies the kind of a DataExchangePoint.
Literal	*Description*
agreed	the data exchange point description represents the agreed data exchange point that should be used during data exchange **Tags:** atp.EnumerationValue=2
consumer	the data exchange point description represents the input of a consuming tool. **Tags:** atp.EnumerationValue=1
producer	the data exchange point description represents the output of a producing tool. **Tags:** atp.EnumerationValue=0

Table 8.4: DataExchangePointKind

Listing 8.1: Example of Top Level Structure

```xml
<AR-PACKAGE>
  <SHORT-NAME>DataExchangePoints</SHORT-NAME>
  <ELEMENTS>
    <DATA-EXCHANGE-POINT>
      <SHORT-NAME>ECU_System_Description</SHORT-NAME>
      <LONG-NAME>
        <L-4 L="EN">ECU System Description for Configuration of ComStack
            for Unsegmented Unmultiplexed Signal-Based Communication on
            CAN</L-4>
      </LONG-NAME>
      <DESC>
        <L-2 L="EN">This profile describes the data that is exchanged in
            the deliverable "ECU␣System␣Description" and focuses on data
            that is required for configuring the behavior of the ECU on
            the CAN network with respect to unsegmented signal-based
            communication. The profile shows the supported input of
            FancyCanStackConfigurator version 1.2.2</L-2>
      </DESC>
      <INTRODUCTION>
        <P>
          <L-1 L="EN">Consumer, Tool: FancyCanStackConfigurator version
              1.2.2, invoked using "fancy␣-buildCar"</L-1>
        </P>
      </INTRODUCTION>
      <KIND>CONSUMER</KIND>
      <REFERENCED-BASELINE>
        <STANDARD-REVISIONS>
          <STANDARD-REVISION>CP R4.3.0</STANDARD-REVISION>
          <STANDARD-REVISION>FO R1.0.0</STANDARD-REVISION>
        </STANDARD-REVISIONS>
          <CUSTOM-SPECIFICATION-REFS>
          <CUSTOM-SPECIFICATION-REF DEST="DOCUMENTATION">/VendorName/
              DataExchangePoints/CustomExtensions</CUSTOM-SPECIFICATION-
              REF>
        </CUSTOM-SPECIFICATION-REFS>
      </REFERENCED-BASELINE>
```

```
<SPECIFICATION-SCOPE>
  <!-- -->
</SPECIFICATION-SCOPE>
<DATA-FORMAT-TAILORING>
  <!-- -->
</DATA-FORMAT-TAILORING>
</DATA-EXCHANGE-POINT>
<DOCUMENTATION>
  <SHORT-NAME>CustomExtensions</SHORT-NAME>
  <DOCUMENTATION-CONTENT>
    <CHAPTER>
      <SHORT-NAME>RFCs</SHORT-NAME>
      <STRUCTURED-REQ>
        <SHORT-NAME>Example_RFC12345</SHORT-NAME>
        <DESCRIPTION>
          <P>
            <L-1 L="EN">Description of the change request</L-1>
          </P>
        </DESCRIPTION>
      </STRUCTURED-REQ>
    </CHAPTER>
  </DOCUMENTATION-CONTENT>
</DOCUMENTATION>
</ELEMENTS>
</AR-PACKAGE>
```

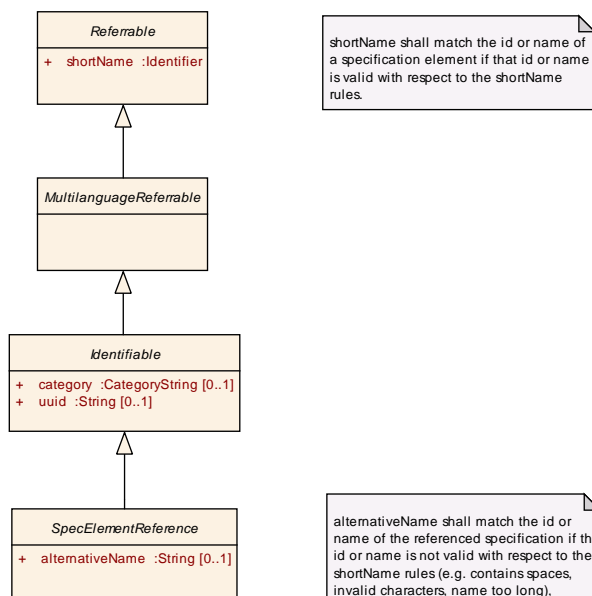## 8.2.2 Referencing Standardized Specification Elements

Figure 8.6: Referencing Specification Elements

[TPS_STDT_00102] Referencing AUTOSAR Specification Elements via short-Name ⌈ If the name of the AUTOSAR Specification Element follows the rules of shortNames (see Identifier), then SpecElementReference.short-

`Name` shall describe the name of the referenced `AUTOSAR Specification Element`. ⌋*(RS_STDT_00102, RS_STDT_00103, RS_STDT_00106, RS_STDT_00108, RS_STDT_00109)*

[TPS_STDT_00103] Referencing AUTOSAR Specification Elements via alternativeName ⌈ If the name of the `AUTOSAR Specification Element` does not follow the rules of `shortName`s (see `Identifier`), then `alternativeName` shall describe the name of the referenced `AUTOSAR Specification Element`. The `shortName` shall contain a simplified name that is created using the following rules:

- replace all characters, that are not allowed by the shortName rules (see `Identifier`) by '_' (underline)

- If the shortName is longer than 128 characters, then the following algorithm applies:

  1. get the first 121 characters. This leaves room for a separator and a CRC number.

  2. append "_0x"

  3. append a CRC16 checksum in hex format (uppercase) of the original name. For more information about the CRC16 algorithm see [18].

⌋*(RS_STDT_00102, RS_STDT_00103, RS_STDT_00106, RS_STDT_00108, RS_STDT_00109)*

[constr_2610] No alternativeName if matching via shortName ⌈ The `alternativeName` shall not be set if the referenced AUTOSAR Specification Element matches the rules of `Identifier`. ⌋*()*

[constr_2611] Referenced AUTOSAR Specification Elements shall be part of the AUTOSAR Specification Baseline ⌈ If the `SpecElementReference` references an AUTOSAR specification element then the `shortName` or `alternativeName` shall match the name of the AUTOSAR specification element in a specification that is part of the revision of the standard that is specified in `Baseline`. ⌋*()*

See also example A.1.

Class	SpecElementReference (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Common Patterns			
Note	This is a reference to a specification element in the Autosar standard.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
alternative Name	String	0..1	attr	Alternative name of a specification element if its name doesn't fit into the shortName. E.g. because the name contains spaces.

Table 8.5: SpecElementReference

8.2.3 Referencing Custom Specification Elements

[TPS_STDT_00104] Referencing Custom Specification Elements ⌈ If it is required to define custom specification elements that go beyond the AUTOSAR standardized specification elements, then the `Description of Data Exchange Point`s allows the referencing of those descriptions via AUTOSAR `shortName` path based references. If a reference to a custom Specification Element is defined, then this reference is used for identification of the Specification element. No matching of AUTOSAR defined Specification Elements via `alternativeName` or `shortName` applies. ⌋*(RS_STDT_00102, RS_STDT_00103, RS_STDT_00106, RS_STDT_00108, RS_STDT_00109)*

[constr_2608] Custom extensions shall be part of the `Documentation` that is referenced by the `Baseline` ⌈ If a `SpecElementReference` references a custom defined specification element, then this specification element shall be part of a `Documentation` that is referenced by the `Baseline` of this `Profile`. ⌋*()*
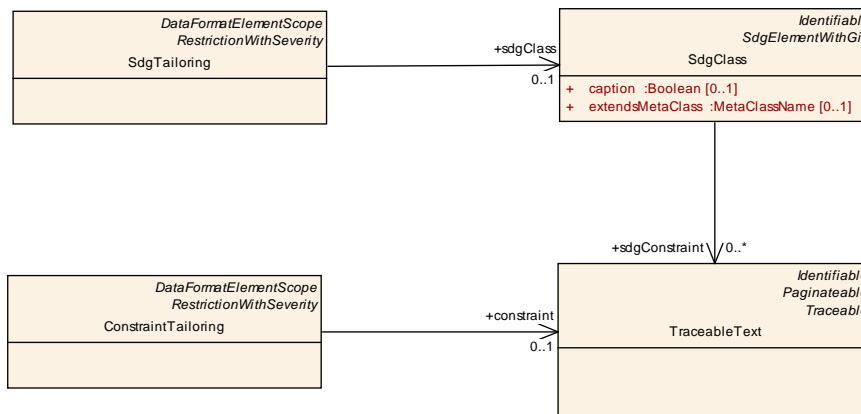
Figure 8.7: Referencing Custom Defined Constraints and Special Data Groups
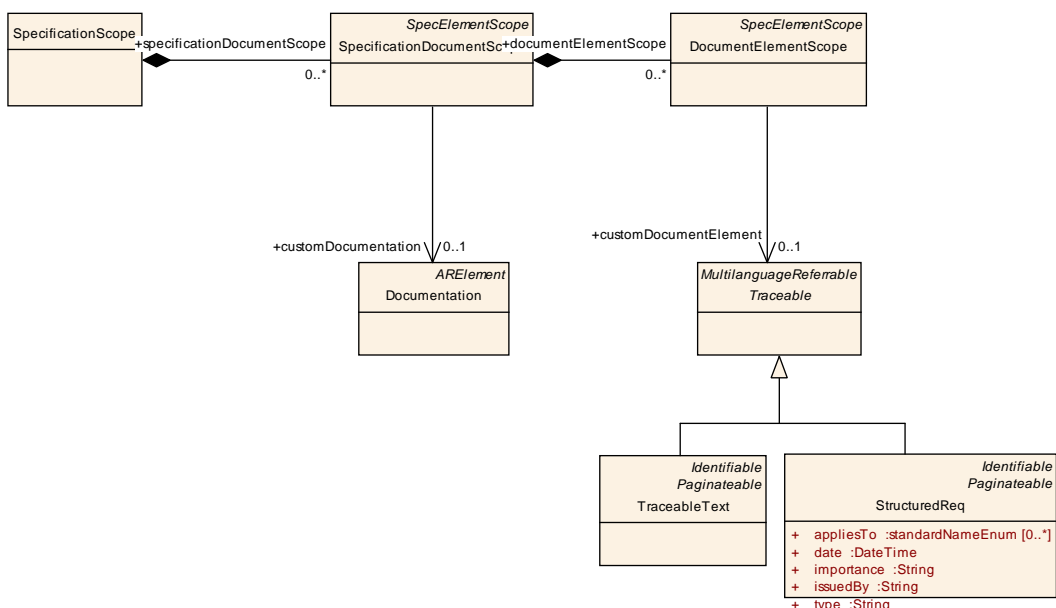
Figure 8.8: Referencing elements in custom specifications

See also example A.1.

8.2.4 Scoping of Specification Elements
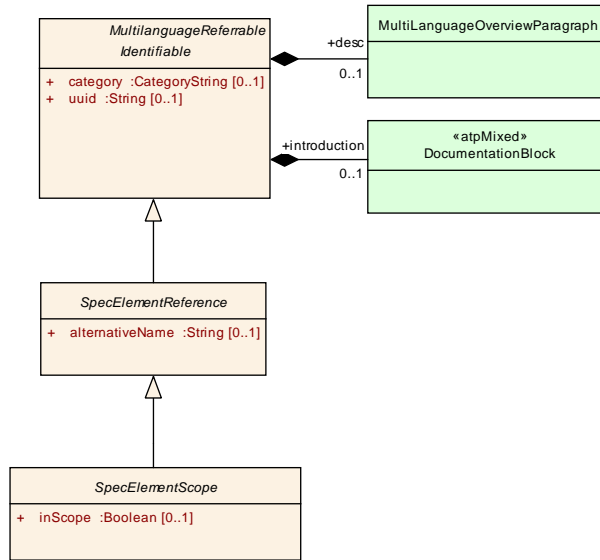
Figure 8.9: Scoping of Specification Elements

[TPS_STDT_00124] Purpose of `SpecElementScope` ⌈ For all AUTOSAR specification elements and custom functionality a Data Exchange Point describes if a referenced specification element is relevant for the Data Exchange Point. If `inScope`==true, then the specification element is relevant. (e.g. a requirement needs to be fullfilled, a constraint is enabled, an attribute shall exist, ...). If `inScope`==false, then the specification element is not relevant. (e.g. a requirement does not apply, a constraint is disabled, it is not relevant if an attribute exists, ...) ⌋*(RS_STDT_00103, RS_STDT_00106, RS_STDT_00108, RS_STDT_00109)*

Class	SpecElementScope (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Common Patterns			
Note	This class defines if a specification element is relevant within the context of this data exchange point.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
inScope	Boolean	0..1	attr	indicates, if a specification element is relevant for this data exchange point. It is relevant if inScope==true. It is not relevant or don't care if inScope=false.

Table 8.6: SpecElementScope

8.2.5 Tailoring of Data Format Elements
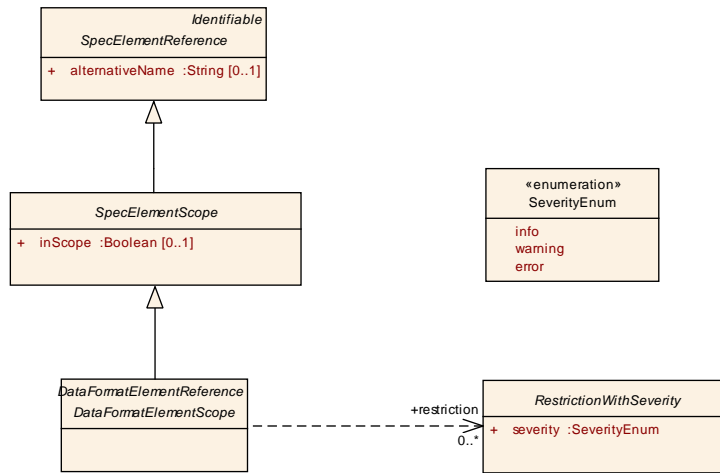
Figure 8.10: Tailoring of Data Format Elements
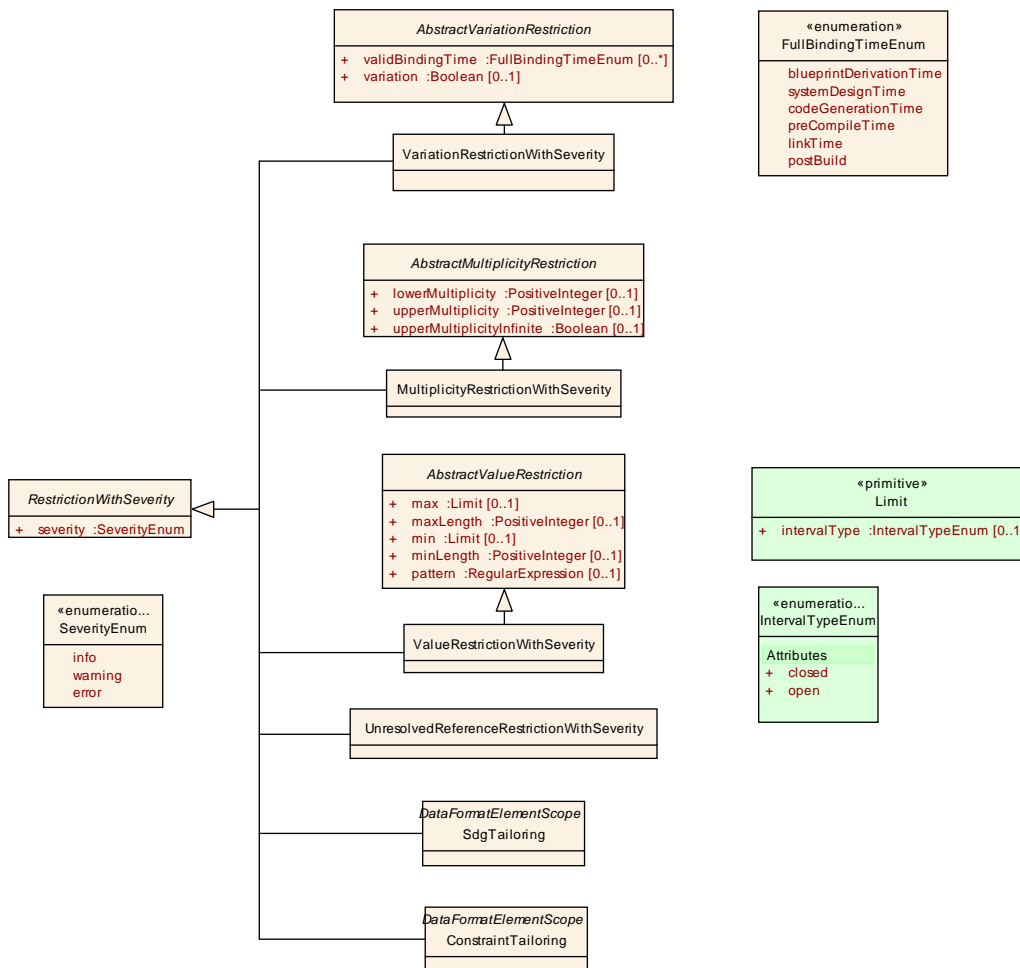
Figure 8.11: Restrictions with Severity

[TPS_STDT_00126] Definition: Data Format Elements ⌈ `Data Format Elements are Meta-Classes, Meta-Attributes, Constraints and Special Data`

`Group Definition`s that have direct impact on the AUTOSAR data exchange format. ⌋*(RS_STDT_00106, RS_STDT_00114)*

[TPS_STDT_00186] Scope and Restrictions of Data Format Elements ⌈ A `DataFormatElementScope` defines if a `Data Format Element` is relevant for the `Data Exchange Point`. If `inScope` == true then restrictions with severity specify additional constraints and their severity. ⌋*(RS_STDT_00106, RS_STDT_00114)*

[TPS_STDT_00172] Purpose of `RestrictionWithSeverity` ⌈ A `RestrictionWithSeverity` defines constraints on the model. The severity describes the severity level that is reported in case the restriction is violated. ⌋*(RS_STDT_00114)*

[TPS_STDT_00173] Purpose of `ValueRestrictionWithSeverity` ⌈ A `ValueRestrictionWithSeverity` defines constraints on the value of a simple attribute (string, integer, float). ⌋*(RS_STDT_00113)*

[TPS_STDT_00174] Purpose of `MultiplicityRestrictionWithSeverity` ⌈ A `MultiplicityRestrictionWithSeverity` specifies the valid number of occurrences of an element in the current context. ⌋*(RS_STDT_00106, RS_STDT_00110)*

[TPS_STDT_00175] Purpose of `VariationRestrictionWithSeverity` ⌈ A `VariationRestrictionWithSeverity` specifies constraints on the usage of variation and on the valid binding times. ⌋*(RS_STDT_00125)*

[TPS_STDT_00176] Context specific Tailoring ⌈ The tailoring of a `Meta Class` can optionally depend on

- the `role` by which an object is aggregated or referenced and

- conditions that depend for instance on `attribute values` (e.g. the value of "category")

⌋*(RS_STDT_00125)*

Class	RestrictionWithSeverity (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Common Patterns			
Note	A restriction that has a severity. The severity describes the severity level that is reported in case the restriction is violated.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
severity	SeverityEnum	1	attr	Severity level that is reported in case the restriction is violated.

Table 8.7: RestrictionWithSeverity

Enumeration	SeverityEnum
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint
Note	Definition of severity levels.
Literal	Description

error	Something is not right. High risk of interoperability issues. **Tags:** atp.EnumerationValue=2
info	Something was found that is worth mentioning. Low risk of interoperability issues. **Tags:** atp.EnumerationValue=0
warning	Something might be wrong depending on the context. Medium risk of interoperability issues. **Tags:** atp.EnumerationValue=1

Table 8.8: SeverityEnum

Class	**ValueRestrictionWithSeverity**			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Specifies valid values of primitive data types. A value is valid if all rules defined by this ValueRestriction evaluate to true.			
Base	ARObject, AbstractValueRestriction, RestrictionWithSeverity			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
–	–	–	–	–

Table 8.9: ValueRestrictionWithSeverity

Class	**AbstractValueRestriction (abstract)**			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Model RestrictionTypes			
Note	Restricts primitive values. A value is valid if all rules that are defined by this restriction evaluate to true.			
Base	ARObject			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
max	Limit	0..1	attr	Specifies the upper bounds for numeric values.
maxLength	PositiveInteger	0..1	attr	Specifies the maximum number of characters of textual values.
min	Limit	0..1	attr	Specifies the lower bounds for numeric values.
minLength	PositiveInteger	0..1	attr	Specifies the minimal number of characters of textual values.
pattern	RegularExpress ion	0..1	attr	Defines the exact sequence of characters that are acceptable.

Table 8.10: AbstractValueRestriction

Class	MultiplicityRestrictionWithSeverity			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Restriction that specifies the valid number of occurrences of an element in the current context.			
Base	ARObject, AbstractMultiplicityRestriction, RestrictionWithSeverity			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table 8.11: MultiplicityRestrictionWithSeverity

Class	AbstractMultiplicityRestriction (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Model RestrictionTypes			
Note	Restriction that specifies the valid number of occurrences of an element in the current context.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
lowerMultiplicity	PositiveInteger	0..1	attr	Specifies the minimal number of times an object shall occur. If this primitive attribute is not set, then the object is optional.
upperMultiplicity	PositiveInteger	0..1	attr	Specifies the maximum number of times an object may occur. If this primitive attribute is not set, then there is no limit with respect to the maximum occurrence.
upperMultiplicityInfinite	Boolean	0..1	attr	This explicitly specifies, that the upper multiplicity is NOT restricted. Note: The use of 'upperMultiplicityInfinite' and 'upperMultiplicity' is mutual exclusive.

Table 8.12: AbstractMultiplicityRestriction

Class	VariationRestrictionWithSeverity			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Defines constraints on the usage of variation and on the valid binding times.			
Base	ARObject, AbstractVariationRestriction, RestrictionWithSeverity			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table 8.13: VariationRestrictionWithSeverity

Class	AbstractVariationRestriction (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Model RestrictionTypes			
Note	Defines constraints on the usage of variation and on the valid binding times.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
validBindin gTime	FullBindingTime Enum	*	attr	List of valid binding times. **Tags:** xml.sequenceOffset=20
variation	Boolean	0..1	attr	Defines if the AUTOSAR model may define a VariationPoint at this location. **Tags:** xml.sequenceOffset=10

Table 8.14: AbstractVariationRestriction

Enumeration	FullBindingTimeEnum
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Model RestrictionTypes
Note	This enumeration specifies the BindingTimes that can be used in AUTOSAR models.
Literal	Description
blueprint Derivation Time	The point in time when an object is created from a blueprint. **Tags:** atp.EnumerationValue=0
codeGenera- tionTime	- Coding by hand, based on requirements document. - Tool based code generation, e.g. from a model. - The model may contain variants. - Only code for the selected variant(s) is actually generated. **Tags:** atp.EnumerationValue=2
linkTime	Configure what is included in object code, and what is omitted Based on which variant(s) are selected E.g. for modules that are delivered as object code (as opposed to those that are delivered as source code) **Tags:** atp.EnumerationValue=4
postBuild	PostBuild is the binding time which is bound latest at startup of the ECU. In other words this is everything between creation of the executable program and startup of the ECU. **Tags:** atp.EnumerationValue=5

preCompile Time	This is typically the C-Preprocessor. Exclude parts of the code from the compilation process, e.g., because they are not required for the selected variant, because they are incompatible with the selected variant, because they require resources that are not present in the selected variant. Object code is only generated for the selected variant(s). The code that is excluded at this stage code will not be available at later stages. **Tags:** atp.EnumerationValue=3

systemDe-signTime	
	    • Designing the VFB.
	
	    • Software Component types (PortInterfaces).
	
	    • SWC Prototypes and the Connections between SWCprototypes.
	
	    • Designing the Topology
	
	    • ECUs and interconnecting Networks
	
	    • Designing the Communication Matrix and Data Mapping
	
	Tags: atp.EnumerationValue=1

Table 8.15: FullBindingTimeEnum

8.2.6 Effective vs. Serialized Profile

[TPS_STDT_00105] Serialized Profile ⌈
The `Serialized Profile of Data Exchange Point` is the `ARXML Description` of a `Profile of Data Exchange Points`. This ARXML representation shall explicitly specify the parts of a Profile that deviate from the default values as described in section 8.5. It may explicitly specify values that do not deviate from the default values. ⌋*(RS_STDT_00120)*

[TPS_STDT_00106] Effective Profile ⌈
The `Effective Profile of Data Exchange Point` is a logical representation of a Profile that provides

    • a `scope` for all AUTOSAR Specifications and their elements and

    • a `tailoring` and `restriction`s for each `Meta Class` and `Attribute`, `Constraint`, etc.

of a dedicated AUTOSAR revision. It is calculated by applying the default values that are described in section 8.5 whenever the given profile does not explicitly specify a value. ⌋*(RS_STDT_00120)*

8.2.7 Documentation of Rationales

[TPS_STDT_00170] Local documentation of Rationale ⌈
`desc` and `introduction` of the `SpecElementScope` objects can be used to document why something is in scope or tailored in a specific way. ⌋*(RS_STDT_00115)*

[TPS_STDT_00168] Share documentation of Rationale ⌈
A `DocumentElementScope` can reference multiple `DataFormatElementReference`s in order to document that it is the rationale for the referenced tailorings. ⌋
(RS_STDT_00115)
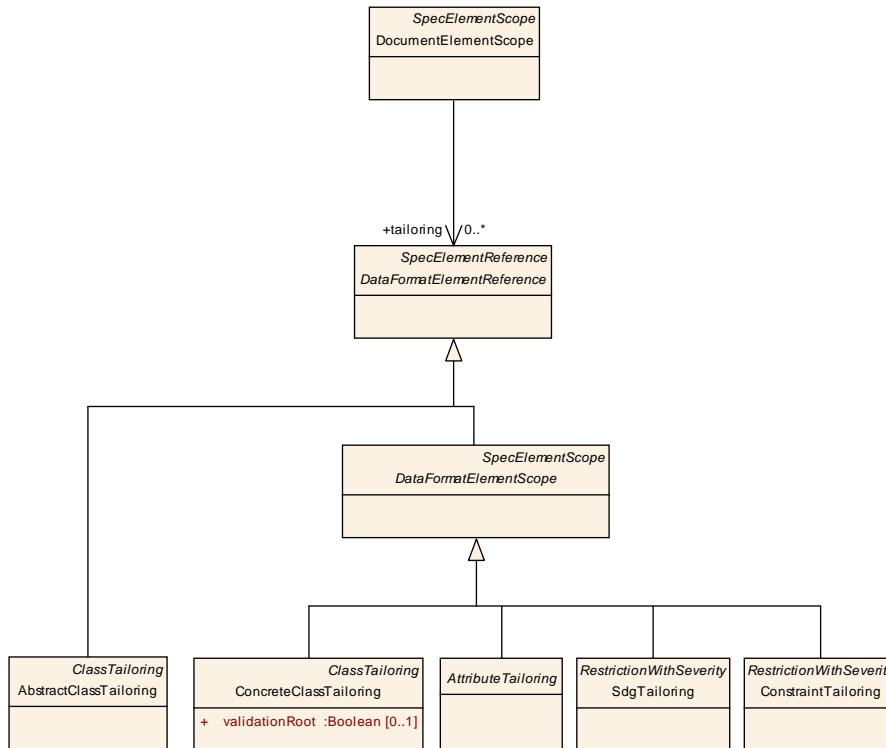
Figure 8.12: Shared Rationale

Class	**DataFormatElementReference (abstract)**			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Common Patterns			
Note	Superclass of all references to specification elements that have direct impact on the data exchange format (Meta-Classes, Meta-Attributes, constraints, SdgDefs)			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
–	–	–	–	–

Table 8.16: DataFormatElementReference

Class	DataFormatElementScope (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::DataFormatTailoring			
Note	This class specifies if a Meta Class, Meta Attribute, Constraint or SdgDef is relevant for the Data Exchange Point.			
Base	ARObject, DataFormatElementReference, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference, SpecElementScope			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table 8.17: DataFormatElementScope

8.2.8 Validation Semantics

[TPS_STDT_00127] Validation Environment ⌈ The evaluation of the compliance of an `AUTOSAR Model` with a profile assumes that:

- The model is loaded and merged according to the `splitable` rules as defined in [7].

- Default values that are standardized by AUTOSAR are applied according to the strategy defined in `PrimitiveAttributeTailoring.defaultValue-Handling`.

- Variation is bound (temporarily).

⌋*(RS_STDT_00111)*

[TPS_STDT_00129] Semantics of `DataFormatElementScope` with `in-Scope==true` ⌈ If `inScope` of `DataFormatElementScope` is true then all attached restrictions are enabled otherwise they are disabled. E.g. If a meta class is out of scope, then the AUTOSAR model may contain an instance of that meta class. However this instance is not subject of validation. ⌋*(RS_STDT_00106, RS_STDT_00121)*

Figure 8.13 visualizes the semantics of the scope of `DataFormatElementScope`.
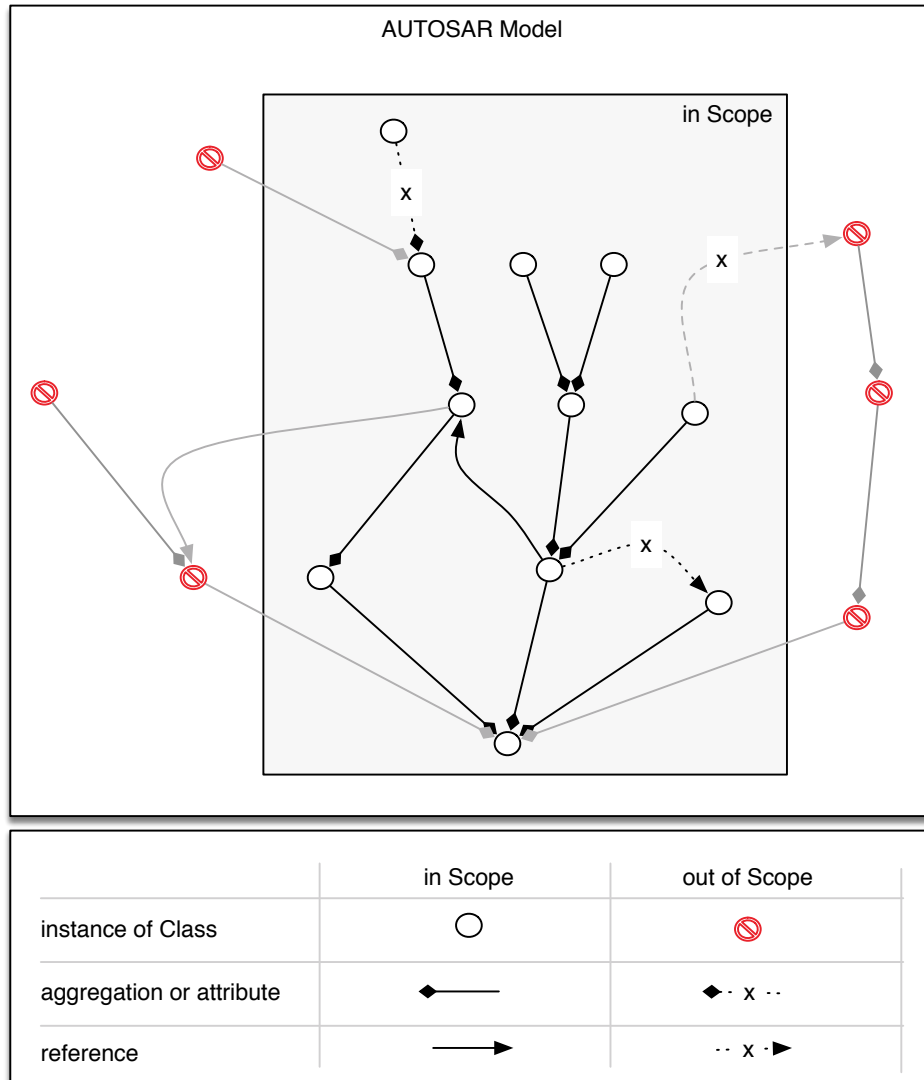
Figure 8.13: Example of AUTOSAR Model with Scoping.

[TPS_STDT_00130] Navigation strategy for validation ⌈ The evaluation of the restrictions that are enabled or implied by the profile focuses on the subset of the `AUTOSAR Model` that is reachable from one or more validationRoot objects using the following navigation strategy. In contrast to the scoping based on meta classes and attributes as described in [TPS_STDT_00129] this navigation strategy allows to collect all objects in the current model that are actually used directly or indirectly by the instances of `ConcreteClassTailoring`s with `inScope`==true. E.g. It can be used to differentiate interfaces that are used from interfaces that are not used. Interfaces that are not used may contain errors while interfaces that are used should be valid.

- Start with an instance of a Meta-Class that is specified as a root element for the validation (`ConcreteClassTailoring.validationRoot`==true). If there are more than one validationRoot elements, then the validating tool should support the selection of one or more elements that are subject of validation.

- Follow the aggregations if the following preconditions evaluate to true:

  1. The aggregation is in scope and the aggregation is not explicitly excluded (`AggregationTailoring`.`inScope`==true AND `AggregationTailoring`.`multiplicityRestriction`.`upperMultiplicity`!=0) AND

  2. The aggregated object is in scope and it is not explicitly excluded (`ConcreteClassTailoring`.`inScope`==true AND `ConcreteClassTailoring`.`multiplicityRestriction`.`upperMultiplicity`!=0)

- Follow the references if the following preconditions evaluate to true:

  1. The reference is in scope and it is not explicitly excluded (`ReferenceTailoring`.`inScope`==true AND `ReferenceTailoring`.`multiplicityRestriction`.`upperMultiplicity`!=0) AND

  2. The referneced object is in scope and and not explicitly excluded (`ConcreteClassTailoring`.`inScope`==true AND `ConcreteClassTailoring`.`multiplicityRestriction`.`upperMultiplicity`!=0)

⌋*(RS_STDT_00107)*

Figure 8.14 shows an example of the application of the aforementioned navigation strategy.
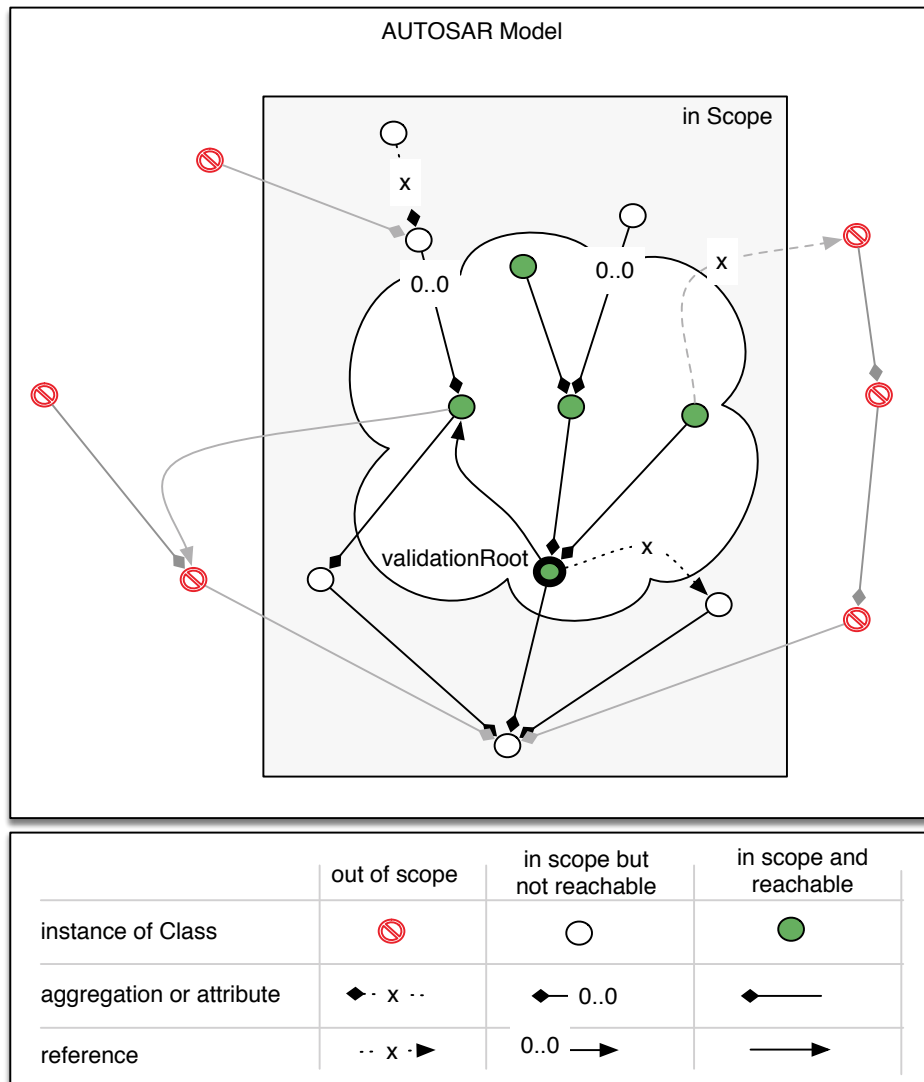
Figure 8.14: Example of AUTOSAR Model with Scoping (Elements that are reachable during validation are marked green)

8.3 Scoping of Specifications

[TPS_STDT_00156] Purpose of `SpecificationScope` ⌈ The `Specification-Scope` specifies the subset of AUTOSAR Specifications and AUTOSAR specification elements that is relevant for this `DataExchangePoint`. (See 8.15) ⌋ *(RS_STDT_00102, RS_STDT_00103)*

[TPS_STDT_00188] Purpose of `SpecificationDocumentScope` ⌈ The `SpecificationDocumentScope` if an AUTOSAR or custom specification is in scope of this `DataExchangePoint`. Autosar specifications are identified by their title. Custom specifications are referenced by `SpecificationDocumentScope.customDocumentation`. ⌋ *(RS_STDT_00102, RS_STDT_00103)*

[TPS_STDT_00187] Purpose of `DocumentElementScope` ⌈ The `DocumentElementScope` specifies if an element in an AUTOSAR or custom specification is relevant for this `DataExchangePoint`. Elements of Autosar Specifications are identified by their Id (e.g. TPS_STDT_00187) that is composed according to [TPS_STDT_00042] or its name if the specification element is a SPEM Work Definition or SPEM Work Product in the Methodology specification [19]. Custom elements are referenced by `DocumentElementScope.customDocumentElement`. ⌋ *(RS_STDT_00102, RS_STDT_00103)*

[TPS_STDT_00123] Guidance on how to specify `SpecificationDocumentScope` and `DocumentElementScope` ⌈ When specifying the `SpecificationDocumentScope`s and `DocumentElementScope`s of a `Data Exchange Point` then the author should focus on `Autosar Specifcation`s and `Specification Element`s that describe the current status of the data and on the description of how the data will be used after data exchange. ⌋*(RS_STDT_00102, RS_STDT_00103)*

For example, a `Profile of Data Exchange Point` should refer to the `Autosar Specification` "Methodology" [19] and should refer to a `deliverable`. Additionally, it should describe which follow-up activities are intended to be performed based on that deliverable.

However, the author does not need to describe how the `deliverable` was produced.
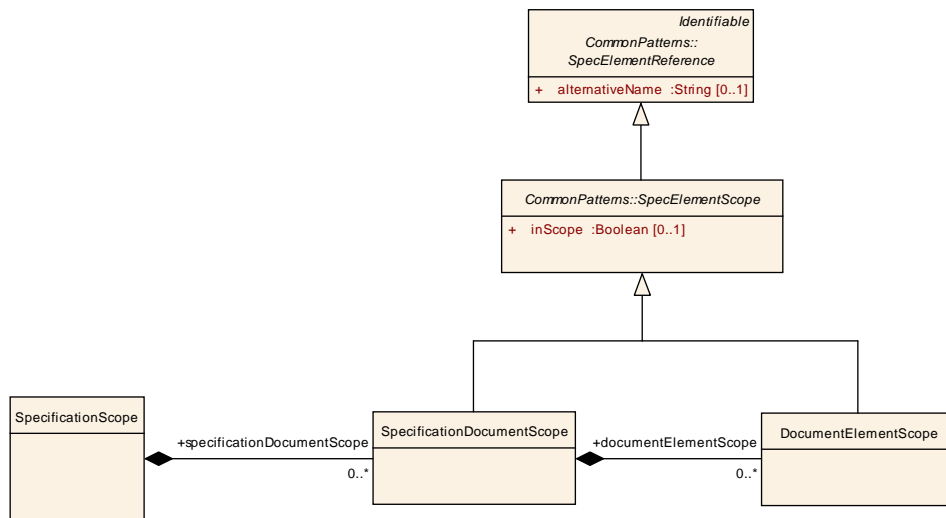
Figure 8.15: Overview SpecificationScope

Class	SpecificationScope			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint:: SpecificationScope			
Note	Specification of the relevant subset of Autosar specifcations.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
specificationDocumentScope	SpecificationDocumentScope	*	aggr	The Autosar or custom specifications that contain that are considered in this Data Exchange Point.

Attribute	Type	Mul.	Kind	Note

Table 8.18: SpecificationScope

Class	SpecificationDocumentScope			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint:: SpecificationScope			
Note	Represents a standardized or custom specification document such as Software Component Template, Main Requirements, Specification of Communication, etc. Autosar specifications are referenced via their title.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference, SpecElementScope			
Attribute	Type	Mul.	Kind	Note
customDocumentation	Documentation	0..1	ref	reference to a custom defined specification.
documentElementScope	DocumentElementScope	*	aggr	An element with a name or ID that is specified in the Spcification Document.

Table 8.19: SpecificationDocumentScope

Class	DocumentElementScope			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint:: SpecificationScope			
Note	Specifies if a specification element such as a requirement, specification, deliverable, artifact, task definition or activity is in scope of this data exchange point. The DocumentElementScope may reference all specification elements that have a name or ID. The only exception are Meta Classes, Meta Attribute and constraints which are handled in the Data Format Tailoring section of the Profile of Data Exchange Point. Elements of Autosar specification documents are referenced via their ID (requirement, specification items) or name (deliverable, artifact, task definition or activity)			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference, SpecElementScope			
Attribute	Type	Mul.	Kind	Note
customDocumentElement	Traceable	0..1	ref	Reference to a custom defined specification element.
tailoring	DataFormatElementReference	*	ref	Data Format Element that is implied by this element in the specification. Used to share one rationale for more tailorings.

Table 8.20: DocumentElementScope

8.3.1 Addition Constraints

None

8.4 Tailoring of Data Format Elements

[TPS_STDT_00157] Purpose of `DataFormatTailoring` ⌈ The `DataFormatTailoring` tailors the `AUTOSAR Data Exchange Format` for a specific data exchange point. This includes:

- Identification if meta-classes, attributes, constraints, or SDGs are relevant (in-Scope) of the data exchange point.

- Restriction of multiplicities, attribute values and use of variation

- Specification of severities in case a rule is violated

- Declaration of completeness

- Declaration on how to handle AUTOSAR defined default values

- Specification of the structure of Special Data Group

- Definition of the start element and navigation strategy during validation

⌋(*RS_STDT_00106, RS_STDT_00107, RS_STDT_00108, RS_STDT_00109, RS_STDT_00110, RS_STDT_00111, RS_STDT_00113, RS_STDT_00114, RS_STDT_00116*)
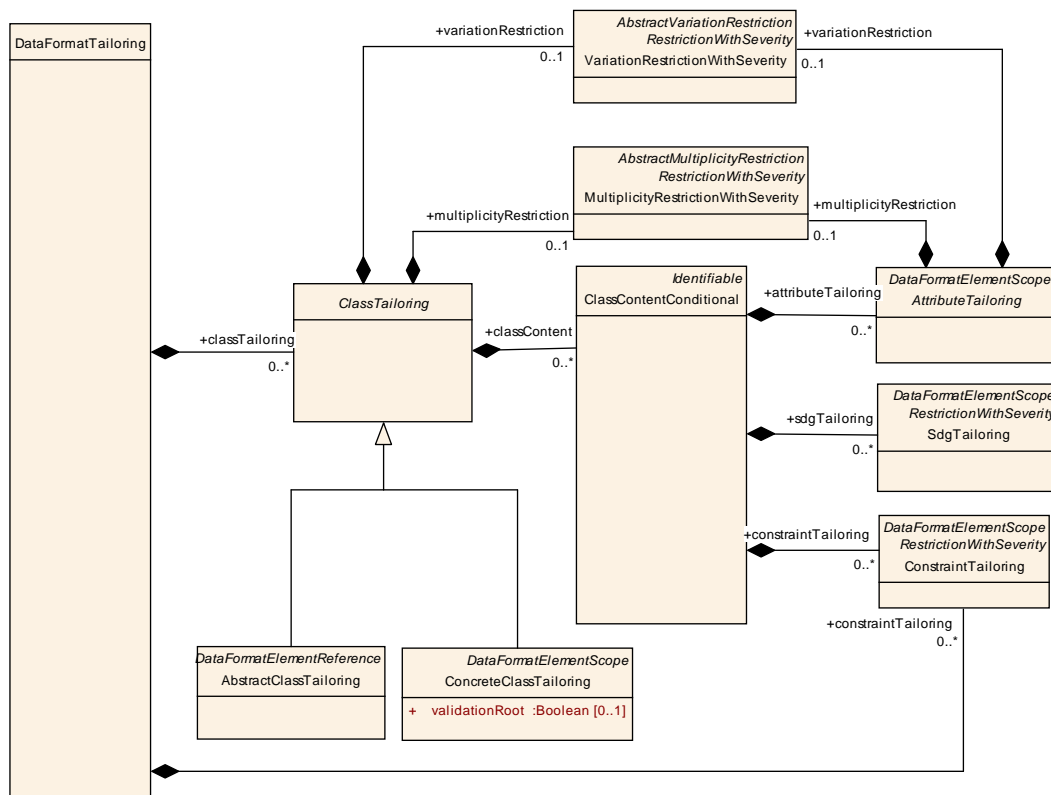
Figure 8.16: Overview of DataFormatTailoring

8.4.1 Tailoring of Classes

8.4.1.1 Description

[TPS_STDT_00145] Purpose of `ClassTailoring` ⌈ The `ClassTailoring` tailors a `Meta-Class` with respect to the relevant attributes, applicable constraints, number of occurances, use of variation and the extensibility via Sdgs. ⌋*(RS_STDT_00106)*

[TPS_STDT_00109] AUTOSAR Standardized Concrete Meta-Classes ⌈ AUTOSAR standardized concrete meta-classes are specified by concrete UML classes (abstract=false) that are not representing primitive types (no stereotype «primitive», «enumeration») in the AUTOSAR MetaModel [20], sub-packages "M2::AUTOSAR DataFormat" or "M2::MSR".

The reference is established via the name of the UML classes. ⌋*(RS_STDT_00106)*

[TPS_STDT_00146] AUTOSAR Standardized Abstract Meta-Classes ⌈ AUTOSAR standardized abstract meta-classes are specified by abstract UML classes (abstract=true) that are not representing primitive types (no stereotype «primitive», «enumeration») in the AUTOSAR Meta Model [20], sub-packages "M2::AUTOSAR DataFormat" or "M2::MSR".

The reference is established via the name of the UML classes. ⌋*(RS_STDT_00106)*

[TPS_STDT_00177] Global `ClassTailoring` ⌈ `ClassTailoring`s that are directly contained by `DataFormatTailoring` are global `ClassTailoring`s. If a global `ConcreteClassTailoring` is `inScope` then its tailorings and restrictions apply for all reachable instances of the class. ⌋*(RS_STDT_00106)*

[TPS_STDT_00178] Role Specific `ClassTailoring` ⌈ `ClassTailoring`s that are contained by `AggregationTailoring.typeTailoring` or `ReferenceTailoring.typeTailoring` are context specific `ClassTailoring`s. Their tailorings and restrictions are applicable if

- `inScope` == true AND

- the object in the AUTOSAR model is aggregated or referenced by the specified role.

⌋*(RS_STDT_00106)*

See also examples A.2, A.3 and A.4.

[TPS_STDT_00179] Conditional `ClassTailoring` ⌈ The content model of a metaclass is tailored via one or more `ClassContentConditional`s. Multiple `ClassContentConditional`s may apply for a single object. ⌋*(RS_STDT_00106)*

[TPS_STDT_00180] Invariant Content Model ⌈ If `condition` does not exist, then the tailorings and restrictions defined by this `ClassContentConditional` shall be applied for all instances within the current context. ⌋*(RS_STDT_00106)*

[TPS_STDT_00181] Conditional Content Model ⌈ If `condition` is defined, then the restrictions defined by this `ClassContentConditional` shall apply if that condition evaluates to true. ⌋(*RS_STDT_00106*)

See also example A.5.
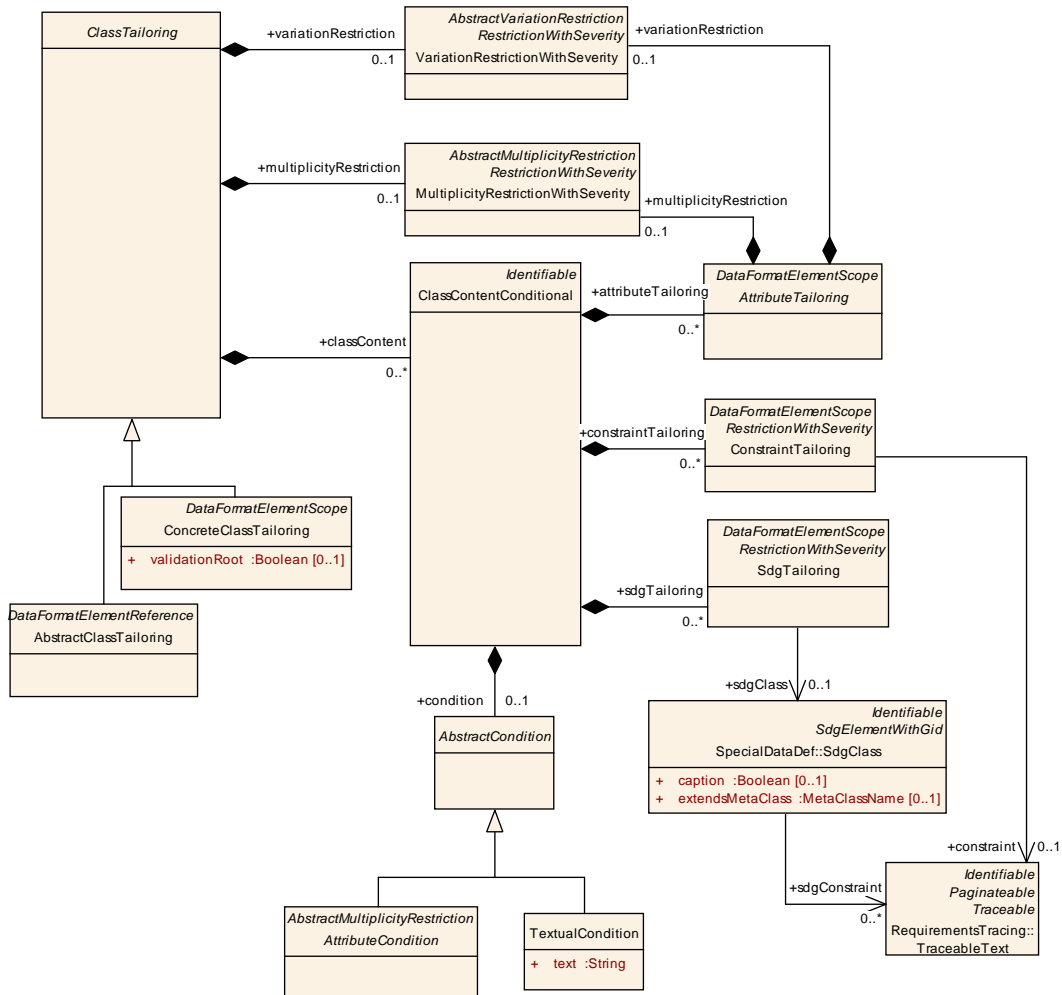
Figure 8.17: Overview of ClassTailoring
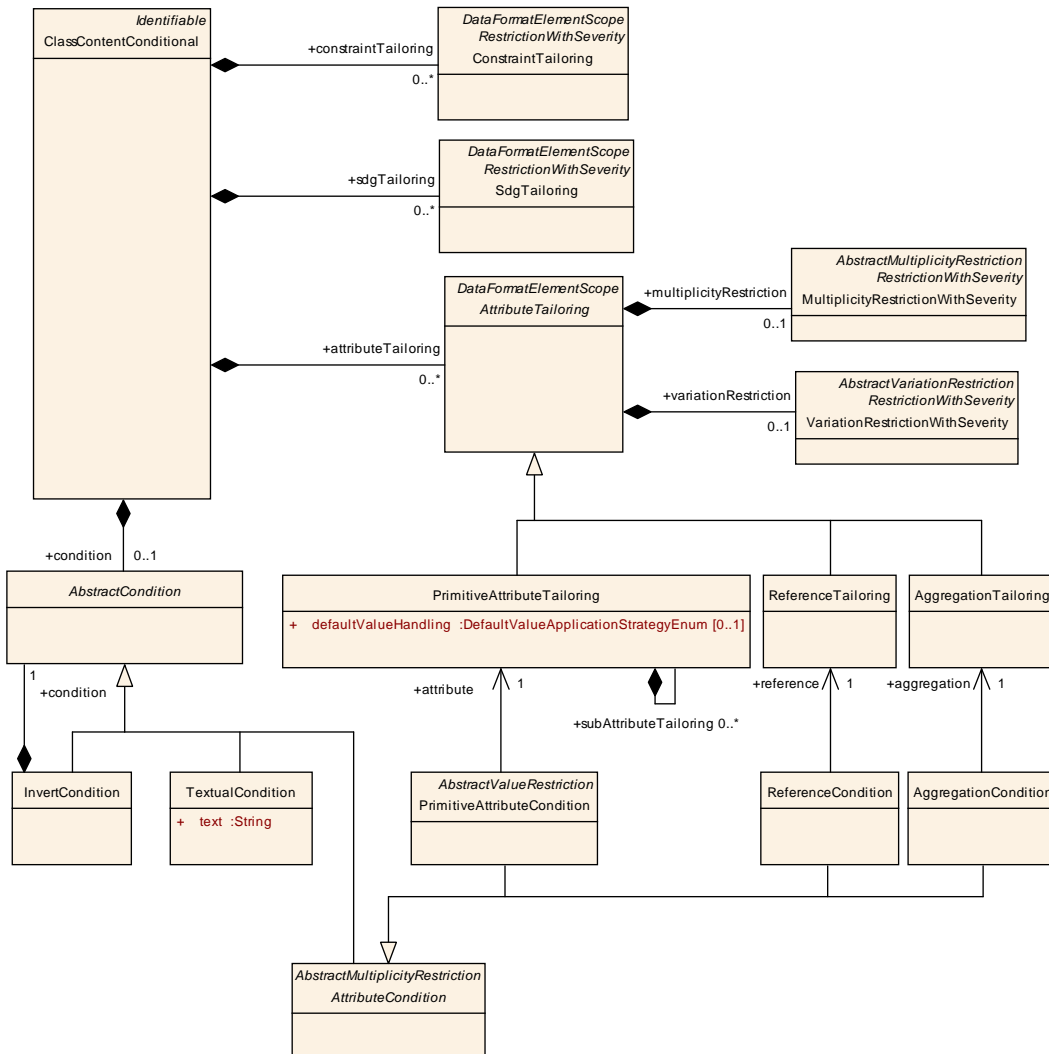
Figure 8.18: Overview of ClassContentConditional

Class	AbstractClassTailoring
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring
Note	Tailoring of abststract classes in the AUTOSAR meta-model
Base	ARObject, ClassTailoring, DataFormatElementReference, Identifiable, Multilanguage Referrable, Referrable, SpecElementReference
Attribute	**Type**	**Mul.**	**Kind**	**Note**
—	—	—	—	—

Table 8.21: AbstractClassTailoring

Class	AbstractCondition (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	A premise upon which the fulfillment of an agreement depends			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table 8.22: AbstractCondition

Class	AggregationCondition			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	The AggregationCondition evaluates to true, if the referenced aggregation is accepted by all rules of this condition.			
Base	ARObject, AbstractCondition, AbstractMultiplicityRestriction, AttributeCondition			
Attribute	Type	Mul.	Kind	Note
aggregation	AggregationTailoring	1	ref	The aggregation that has to be accepted by the restrictions of this AggregationCondition

Table 8.23: AggregationCondition

Class	AttributeCondition (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	The AttributeCondition evaluates to true, if the referenced attribute is accepted by all rules of this condition.			
Base	ARObject, AbstractCondition, AbstractMultiplicityRestriction			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table 8.24: AttributeCondition

Class	ClassTailoring (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	The ClassTailoring is an abstract class that allows the tailoring of its attributes, applicable constraints and Sdgs.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
classContent	ClassContentConditional	*	aggr	Specifies the accepted / not accepted content of the class. All rules apply that fullfill the condition of the ClassContentConditional **Tags:** xml.sequenceOffset=30

Attribute	Type	Mul.	Kind	Note
multiplicity Restriction	MultiplicityRestrictionWithSeverity	0..1	aggr	Specifies the multiplicity of the class in the current context. **Tags:** xml.sequenceOffset=10
variationRestriction	VariationRestrictionWithSeverity	0..1	aggr	Specifies restrictions on the usage of variant handling. **Tags:** xml.sequenceOffset=20

Table 8.25: ClassTailoring

Class	ClassContentConditional			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::DataFormatTailoring			
Note	Specifies the valid content of the class. The content can optionally depend on a condition. (E.g. value of attribute 'category')			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
attributeTailoring	AttributeTailoring	*	aggr	Tailorings of the owned and inherited attributes of this Meta Classes **Tags:** xml.sequenceOffset=20
condition	AbstractCondition	0..1	aggr	The rules on the content of this class are enabled if the condition validates to true. **Tags:** xml.sequenceOffset=10
constraintTailoring	ConstraintTailoring	*	aggr	Specification of tailorings of Constraints of that are owned by this Meta Classes **Tags:** xml.sequenceOffset=30
sdgTailoring	SdgTailoring	*	aggr	Specification of the applicable Special Data Group **Tags:** xml.sequenceOffset=40

Table 8.26: ClassContentConditional

Class	ConcreteClassTailoring			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::DataFormatTailoring			
Note	Tailoring of concrete meta classes.			
Base	ARObject, ClassTailoring, DataFormatElementReference, DataFormatElementScope, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference, SpecElementScope			
Attribute	**Type**	**Mul.**	**Kind**	**Note**

Attribute	Type	Mul.	Kind	Note
validationRoot	Boolean	0..1	attr	Specification if this concrete Meta-Class is a root element for validation. I.e.: The validation starts at an object of this concrete Meta-Class and continues by following all aggregations and references that are in scope of this Data Exchange Point. **Tags:** xml.sequenceOffset=10

Table 8.27: ConcreteClassTailoring

Class	InvertCondition			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	inverts the nested condition			
Base	ARObject, AbstractCondition			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
condition	AbstractCondition	1	aggr	The inverted condition

Table 8.28: InvertCondition

Class	PrimitiveAttributeCondition			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	The PrimitiveAttributeCondition evaluates to true, if the referenced primitive attribute is accepted by all rules of this condition.			
Base	ARObject, AbstractCondition, AbstractMultiplicityRestriction, AbstractValue Restriction, AttributeCondition			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
attribute	PrimitiveAttributeTailoring	1	ref	The primitive attribute that has to be accepted by the restrictions of this PrimitiveAttributeCondition

Table 8.29: PrimitiveAttributeCondition

Class	ReferenceCondition			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	The ReferenceCondition evaluates to true, if the referenced reference is accepted by all rules of this condition.			
Base	ARObject, AbstractCondition, AbstractMultiplicityRestriction, AttributeCondition			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
reference	ReferenceTailoring	1	ref	The reference that has to be accepted by the restrictions of this ReferenceCondition

Table 8.30: ReferenceCondition

Class	TextualCondition			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::DataFormatTailoring			
Note	Specifies additional conditions for one or more model elements. The condition is described using human language.			
Base	ARObject, AbstractCondition			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
text	String	1	attr	Human language description of the condition.

Table 8.31: TextualCondition

8.4.1.2 Additional Constraints

[constr_2612] `shortName` of `ConcreteClassTailoring` shall match the name of an AUTOSAR specified concrete meta-class ⌈ `shortName` of `ConcreteClassTailoring` shall match the name of an AUTOSAR specified concrete meta-class). ⌋*()*

[constr_2613] `shortName` of `AbstractClassTailoring` shall match the name of an AUTOSAR specified abstract meta-class ⌈ `shortName` of `AbstractClassTailoring` shall match the name of an AUTOSAR specified abstract meta-class). ⌋*()*

[constr_2614] `PrimitiveAttributeCondition.attribute` shall reference invariant owned `PrimitiveAttributeTailoring`, only ⌈ The following conditions need to evaluate to true for `PrimitiveAttributeCondition.attribute`:

- The referenced `PrimitiveAttributeTailoring` is owned by an `ClassContentConditional` that has no `condition` (invariant class content) **AND**

- The `ClassContentConditional` that owns the referenced `PrimitiveAttributeTailoring` and the `ClassContentConditional` that owns this `PrimitiveAttributeCondition` are owned by the same `ClassTailoring`.

⌋*()*

[constr_2615] `AggregationCondition.aggregation` shall reference invariant owned `AggregationTailoring`, only ⌈ The following conditions need to evaluate to true for `AggregationCondition.aggregation`:

- The referenced `AggregationTailoring` is owned by an `ClassContentConditional` that has no `condition` (invariant class content) **AND**

- The `ClassContentConditional` that owns the referenced `AggregationTailoring` and the `ClassContentConditional` that owns this `AggregationCondition` are owned by the same `ClassTailoring`.

⌋*()*

[constr_2616] **`ReferenceCondition`.`reference`** **shall reference invariant owned `ReferenceTailoring`, only** ⌈ The following conditions need to evaluate to true for `ReferenceCondition`.`reference`:

- The referenced `ReferenceTailoring` is owned by an `ClassContentConditional` that has no `condition` (invariant class content) **AND**

- The `ClassContentConditional` that owns the referenced `ReferenceTailoring` and the `ClassContentConditional` that owns this `ReferenceCondition` are owned by the same `ClassTailoring`.

⌋*()*

[constr_2617] **`ClassTailoring`.`variationRestriction`** **only applicable for «atpVariation» classes** ⌈ If the tailored meta class is not marked with stereotype «atpVariation» then `ClassTailoring`.`variationRestriction` shall not be defined. ⌋ *()*

8.4.1.3 Additional Validation Semantics for Reachable Elements

[TPS_STDT_00163] Validation Semantics of `ConcreteClassTailoring` ⌈ If `ConcreteClassTailoring`.`inScope` = true then the restrictions that are defined for this class are evaluated. If the restrictions are violated then a validation message with the specified severity shall be created. ⌋*(RS_STDT_00106, RS_STDT_00121)*

[TPS_STDT_00182] Validation Semantics of `AbstractClassTailoring` ⌈ `AbstractClassTailoring`s may be used in order to define restrictions that shall apply for all instances of this class. ⌋*(RS_STDT_00106)*

[TPS_STDT_00107] Validation Semantics of global `ConcreteClassTailoring`.`multiplicityRestriction` with `validationRoot`==true ⌈ If the `ConcreteClassTailoring` is directly aggregated by `DataFormatTailoring`.`classTailoring` and `ConcreteClassTailoring`.`validationRoot`==true then the `MultiplicityRestrictionWithSeverity` is evaluated for all instances of the concrete meta class in the context of the complete model (not only the reachable elements). This evaluation can happen before the set of reachable elements is calculated. ⌋*(RS_STDT_00106)*

Example 8.2 specifies a `ConcreteClassTailoring` of a class that is used as `validationRoot` element. The Validation semantics is: the complete model shall contain exactly one `System`.

Listing 8.2: Example of Multiplicity Restriction of class that is used as validation root element

```
<DATA-EXCHANGE-POINT>
  <SHORT-NAME>MyExchangePoint</SHORT-NAME>
  <!-- -->
  <DATA-FORMAT-TAILORING>
    <CLASS-TAILORINGS>
      <CONCRETE-CLASS-TAILORING>
```

```
    <SHORT-NAME>System</SHORT-NAME>
    <DESC>
      <L-2 L="EN">The complete model shall contain exactly one 'System'
        </L-2>
    </DESC>
    <IN-SCOPE>true</IN-SCOPE>
    <MULTIPLICITY-RESTRICTION>
      <SEVERITY>ERROR</SEVERITY>
      <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
      <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
    </MULTIPLICITY-RESTRICTION>
    <VALIDATION-ROOT>true</VALIDATION-ROOT>
    </CONCRETE-CLASS-TAILORING>
    </CLASS-TAILORINGS>
  </DATA-FORMAT-TAILORING>
</DATA-EXCHANGE-POINT>
```

[TPS_STDT_00108] Validation Semantics of global `ConcreteClassTailoring.multiplicityRestriction` with `validationRoot==false` ⌈
If the `ConcreteClassTailoring` is directly aggregated by `DataFormatTailoring.classTailoring` and `ConcreteClassTailoring.validationRoot`==false then the `MultiplicityRestrictionWithSeverity` is evaluated for each instance of a reference and aggregation individually. I.e. for all reachable instances of references and all reachable instances of aggregations that have a type which is identical to the tailored meta class, the number of referenced / contained objects which are an instance of the tailored meta class is determined and evaluated with respect to the `MultiplicityRestrictionWithSeverity`. ⌋*(RS_STDT_00106)*

Example 8.3 specifies a `ConcreteClassTailoring` of a class that is not used as `validationRoot` element.
The validation semantics of the example is: In the set of reachable elements no instances of references to `FlexrayFrame`s are allowed. Additionally, not instances of aggregations that contain `FlexrayFrame`s are allowed.
Note that `FlexrayFrame`s might exist in parts of the model that are not reachable from selected validation root elements.

Listing 8.3: Example of Multiplicity Restriction of class that is not used as validation root element

```
<DATA-EXCHANGE-POINT>
  <SHORT-NAME>MyExchangePoint</SHORT-NAME>
  <!-- -->
  <DATA-FORMAT-TAILORING>
    <CLASS-TAILORINGS>
      <CONCRETE-CLASS-TAILORING>
        <SHORT-NAME>FlexrayFrame</SHORT-NAME>
        <DESC>
          <L-2 L="EN">
The set of reachable elements shall not contain
any FlexrayFrames.
Note that FlexrayFrames might exist in parts of the model that
are not reachable from the validation root element. </L-2>
```

```
    </DESC>
    <IN-SCOPE>true</IN-SCOPE>
    <MULTIPLICITY-RESTRICTION>
      <SEVERITY>ERROR</SEVERITY>
      <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
      <UPPER-MULTIPLICITY>0</UPPER-MULTIPLICITY>
    </MULTIPLICITY-RESTRICTION>
    <VALIDATION-ROOT>false</VALIDATION-ROOT>
   </CONCRETE-CLASS-TAILORING>
  </CLASS-TAILORINGS>
 </DATA-FORMAT-TAILORING>
</DATA-EXCHANGE-POINT>
```

[TPS_STDT_00113] Validation Semantics of `AbstractClassTailoring.multiplicityRestriction` ⌈
If the `AbstractClassTailoring` is directly aggregated by `DataFormatTailoring.classTailoring` then the `MultiplicityRestrictionWithSeverity` is evaluated for each instance of a reference and aggregation individually. I.e. for all reachable instances of references and all reachable instances of aggregations which have a type which is a sub class of the tailored meta class, the number of referenced / contained objects which are an instance of the tailored meta class is determined and evaluated with respect to the `MultiplicityRestrictionWithSeverity`. ⌋
(RS_STDT_00106)

8.4.2 Tailoring of Attributes

8.4.2.1 Description

[TPS_STDT_00144] Purpose of `AttributeTailoring` ⌈ The `AttributeTailoring` specifies if an owned or inherited AUTOSAR Attribute is in scope and defines which restrictions have to be considered. ⌋*(RS_STDT_00106)*
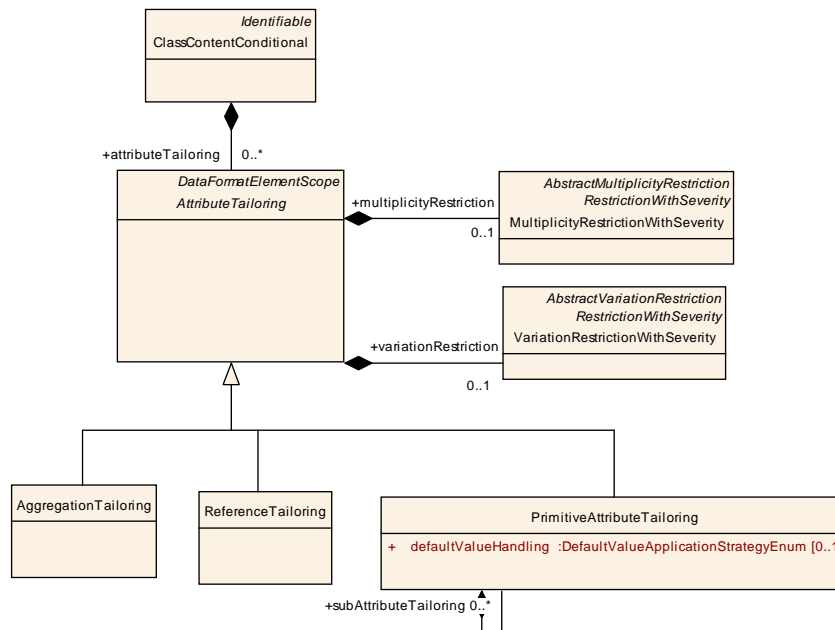
Figure 8.19: Overview of AttributeTailoring

Class	AttributeTailoring (abstract)			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Tailoring of Attributes			
Base	ARObject, DataFormatElementReference, DataFormatElementScope, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference, SpecElementScope			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
multiplicity Restriction	MultiplicityRestrictionWithSeverity	0..1	aggr	Multiplicity restriction of the attribute **Tags:** xml.sequenceOffset=10
variationR estriction	VariationRestrictionWithSeverity	0..1	aggr	Restrictions on the usage of variant handling. **Tags:** xml.sequenceOffset=20

Table 8.32: AttributeTailoring

8.4.2.2 Additional Constraints

[constr_2618] ShortName of AttributeTailoring shall match owned or inherited attributes ⌈ The `shortName` shall match the name of an attribute that is owned or inherited by the AUTOSAR meta-class which is identified by the `ClassTailoring` that owns this `AttributeTailoring`. ⌋*()*

[constr_2619] No `AttributeTailoring` for Derived or Abstract Attributes ⌈ No `AttributeTailoring`s are allowed for `Attributes` that are marked with stereotypes «atpDerived» or «atpAbstract». ⌋*()*

See [TPS_GST_00022] and [TPS_GST_00023] in [7] for more details about the stereo-types «atpDerived» and «atpAbstract».

[constr_2624] `AttributeTailoring.variationRestriction` only applicable for «atpVariation» attributes ⌈ If the tailored attribute is not marked with stereotype «atpVariation» then `AttributeTailoring.variationRestriction` shall not be defined. ⌋*()*

8.4.2.3 Additional Validation Semantics for Reachable Elements

[TPS_STDT_00159] Semantics of Attribute that is in Scope ⌈ If `AttributeTailoring.inScope` = true then the restrictions defined for the `AttributeTailoring` apply. ⌋*(RS_STDT_00106, RS_STDT_00121)*

[TPS_STDT_00114] `MultiplicityRestrictionWithSeverity` in the context of `ClassTailoring` vs. `AggregationTailoring`/`ReferenceTailoring` ⌈

- The `MultiplicityRestrictionWithSeverity` that is aggregated via `AggregationTailoring.multiplicityRestriction` evaluates the total number of contained elements per instance of the tailored aggregation.

- The `MultiplicityRestrictionWithSeverity` that is aggregated via `ReferenceTailoring.multiplicityRestriction` evaluates the total number of referenced elements per instance of the tailored reference.

- The `MultiplicityRestrictionWithSeverity` that is aggregated via `ClassTailoring.multiplicityRestriction` evaluates the total number of aggregated or referenced elements that are an instance of the tailored class per instance of aggregation or reference.

⌋*(RS_STDT_00106)*

See also [TPS_STDT_00108], [TPS_STDT_00112] and example A.2

8.4.3 Tailoring of Primitive Attributes

8.4.3.1 Description

[TPS_STDT_00142] Purpose of `PrimitiveAttributeTailoring` ⌈ The `PrimitiveAttributeTailoring` specifies if a owned or inherited `Primitive Attribute` is in scope. Additionally, it defines the handling of AUTOSAR specified default values. ⌋*(RS_STDT_00106)*

[TPS_STDT_00143] AUTOSAR Standardized Primitive Attributes of Meta-Class ⌈ Within the context of a given AUTOSAR meta-class all inherited and owned primi-

tive attributes that are not marked with «atpDerived» or «atpAbstract» may be tailored. The reference to the primitive attribute is established via the name of the primitive attribute. ⌋*(RS_STDT_00106)*

Note: In the context of this specification a primitive attribute is a UML property that has a type that is marked with a stereotype «primitive» or «enumeration».

Figure 8.20: Tailoring of Primitive Attributes

Class	PrimitiveAttributeTailoring			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Tailoring of primitive attributes. Primitive attributes are attributes that have a type which is marked by the stereotype «primitive» or «enumeration»			
Base	ARObject, AttributeTailoring, DataFormatElementReference, DataFormatElement Scope, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference, SpecElementScope			
Attribute	Type	Mul.	Kind	Note
defaultValu eHandling	DefaultValueAp plicationStrateg yEnum	0..1	attr	Specification of how to handle AUTOSAR defined default values.
subAttribut eTailoring	PrimitiveAttribut eTailoring	*	aggr	Tailors the attribute of a «primitive» data type.
valueRestri ction	ValueRestriction WithSeverity	0..1	aggr	The restriction of the attribute value.

Table 8.33: PrimitiveAttributeTailoring

Enumeration	DefaultValueApplicationStrategyEnum
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring
Note	Enumeration that describes how to handle AUTOSAR defined default values. If the strategy requires application of the AUTOSAR defined default value, then the value shall be added before further validation or processing.
Literal	**Description**
defaultIfRevisionUpdate	If the AUTOSAR model is older than the Baseline of the Data Exchange Point and the older version did not yet support the attribute, then the AUTOSAR defined default value SHALL be applied before further validation or processing. **Tags:** atp.EnumerationValue=1
defaultIf Undefined	If the AUTOSAR model does not explicitly specify a value, then the apply the AUTOSAR defined default value before further validation or processing. **Tags:** atp.EnumerationValue=2
noDefault	do not apply the AUTOSAR defined default value **Tags:** atp.EnumerationValue=0

Table 8.34: DefaultValueApplicationStrategyEnum

8.4.3.2 Additional Constraints

[constr_2620] shortName of PrimitiveAttributeTailoring shall be a primitive attribute in the referenced Baseline ⌈ The shortName of PrimitiveAttributeTailoring shall match the name of an AUTOSAR specified primitive attribute of the Meta-Class in the referenced Baseline. ⌋ *()*

8.4.3.3 Additional Validation Semantics for Reachable Elements

No additional validation semantics.

8.4.4 Tailoring of Aggregations

8.4.4.1 Description

[TPS_STDT_00140] Purpose of AggregationTailoring ⌈ The AggregationTailoring specifies if an owned or inherited Aggregation is in scope. ⌋ *(RS_STDT_00106)*

[TPS_STDT_00141] AUTOSAR Standardized Aggregations of Meta-Class ⌈ Within the context of a given AUTOSAR meta-class all inherited and owned aggregations that are not marked with «atpDerived» or «atpAbstract» may be tailored. ⌋ *(RS_STDT_00106)*

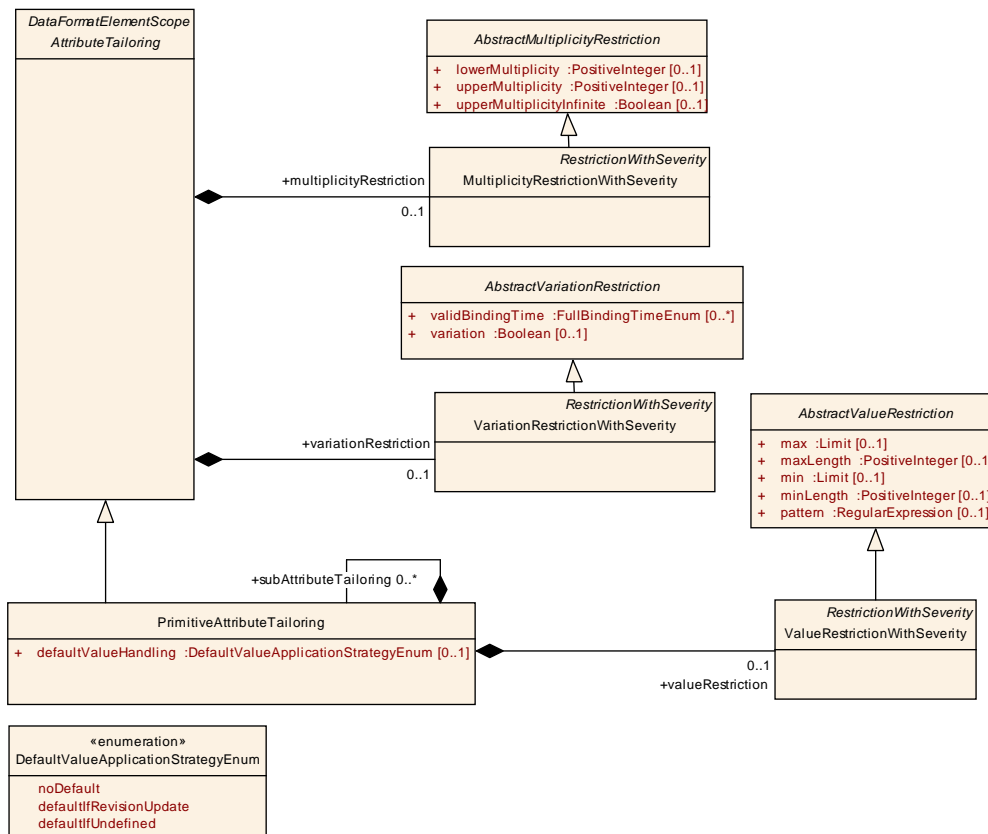Note: In the context of this specification an aggregation is a UML property that has a type that is NOT marked with a stereotype «primitive» or «enumeration» and aggregation=AggegationKind::composite.
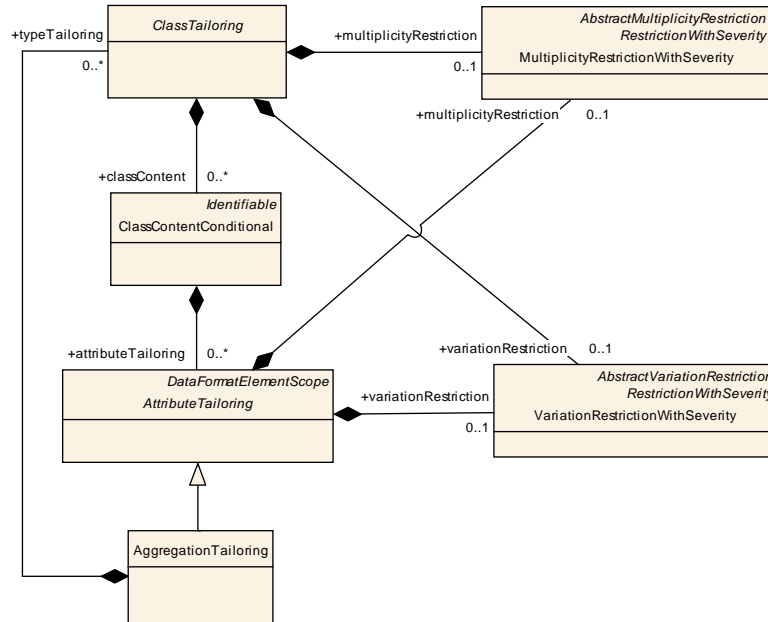
Figure 8.21: Tailoring of Aggregations

Class	AggregationTailoring			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Tailoring of aggregations in the AUTOSAR meta-model			
Base	ARObject, AttributeTailoring, DataFormatElementReference, DataFormatElement Scope, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference, SpecElementScope			
Attribute	Type	Mul.	Kind	Note
typeTailori ng	ClassTailoring	*	aggr	Local class tailoring which is applied if the content is contained by this aggegation.

Table 8.35: AggregationTailoring

8.4.4.2 Additional Constraints

[constr_2621] The `shortName` of `AggregationTailoring` shall match the name of an AUTOSAR specified aggregation of the meta-class ⌈ The `shortName` of `AggregationTailoring` shall match the name of an AUTOSAR specified aggregation of the meta-class). ⌋*()*

8.4.4.3 Additional Validation Semantics for Reachable Elements

[TPS_STDT_00112] Validation Semantics of `ClassTailoring.multiplicityRestriction` in the context of `AggregationTailoring.typeTailoring` ⌈
If the `ClassTailoring` is directly aggregated by `AggregationTailoring.typeTailoring` then the `MultiplicityRestrictionWithSeverity` is evaluated for each instance the tailored aggregation individually. I.e. for each instance of the tailored aggregation, the number of contained objects which are an instance of the tailored meta class is determined and evaluated with respect to the `MultiplicityRestrictionWithSeverity`. ⌋*(RS_STDT_00106)*

See also example A.3.

8.4.5 Tailoring of References

8.4.5.1 Description

[TPS_STDT_00138] Purpose of `ReferenceTailoring` ⌈ The `ReferenceTailoring` specifies if an owned or inherited `Reference` is in scope. ⌋*(RS_STDT_00106)*

[TPS_STDT_00139] AUTOSAR Standardized References of Meta-Class ⌈ Within the context of a given `AUTOSAR Meta-Class` all inherited and owned references that are not marked with «atpDerived» or «atpAbstract» may be tailored. The reference to the reference is established via the name of the reference. ⌋*(RS_STDT_00106)*

Note: in the context of this specification a reference is a UML property that has a type that is NOT marked with a stereotype «primitive» or «enumeration» and aggregation=AggregationKind::none.
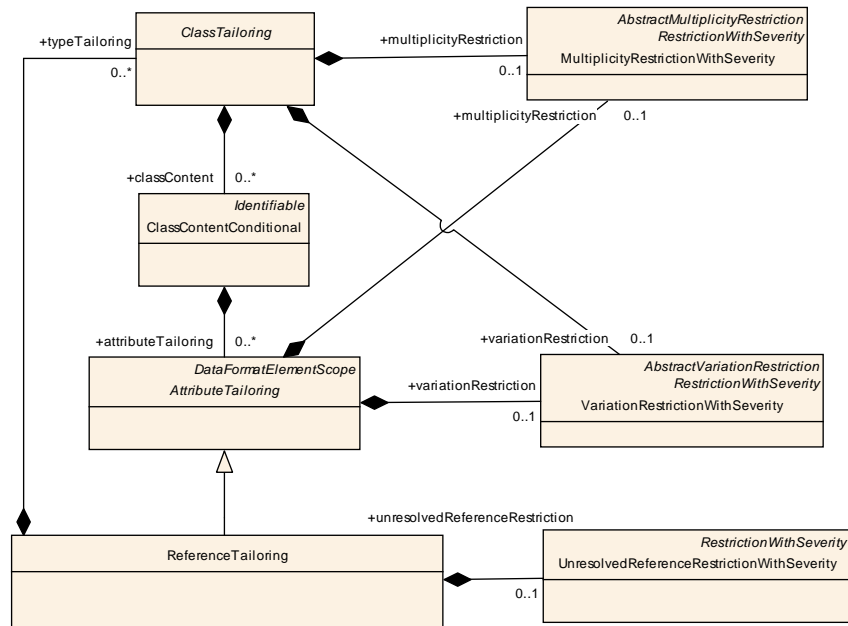
Figure 8.22: Tailoring of References

Class	ReferenceTailoring			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Tailoring of Non-Containment References.			
Base	ARObject, AttributeTailoring, DataFormatElementReference, DataFormatElement Scope, Identifiable, MultilanguageReferrable, Referrable, SpecElementReference, SpecElementScope			
Attribute	Type	Mul.	Kind	Note
typeTailori ng	ClassTailoring	*	aggr	Local class tailoring for content that is referenced by this reference.
unresolved Reference Restriction	UnresolvedRefe renceRestriction WithSeverity	0..1	aggr	Specifies the severity of unresolved references.

Table 8.36: ReferenceTailoring

8.4.5.2 Additional Constraints

[constr_2622] The `shortName` of `ReferenceTailoring` shall match the name of an AUTOSAR specified reference of the meta-class ⌈ The `shortName` of `ReferenceTailoring` shall match the name of an AUTOSAR specified reference of the meta-class). ⌋*()*

8.4.5.3 Additional Validation Semantics for Reachable Elements

[TPS_STDT_00169] Handling of unresolved references ⌈ If a reachable object defines an unresolved reference that is referenced by this `ReferenceTailoring` then the `unresolvedReferenceRestriction` specifies the severity of this violation. ⌋ *(RS_STDT_00121)*

[TPS_STDT_00119] Validation Semantics of `ClassTailoring.multiplicityRestriction` in the context of `ReferenceTailoring.typeTailoring` ⌈ If the `ClassTailoring` is directly aggregated by `ReferenceTailoring.typeTailoring` then the `MultiplicityRestrictionWithSeverity` is evaluated for each instance of the tailored reference individually. I.e. for each instance of the tailored reference, the number of referenced objects which are an instance of the tailored meta class is determined and evaluated with respect to the `MultiplicityRestrictionWithSeverity`. ⌋ *(RS_STDT_00106)*

See also example A.2.

8.4.6 Tailoring of Constraints

8.4.6.1 Description

[TPS_STDT_00147] Purpose of `ConstraintTailoring` ⌈ The `ConstraintTailoring` specifies if the referenced `Constraint` is enabled for this `DataExchangePoint`. ⌋ *(RS_STDT_00108)*

[TPS_STDT_00111] AUTOSAR Standardized Constraints ⌈ Constraints are Specification Elements that have an ID that starts with 'constr_'. A complete list of constraints is available in document AUTOSARModelConstraints [21]. ⌋ *(RS_STDT_00108, RS_STDT_00122)*
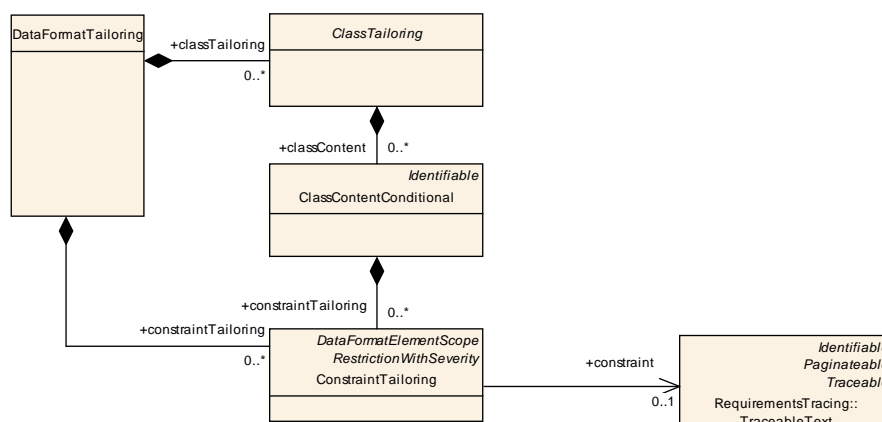
Figure 8.23: Tailoring of Constraints

Class	ConstraintTailoring			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Tailoring of constraints. If a constraint is in scope, then the severity defines its Error Severity Level. If it is not in scope, then the constraint is disabled.			
Base	ARObject, DataFormatElementReference, DataFormatElementScope, Identifiable, MultilanguageReferrable, Referrable, RestrictionWithSeverity, SpecElement Reference, SpecElementScope			
Attribute	Type	Mul.	Kind	Note
constraint	TraceableText	0..1	ref	Reference to custom specification of constraint.

Table 8.37: ConstraintTailoring

8.4.6.2 Additional Constraints

8.4.6.3 Additional Validation Semantics for Reachable Elements

[TPS_STDT_00164] Semantics of a Constraint that is out of Scope ⌈ If `ConstraintTailoring.inScope` = false then the referenced constraint is disabled. ⌋ *(RS_STDT_00108, RS_STDT_00121)*

[TPS_STDT_00165] Semantics of Constraint that is in Scope ⌈ If `ConstraintTailoring.inScope` = true then the referenced constraint is evaluated. ⌋ *(RS_STDT_00108, RS_STDT_00121)*

[TPS_STDT_00125] Trigger for Evaluation of Constraints ⌈
The context in which a `ConstraintTailoring` is specified defines the trigger for the evaluation of the constraint:

- If a `ConstraintTailoring` is aggregated via `ClassContentConditional.constraintTailoring` then the constraint is only evaluated for reachable instances of the tailored `meta class` which fullfill the condition.

- If a `ConstraintTailoring` is aggregated via `DataFormatTailoring.constraintTailoring` then no explicit hint on instances of classes which trigger the evaluation are provided. It is up to the tool implementer to decide on the correct trigger.

Therefore, the author of a `Profile of Data Exchange Point` should attach `ConstraintTailoring`s to `ClassTailoring`s whenever this is possible. ⌋ *(RS_STDT_00108, RS_STDT_00121)*

8.4.7 Tailoring of Special Data Groups

8.4.7.1 Description

[TPS_STDT_00132] Purpose of `SdgTailoring` ⌈ SdgTailoring specifies if a SdgClass (Sdg with a specific gid and structure) may be added to a given Meta-Class. ⌋*(RS_STDT_00116)*
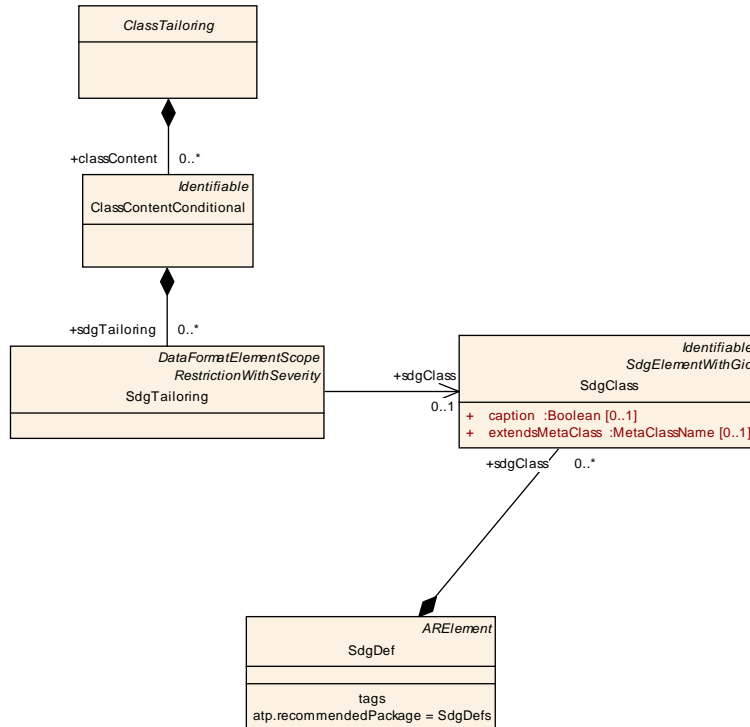
Figure 8.24: Tailoring of Usage of Special Data Groups

Class	SdgTailoring			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	Describes if the referenced Sdg may be attached to the current class.			
Base	ARObject, DataFormatElementReference, DataFormatElementScope, Identifiable, MultilanguageReferrable, Referrable, RestrictionWithSeverity, SpecElement Reference, SpecElementScope			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
sdgClass	SdgClass	0..1	ref	Specification of the structure of the Special Data Group.

Table 8.38: SdgTailoring

8.4.7.2   Additional Constraints

[constr_2623] Referenced `SdgClass` shall be part of a `SdgDef` that is referenced by the `Baseline` ⌈ Referenced `SdgClass` shall be part of a `SdgDef` that is referenced by the `Baseline` of this `Profile of Data Exchange Point.` ⌋ *()*

8.4.7.3   Additional Validation Semantics for Reachable Elements

[TPS_STDT_00167] Semantics of SdgTailoring that is in scope ⌈ If `SdgTailoring.inScope` == true then Sdg structure of instance of the tailored class shall be evaluated against the structure that is specified by the referenced `SdgClass`. ⌋ *(RS_STDT_00121)*

8.4.8   Description of Special Data Group Definitions

The Special Data Group Definition `SdgDef` specifies the structure of special data group extensions. For a quick overview see figure 8.25. More detailed information is described in [TPS_GST_00374]ff in [7].
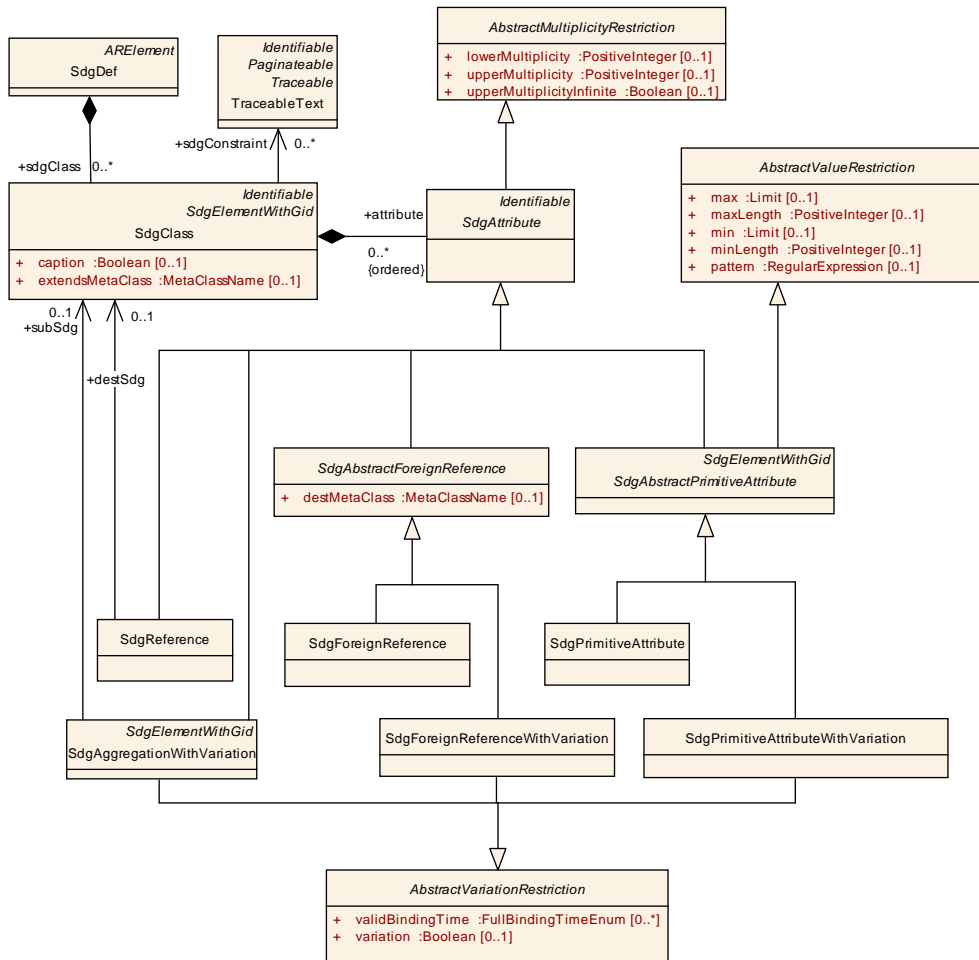
Figure 8.25: Special Data Group Definition

8.4.9 Description of Custom Constraints

8.4.9.1 Description

Custom constraints are documented as `TraceableText` with category==CONSTRAINT_ITEM as defined in [TPS_STDT_00059] and [constr_2540]

8.4.9.2 Additional Constraints

8.4.9.3 Additional Validation Semantics for Reachable Elements

8.5 Default Values in Profiles of Data Exchange Point

This chapter describes rules for default values in `Profile of Data Exchange Point`s which apply if a Profile does not explicitly specify that information. In addition to these rules AUTOSAR provides `Baseline Profile`s in [22] which explicity declare the default values of the latest AUTOSAR releases.

[TPS_STDT_00191] Purpose of `Baseline Profile of Data Exchange Point` ⌈
A `Baseline Profile of Data Exchange Point` is a `Profile of Data Exchange Point` that explicitly models the following default values of `ClassTailoring`s:

- `inScope` (see [TPS_STDT_00190])

- `validationRoot` (see [TPS_STDT_00196])

- `multiplicityRestriction` (see [TPS_STDT_00197])

- `variationRestriction` (see [TPS_STDT_00200])

Additionally, it specifies the default values of `AttributeTailoring`s:

- `inScope` (see [TPS_STDT_00195])

- `multiplicityRestriction` (see [TPS_STDT_00198])

- `variationRestriction` (see [TPS_STDT_00199])

- `defaultValueHandling` (see [TPS_STDT_00204])

⌋*(RS_STDT_00105, RS_STDT_00106)*

8.5.1 Default Values in `SpecificationScope`

The following rules define the default scope of AUTOSAR `Specification`s and their contained elements.

[TPS_STDT_00192] Default Scope of AUTOSAR `Specification`s ⌈
If `SpecificationDocumentScope.inScope` is not explicitly specified for an AUTOSAR `Specification` then that AUTOSAR `Specification` is considered as not relevant for the `Data Exchange Point`.
Default value of `SpecificationDocumentScope.inScope` is false. ⌋
(RS_STDT_00102, RS_STDT_00103)

[TPS_STDT_00193] Default Scope of AUTOSAR `Specification Elements` ⌈
If `DocumentElementScope.inScope` is not explicitly specified for an element in an AUTOSAR `Specification` then that element has the same scope as the AUTOSAR `Specification` that contains it.
Default value of `DocumentElementScope.inScope` is `SpecificationDocu-`

mentScope.inScope of the AUTOSAR Specification that contains the element.
⌋(*RS_STDT_00102, RS_STDT_00103*)

8.5.2 Default Values in `DataFormatTailoring`

The following rules define default scope and restrictions with respect to the Data Format.

[TPS_STDT_00190] Default Scope of concrete `Meta Classes` ⌈
If ConcreteClassTailoring.inScope is not explicitly specified for a Meta Class then instances of that Meta Class are considered as not relevant for the Data Exchange Point by default.
Default value of ConcreteClassTailoring.inScope is false. ⌋(*RS_STDT_00106*)

[TPS_STDT_00196] Default Validation Root of concrete `Meta Classes` ⌈
If ConcreteClassTailoring.validationRoot is not explicitly specified for a Meta Class then instances of that Meta Class are no root elements for the validation by default.
Default value of ConcreteClassTailoring.validationRoot is false. ⌋(*RS_STDT_00106*)

[TPS_STDT_00197] Default `multiplicityRestriction` of `Meta Classes` ⌈
If attributes of ClassTailoring.multiplicityRestriction are not explicitly specified for a Meta Class then the default values as defined in table 8.39 apply by default. Note that the default values depend on the life cycle status of the Meta Class (see also [TPS_GST_00051] in [7]). ⌋(*RS_STDT_00106*)

Life cycle status of concrete `Meta Class`	Default value of `ClassTailoring.multiplicityRestriction`				Description
	`.lowerMultiplicity`	`.upperMultiplicity`	`.upperMultiplicityInfinite`	`.severity`	
valid	0	n/a	true	info	No restrictions. Any number of this class may occur.
draft	0	0	n/a	info	Info Message if draft classes are used
obsolete	0	0	n/a	warning	Warning message if obsolete classes are used
preliminary	0	0	n/a	info	Info Message if preliminary classes are used
removed	0	0	n/a	error	Error Message if removed classes are used

Table 8.39: Default Multiplicity Restrictions of Meta Classes

[TPS_STDT_00200] Default `variationRestriction` of `Meta Classes` ⌈
If a meta class is marked with stereotype «atpVariation» (see [TPS_GST_00189] in [7]) and attributes of `ClassTailoring`.`variationRestriction` are not explicitly specified then the default values as defined in table 8.40 apply by default. Note that the default values depend on the `vh.latestBindingTime` of the `Meta Attribute` (see also [TPS_GST_00182] in [7]). ⌋*(RS_STDT_00106)*

vh.latestBindingTime of Meta Class	Default value of ClassTailoring.variationRestriction		
	.variation	.validBindingTime	.severity
blueprintDerivationTime	true	blueprintDerivationTime	error
systemDesignTime	true	blueprintDerivationTime, systemDesignTime	error
codeGenerationTime	true	blueprintDerivationTime, systemDesignTime, codeGenerationTime	error
preCompileTime	true	blueprintDerivationTime, systemDesignTime, codeGenerationTime, preCompileTime	error
linkTime	true	blueprintDerivationTime, systemDesignTime, codeGenerationTime, preCompileTime, linkTime	error
postBuild	true	blueprintDerivationTime, systemDesignTime, codeGenerationTime, preCompileTime, linkTime, postBuild	error

Table 8.40: Default Variation Restriction of Meta Classes

[TPS_STDT_00195] Default Scope of `Meta Attributes` ⌈
If `AttributeTailoring`.`inScope` is not explicitly specified for a `Meta Attribute` then occurrences of that `Attribute` are considered as not relevant for the `Data Exchange Point` by default.
Default value of `AttributeTailoring`.`inScope` is false. ⌋*(RS_STDT_00106)*

[TPS_STDT_00198] Default `multiplicityRestriction` of `Meta Attributes` ⌈
If attributes of `AttributeTailoring`.`multiplicityRestriction` are not explicitly specified for a `Meta Attribute` then the default values as defined in table 8.41 apply by default. Note that the default values depend on the life cycle status of the `Meta Attribute` (see also [TPS_GST_00051] in [7]). ⌋*(RS_STDT_00106)*

Life cycle status of `Meta Attribute`	Default value of `AttributeTailoring.multiplicityRestriction`				Description
	`.lowerMultiplicity`	`.upperMultiplicity`	`.upperMultiplicityInfinite`	`.severity`	
valid	(lower)	(upper)	(upperInf)	info	Multiplicity is not restricted. Same rules [1]apply as in AUTOSAR XSD Schema [23]: **if** attribute is tagged with 'xml.enforceMinMultiplicity=true' **then** .lowerMultiplicity = lower multiplicity of attribute as defined in the meta model. **else** .lowerMultiplicity = 0 **if** (upper multiplicity of attribute in the meta model is infinite) **or** (attribute is not marked with xml.attribute=true and it is owned by a class that is marked with stereotypes «atpMixed» or «atpMixed») **then** .upperMultiplicity = n/a **and** .upperMultiplicityInfinite = true **else** .upperMultiplicity = upper multiplicity as defined in meta model **and** .upperMultiplicityInfinite = n/a.
draft	0	0	n/a	info	Info Message if draft attribute is used
obsolete	0	0	n/a	warning	Warning message if obsolete attribute is used
preliminary	0	0	n/a	info	Info Message if preliminary attribute is used
removed	0	0	n/a	error	Error Message if removed attribute is used

Table 8.41: Default Multiplicity Restrictions of Meta Attributes

[TPS_STDT_00199] Default `variationRestriction` of `Meta Attributes` ⌈
If attributes of `AttributeTailoring`.variationRestriction are not explicitly specified for a `Meta Attribute` then the default values as defined in table 8.42 apply by default. Note that the default values depend on the `vh.latestBindingTime` of the `Meta Attribute` (see also [TPS_GST_00182] in [7]). ⌋*(RS_STDT_00106)*

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[1]see [TPS_XMLSPR_00036], [TPS_XMLSPR_00046], [TPS_XMLSPR_00003] in [24]

vh.latestBindingTime of Meta Attribute	Default value of AttributeTailoring.variationRestriction		
	.variation	.validBindingTime	.severity
blueprintDerivationTime	true	{blueprintDerivationTime}	error
systemDesignTime	true	{blueprintDerivationTime, systemDesignTime}	error
codeGenerationTime	true	{blueprintDerivationTime, systemDesignTime, codeGenerationTime}	error
preCompileTime	true	{blueprintDerivationTime, systemDesignTime, codeGenerationTime, preCompileTime}	error
linkTime	true	{blueprintDerivationTime, systemDesignTime, codeGenerationTime, preCompileTime, linkTime}	error
postBuild	true	{blueprintDerivationTime, systemDesignTime, codeGenerationTime, preCompileTime, linkTime, postBuild}	error

Table 8.42: Default Variation Restriction of Meta Attributes

[TPS_STDT_00203] Default PrimitiveAttributeTailoring.valueRestriction ⌈

If attributes of PrimitiveAttributeTailoring.valueRestriction are not explicitly specified for a primitive Attribute then the default values as defined in table 8.43 apply by default. In other words: By default the ValueRestriction of a primitive attribute semantically equals the declaration of its primitive type in the AUTOSAR meta model. ⌋*(RS_STDT_00113)*

Attribute	Default Value
pattern	**if** the type of the primitive attribute specifies `xml.xsd.pattern` **then** value of `xml.xsd.pattern` **else** .*
max	**if** the type of the primitive attribute specifies `xml.xsd.maxInclusive` that is not +INF **then** value of `xml.xsd.maxInclusive` with `intervalType`=closed **else if** the type of the primitive attribute specifies `xml.xsd.maxExclusive` that is not +INF **then** value of `xml.xsd.maxExclusive` with `intervalType`=open **else** +INF with `intervalType`=infinite
min	**if** the type of the primitive attribute specifies `xml.xsd.minInclusive` that is not -INF **then** value of `xml.xsd.minInclusive` with `intervalType`=closed **else if** the type of the primitive attribute specifies `xml.xsd.minExclusive` that is not -INF **then** value of `xml.xsd.minExclusive` with `intervalType`=open **else** -INF with `intervalType`=infinite
maxLength	**if** the type of the primitive attribute specifies `xml.xsd.maxLength` **then** value of `xml.xsd.maxLength` **else** +INF
minLength	**if** the type of the primitive attribute specifies `xml.xsd.minLength` **then** value of `xml.xsd.minLength` **else** 0
severity	error

Table 8.43: Default Values of Value Restrictions

[TPS_STDT_00204] Default `PrimitiveAttributeTailoring.defaultValue-Handling` ⌈

If attribute `PrimitiveAttributeTailoring.defaultValueHandling` is not explicitly specified for a primitive `Attribute` then the no default values are applied by default.

Default value of `PrimitiveAttributeTailoring.defaultValueHandling` is `noDefault`. ⌋*(RS_STDT_00111)*

[TPS_STDT_00207] Default `ReferenceTailoring.unresolvedReferenceRestriction` ⌈

If `ReferenceTailoring.unresolvedReferenceRestriction` or `ReferenceTailoring.unresolvedReferenceRestriction.severity` are not defined then the default value of `ReferenceTailoring.unresolvedReferenceRestriction.severity` is error. ⌋*(RS_STDT_00111)*

8.6 Compatibility

This section describes the meaning of compatibility of `Profiles of Data Exchange Point`s and defines generic rules for evaluating the compatibility of profiles. Compatibility is a measure for the level of interoperability risk. When evaluating the compatibility of a producer's and consumer's profile, a workflow is assumed where both, the producer and consumer, validate an artifact against their individual profiles. A compatibility analysis shall answer the question "What interoperability issues might arise if an Autosar Model passes the producer's validation and is imported on the consumer's side?" Problems can occur, for example, if the consumer's profile is more restrictive than the producer's profile. On the other hand, an issue on the producer side may not necessarily result in a problem on the consumer side, for example, if only a subset of the data is consumed.

- Note, the compatibility of `Profiles of Data Exchange Point`s does not guarantee the absence of any interoperability issues. This compatibility however is an indicator for a low overall interoperability risk.

- On the other hand, the incompatibility of `Profiles of Data Exchange Point`s does not necessarily imply the presence of interoperability issues. This incompatibility however is an indicator for a high interoperability risk.

[TPS_STDT_00110] Identification of Potential Interoperability Issues ⌈
Potential interoperability risks are identified using the following iterative approach. The approach focuses on early identification of incompatibilities with a high risk of producing interoperability issues. The following steps refer to the `effective` representation of the profiles as specified in [TPS_STDT_00106].

1. Compare the high level descriptions in `DataExchangePoint.longName`, `DataExchangePoint.desc` and `DataExchangePoint.introduction` in order to understand if the `Profile of Data Exchange Point`s actually fit to each other with respect to the intended step in the Autosar Methodology. This is a fully manual step. If the profiles relate to completely different steps in the methodology, then an expert discussion about the methodological integration is required.

2. Compare the `Baseline`s according to the rules defined in [TPS_STDT_00183]. If the `Baseline`s are compatible then we can continue with the following steps. Otherwise, special caution is required, since specification items, constraints, meta model elements, etc. might have been added, removed or changed in the `Baseline`s. Thus, in addition to the descriptions in the following steps, it is required to figure out if the changes between the baselines actually affect the compared `Profile of Data Exchange Point`s.

3. Identify matching `SpecElementReference` elements. The key for matching of standardized `Specification Element`s is the relative `shortName` path that is relative to the `DataExchangePoint`. The key for matching custom `Specifi-`

cation `Element`s is the absolute `shortName` path of the referenced custom element.

(a) If there is no matching `SpecElementReference` in the other profile, then expert discussion is needed. This can for instance happen if profiles with incompatible `Baseline`s are compared or if custom extensions are used.

(b) Otherwise: continue with next steps.

4. Identify not relevant elements: Elements that are not relevant (`SpecElementScope.inScope`==false) in both profiles result in low risk for interoperability issues and are ignored in further analysis.

5. Analyze the `SpecificationScope` (see also section 8.6.2):

(a) Compare `SpecificationDocumentScope.inScope` as defined in [TPS_STDT_00128] and [TPS_STDT_00160]. Experts should discuss the identified incompatibilities.

6. Analyze `DataFormatTailoring` (see also section 8.6.3):

(a) Compare `ConcreteClassTailoring.inScope` as defined in [TPS_STDT_00101]. Experts should discuss the identified incompatibilities. Suspect `ConcreteClassTailoring`s are analyzed in the next steps.

(b) Compare `ConcreteClassTailoring.validationRoot`s. Expert discussion is required if the values are not identical.

(c) Compare `ClassTailoring.multiplicityRestriction` [TPS_STDT_00210] and `ClassTailoring.variationRestriction`s [TPS_STDT_00201]. Experts should discuss the identified incompatibilities. Incompatible restrictions with `severity`==error in the consumer's profile should be handled first, followed by restrictions with `severity`==warning and restrictions with `severity`==info.

(d) Compare `ClassTailoring.classContent` [TPS_STDT_00135]. Two `ClassContentConditional` match if the `condition` is equal. Experts should discuss if there is no match in the other profile or if incompatibilities are identified.

(e) Compare `ClassContentConditional.attributeTailoring`s [TPS_STDT_00131][TPS_STDT_00133][TPS_STDT_00134], `ClassContentConditional.constraintTailoring`s [TPS_STDT_00209] and `ClassContentConditional.sdgTailoring`s [TPS_STDT_00209]. Experts should discuss the identified incompatibilities. Incompatible restrictions with `severity`==error in the consumer's profile should be handled first, followed by restrictions with `severity`==warning and restrictions with `severity`==info.

⌋*(RS_STDT_00118)*

8.6.1 Compatibility of `Baseline`

[TPS_STDT_00183] Compatibility of `Baseline`s ⌈
Baselines are compatible if the following criteria are fulfilled

- `standardRevision`s specify the same revisions of `Autosar standards`[2] and

- `customSpecification`s refer to the same set of custom `Documentation`s and

- `customSdgDef`s refer to the same set of `SdgDef`s.

Otherwise the `Baseline`s are not compatible and discussion by engineers is required. ⌋*(RS_STDT_00118)*

8.6.2 Compatibility of `SpecificationScope`

[TPS_STDT_00128] Compatibility of `SpecificationDocumentScope`s ⌈
`SpecificationDocumentScope`s are incompatible if the attribute `inScope` has different values. Further analysis of the contained `DocumentElementScope`s is required if the specification is relevant in both profiles (`inScope`==true). See also table 8.44. ⌋*(RS_STDT_00118)*

	`SpecificationDocumentScope.inScope` of consumer x = compatible, - = incompatible, ? = suspect	
`SpecificationDocumentScope.inScope` of producer	**false**	**true**
false	x	-
true	-	? suspect, further analysis of contained `DocumentElementScope`s required => see [TPS_STDT_00160]

Table 8.44: Compatibility of `SpecificationDocumentScope`

[TPS_STDT_00160] Compatibility of `DocumentElementScope`s ⌈
`DocumentElementScope`s are compatible if the attribute `inScope` has the same value. Otherwise it is incompatible. See also table 8.45. ⌋*(RS_STDT_00118)*

---

[2]Different `standardRevision`s do not automatically result in problems with respect to tool interoperability. Especially, in case the `Data Exchange Point` relates to parts of the standard that have not changed between the revisions

	DocumentElementScope.inScope of consumer x = compatible, - = incompatible	
DocumentElementScope.in-Scope of producer	false	true
false	x	-
true	-	x

Table 8.45: Compatibility of `DocumentElementScope`

8.6.3 Compatibility of `DataFormatTailoring`

[TPS_STDT_00101] Compatibility of `ConcreteClassTailoring`s ⌈ `ConcreteClassTailoring`s are compatible if both the consumer and producer consider the related class as not relevant. (i.e. `ConcreteClassTailoring.in-Scope`==false). They are incompatible if the values of `ConcreteClassTailoring.inScope` are different. Further analysis is required if both the consumer and producer consider the related class as relevant. (i.e. `ConcreteClassTailoring.inScope`=true). See also table 8.46. ⌋*(RS_STDT_00118)*

	ConcreteClassTailoring.inScope of consumer x = compatible, - = incompatible, ? = suspect	
ConcreteClassTailoring.inScope of producer	false	true
false	x	-
true	-	? Further analysis required

Table 8.46: Compatibility of `ConcreteClassTailoring`

[TPS_STDT_00135] Compatibility of `ClassContentConditional` ⌈ Two `ClassContentConditional`s are considered to be incompatible if

- `condition` is not equivalent **OR**

- elements in `attributeTailoring` do not match **OR**

- elements in `constraintTailoring` do not match **OR**

- elements in `sdgTailoring` do not match

Otherwise further analysis is required. See also [TPS_STDT_00131], [TPS_STDT_00133], [TPS_STDT_00134], [TPS_STDT_00209] and [TPS_STDT_00208]. ⌋*(RS_STDT_00118)*

[TPS_STDT_00136] Compatibility of `AttributeTailoring` ⌈ Two `AttributeTailoring`s are considered to be incompatible if

- `multiplicityRestriction` is incompatible [TPS_STDT_00210] **OR**

- `variationRestriction` is incompatible [TPS_STDT_00201]

⌋*(RS_STDT_00118)*

[TPS_STDT_00131] Compatibility of `AggregationTailoring` ⌈
Two `AggregationTailoring`s are incompatible

- if they are incompatible according to [TPS_STDT_00136] **OR**

- if the elements in `typeTailoring` are incompatible.

If no incompatibilities were identified then it is considered as compatible. ⌋
(RS_STDT_00118)

[TPS_STDT_00133] Compatibility of `ReferenceTailoring` ⌈
Two `ReferenceTailoring`s are incompatible

- if they are incompatible according to [TPS_STDT_00136] **OR**

- if the elements in `typeTailoring` are incompatible **OR**

- if `unresolvedReferenceRestriction` is incompatible

If no incompatibilities were identified then it is considered as compatible. ⌋
(RS_STDT_00118)

[TPS_STDT_00134] Compatibility of `PrimitiveAttributeTailoring` ⌈
Two `PrimitiveAttributeTailoring`s are incompatible

- if they are incompatible according to [TPS_STDT_00136] **OR**

- if `defaultValueHandling` is not the same **OR**

- if `valueRestriction` [TPS_STDT_00205] is incompatible

⌋*(RS_STDT_00118)*

[TPS_STDT_00209] Compatibility of `SdgTailoring`s ⌈
Two `SdgTailoring`s are considered to be compatible if their `sdgClass` reference points to the same `SdgClass`. ⌋*(RS_STDT_00118)*

Note: This definition of compatibility does not cover the case, where two `SdgClass` definitions exist at different locations, but boil down to the equivalent `SdgClass`es. This is accepted for simplicity of validation.

[TPS_STDT_00208] Compatibility of `ConstraintTailoring`s ⌈
An interoperability risk exists if the severity of a constraint in the producer's profile is less than the severity in the consumer's profile. Another interoperability risk exists, if a custom constraint is referenced and the textual description is not identical in the

producer's and consumer's profile. In both cases, expert discussion is needed. ⌋ *(RS_STDT_00118)*

[TPS_STDT_00210] Compatibility of `MultiplicityRestrictionWithSeverity` ⌈
`MultiplicityRestrictionWithSeverity`s are compatible if the range that is specified by `lowerMultiplicity` and `upperMultiplicity`/`upperMultiplicityInfinite` of the producer is fully covered by the range that is specified by the consumer. See also table 8.47. ⌋*(RS_STDT_00118)*

MultiplicityRestrictionWithSeverity of Producer	MultiplicityRestrictionWithSeverity of Consumer x = compatible, - = incompatible				
	0..0	0..1	0..*	1..1	1..*
0..0	x	x	x	-	-
0..1	-	x	x	-	-
0..*	-	-	x	-	-
1..1	-	x	x	x	x
1..*	-	-	x	-	x

Table 8.47: Compatibility of Multiplicity Restrictions

[TPS_STDT_00201] Compatibility of `VariationRestrictionWithSeverity.variation` ⌈
When evaluating the compatibility of `VariationRestrictionWithSeverity`s the `variation` attribute at the producer's and the consumer's side are compared in a first step. Table 8.48 illustrates the outcome of this evaluation w.r.t. compatibility. ⌋*(RS_STDT_00118)*

Value of `VariationRestrictionWithSeverity.variation` of the Producer	Value of `VariationRestrictionWithSeverity.variation` of the Consumer	
	false	true
false	compatible	compatible
true	incompatible	further evaluation of the `VariationRestrictionWithSeverity.validBindingTime` attribute is required. See [TPS_STDT_00202]

Table 8.48: Compatibility of Variation Restrictions

[TPS_STDT_00202] Compatibility of `VariationRestrictionWithSeverity.validBindingTime` ⌈
In case the value of `VariationRestrictionWithSeverity.variation` is true at both the producer's and the consumer's side, further evaluation of the `VariationRestrictionWithSeverity.validBindingTime` attribute is required. The `validBindingTime` attributes at the producer's and the consumer's side are considered compatible if the the set of valid binding times of the producer is a subset

of the set of valid binding times of the consumer. Otherwise the `validBindingTime` attributes at the producer's and the consumer's side are considered incompatible. ⌋ *(RS_STDT_00118)*

[TPS_STDT_00205] Compatibility of `ValueRestrictionWithSeverity` ⌈
The compatibility of `ValueRestrictionWithSeverity`s is calculated using the following algorithm:

1. **if** `min` of the producer >= `min` of the consumer **then** `min` is compatible. Continue with next attribute. **else** `ValueRestrictionWithSeverity` is incompatible. Stop comparison.

2. **if** `max` of the producer <= `max` of the consumer **then** `max` is compatible. Continue with next attribute. **else** `ValueRestrictionWithSeverity` is incompatible. Stop comparison.

3. **if** `minLength` of the producer >= `minLength` of the consumer **then** `minLength` is compatible. Continue with next attribute. **else** `ValueRestrictionWithSeverity` is incompatible. Stop comparison.

4. **if** `maxLength` of the producer <= `maxLength` of the consumer **then** `maxLength` is compatible. Continue with next attribute. **else** `ValueRestrictionWithSeverity` is incompatible. Stop comparison.

5. **if** any match to the regular expression defined in the `pattern` attribute at the producer's side also yields a match to the regular expression defined in the `pattern` attribute at the consumer's side[3] **then** `pattern` is compatible. `ValueRestrictionWithSeverity` is compatible **else** `ValueRestrictionWithSeverity` is incompatible. Stop comparison.

⌋*(RS_STDT_00118)*

[TPS_STDT_00206] Compatibility of `UnresolvedReferenceRestriction-WithSeverity` ⌈
For an existing reference attribute, the `UnresolvedReferenceRestrictionWithSeverity` defines the `severity`, if the given reference path cannot be resolved.
An interoperability problem exists if the `UnresolvedReferenceRestrictionWithSeverity.severity` on the producer side is lower than the `UnresolvedReferenceRestrictionWithSeverity.severity` on the consumer side. ⌋ *(RS_STDT_00118)*

---

[3]Note that this basically boils down to computing the intersection to the two languages describe by the two regular expressions and checking whether this intersection in equal to the language described by the regular expression at the producer's side. Since this is a rather complex check it is permissible that a validating tool simply performs a string comparison of the two pattern attributes and treats them as incompatible if the two strings are not equal

Note: Unresolved references may happen by mistake or intentionally. For example, unresolved references may be tolerated by the consumer, if the data is not needed for the intended methodology step.

A Example Profiles of Data Exchange Points

A.1 Referencing Specification Elements

Example A.1 shows examples of references to standardized and custom specification elements.

Listing A.1: Referencing Specification Elements

```
<DATA-EXCHANGE-POINT>
  <SHORT-NAME>ExampleDataExchangePointWithCustomExtensions</SHORT-NAME>
  <REFERENCED-BASELINE>


    <STANDARD-REVISIONS>
      <STANDARD-REVISION>CP R4.2.2</STANDARD-REVISION>
    </STANDARD-REVISIONS>
      <CUSTOM-SPECIFICATION-REFS>
      <CUSTOM-SPECIFICATION-REF DEST="DOCUMENTATION">
          CustomSpecificationOfOS</CUSTOM-SPECIFICATION-REF>
      <CUSTOM-SPECIFICATION-REF DEST="DOCUMENTATION">
          CustomDataFormatExtensions</CUSTOM-SPECIFICATION-REF>
    </CUSTOM-SPECIFICATION-REFS>
      <CUSTOM-SDG-DEF-REFS>
      <CUSTOM-SDG-DEF-REF DEST="SDG-DEF">SafetyExtensionSdgDef</CUSTOM-SDG-
          DEF-REF>
    </CUSTOM-SDG-DEF-REFS>
  </REFERENCED-BASELINE>
  <SPECIFICATION-SCOPE>
    <SPECIFICATION-DOCUMENT-SCOPES>
      <SPECIFICATION-DOCUMENT-SCOPE>
        <SHORT-NAME>Methodology</SHORT-NAME>
        <IN-SCOPE>true</IN-SCOPE>
        <DOCUMENT-ELEMENT-SCOPES>
          <DOCUMENT-ELEMENT-SCOPE>
            <SHORT-NAME>Topology</SHORT-NAME>
            <DESC>
              <L-2 L="EN">Reference to STANDARDIZED element via shortName</
                  L-2>
            </DESC>
            <IN-SCOPE>true</IN-SCOPE>
          </DOCUMENT-ELEMENT-SCOPE>
          <DOCUMENT-ELEMENT-SCOPE>
            <SHORT-NAME>ECU_System_Description</SHORT-NAME>
            <DESC>
              <L-2 L="EN">Reference to STANDARDIZED deliverable via
                  alternativeName. The name of the deliverable contains
                  spaces and thus it is required to use the alternativeName<
                  /L-2>
            </DESC>
            <ALTERNATIVE-NAME>ECU System Description</ALTERNATIVE-NAME>
            <IN-SCOPE>true</IN-SCOPE>
          </DOCUMENT-ELEMENT-SCOPE>
        </DOCUMENT-ELEMENT-SCOPES>
      </SPECIFICATION-DOCUMENT-SCOPE>
```

```xml
<SPECIFICATION-DOCUMENT-SCOPE>
  <SHORT-NAME>Specification_of_Operating_System</SHORT-NAME>
  <DESC>
    <L-2 L="EN">Reference to STANDARDIZED Specification via
        alternative name that represents the title of the
        specification</L-2>
  </DESC>
  <ALTERNATIVE-NAME>Specification of Operating System</ALTERNATIVE-
    NAME>
  <IN-SCOPE>true</IN-SCOPE>
  <DOCUMENT-ELEMENT-SCOPES>
    <DOCUMENT-ELEMENT-SCOPE>
      <SHORT-NAME>SRS_Os_11005</SHORT-NAME>
      <DESC>
        <L-2 L="EN">Reference to STANDARDIZED requirement via
            shortName</L-2>
      </DESC>
      <IN-SCOPE>true</IN-SCOPE>
    </DOCUMENT-ELEMENT-SCOPE>
  </DOCUMENT-ELEMENT-SCOPES>
</SPECIFICATION-DOCUMENT-SCOPE>
<SPECIFICATION-DOCUMENT-SCOPE>
  <SHORT-NAME>CustomSpecificationOfOsScope</SHORT-NAME>
  <IN-SCOPE>true</IN-SCOPE>
  <CUSTOM-DOCUMENTATION-REF DEST="DOCUMENTATION">
      CustomSpecificationOfOS</CUSTOM-DOCUMENTATION-REF>
  <DOCUMENT-ELEMENT-SCOPES>
    <DOCUMENT-ELEMENT-SCOPE>
      <SHORT-NAME>Custom_SRS_Os_00001_Scope</SHORT-NAME>
      <DESC>
        <L-2 L="EN">Reference to CUSTOM requirement via shortName
            path</L-2>
      </DESC>
      <IN-SCOPE>true</IN-SCOPE>
      <CUSTOM-DOCUMENT-ELEMENT-REF DEST="STRUCTURED-REQ">
          CustomSpecificationOfOS/FunctionalExtensions/
          Custom_SRS_Os_00001</CUSTOM-DOCUMENT-ELEMENT-REF>
    </DOCUMENT-ELEMENT-SCOPE>
  </DOCUMENT-ELEMENT-SCOPES>
</SPECIFICATION-DOCUMENT-SCOPE>
<SPECIFICATION-DOCUMENT-SCOPE>
  <SHORT-NAME>Software_Component_Template</SHORT-NAME>
  <ALTERNATIVE-NAME>Software Component Template</ALTERNATIVE-NAME>
  <DOCUMENT-ELEMENT-SCOPES>
    <DOCUMENT-ELEMENT-SCOPE>
      <SHORT-NAME>TPS_SWCT_01251</SHORT-NAME>
      <DESC>
        <L-2 L="EN">Reference to STANDARDIZED specItem via shortName<
            /L-2>
      </DESC>
      <IN-SCOPE>true</IN-SCOPE>
    </DOCUMENT-ELEMENT-SCOPE>
  </DOCUMENT-ELEMENT-SCOPES>
</SPECIFICATION-DOCUMENT-SCOPE>
</SPECIFICATION-DOCUMENT-SCOPES>
</SPECIFICATION-SCOPE>
```

```xml
<DATA-FORMAT-TAILORING>
  <CLASS-TAILORINGS>
    <CONCRETE-CLASS-TAILORING>
      <SHORT-NAME>StructuredReq</SHORT-NAME>
      <IN-SCOPE>true</IN-SCOPE>
      <CLASS-CONTENTS>
        <CLASS-CONTENT-CONDITIONAL>
          <SHORT-NAME>Invariant</SHORT-NAME>
          <SDG-TAILORINGS>
            <SDG-TAILORING>
              <SHORT-NAME>SafetyExtension</SHORT-NAME>
              <SEVERITY>WARNING</SEVERITY>
              <SDG-CLASS-REF DEST="SDG-CLASS">SafetyExtensionSdgDef/
                SafetyRequirement</SDG-CLASS-REF>
            </SDG-TAILORING>
          </SDG-TAILORINGS>
        </CLASS-CONTENT-CONDITIONAL>
      </CLASS-CONTENTS>
    </CONCRETE-CLASS-TAILORING>
  </CLASS-TAILORINGS>
  <CONSTRAINT-TAILORINGS>
    <CONSTRAINT-TAILORING>
      <SHORT-NAME>constr_2508</SHORT-NAME>
      <DESC>
        <L-2 L="EN">Reference to STANDARDIZED constraint via shortName</L
          -2>
      </DESC>
      <IN-SCOPE>true</IN-SCOPE>
    </CONSTRAINT-TAILORING>
    <CONSTRAINT-TAILORING>
      <SHORT-NAME>CUSTOM_constr_0001Tailoring</SHORT-NAME>
      <DESC>
        <L-2 L="EN">Reference to CUSTOM constraint via shortName path</L
          -2>
      </DESC>
      <IN-SCOPE>true</IN-SCOPE>
      <SEVERITY>ERROR</SEVERITY>
      <CONSTRAINT-REF DEST="TRACEABLE-TEXT">CustomDataFormatExtensions/
        CustomConstraints/CUSTOM_constr_0001</CONSTRAINT-REF>
    </CONSTRAINT-TAILORING>
  </CONSTRAINT-TAILORINGS>
</DATA-FORMAT-TAILORING>
</DATA-EXCHANGE-POINT>
<DOCUMENTATION>
  <SHORT-NAME>CustomSpecificationOfOS</SHORT-NAME>
  <DOCUMENTATION-CONTENT>
    <CHAPTER>
      <SHORT-NAME>FunctionalExtensions</SHORT-NAME>
      <STRUCTURED-REQ>
        <SHORT-NAME>Custom_SRS_Os_00001</SHORT-NAME>
        <DESCRIPTION>
          <P>
            <L-1 L="EN">The description of the custom requirement</L-1>
          </P>
        </DESCRIPTION>
        <RATIONALE>
```

```xml
            <P>
              <L-1 L="EN">The rationale of the custom requirement</L-1>
            </P>
          </RATIONALE>
        </STRUCTURED-REQ>
      </CHAPTER>
    </DOCUMENTATION-CONTENT>
  </DOCUMENTATION>
  <DOCUMENTATION>
    <SHORT-NAME>CustomDataFormatExtensions</SHORT-NAME>
    <DOCUMENTATION-CONTENT>
      <CHAPTER>
        <SHORT-NAME>CustomConstraints</SHORT-NAME>
        <TRACE>
          <SHORT-NAME>CUSTOM_constr_0001</SHORT-NAME>
          <CATEGORY>CONSTRAINT_ITEM</CATEGORY>
          <P>
            <L-1 L="EN">Description of the custom constraint</L-1>
          </P>
        </TRACE>
      </CHAPTER>
    </DOCUMENTATION-CONTENT>
  </DOCUMENTATION>
  <SDG-DEF>
    <SHORT-NAME>SafetyExtensionSdgDef</SHORT-NAME>
    <DESC>
      <L-2 L="EN">Sdgs used for safety extensions</L-2>
    </DESC>
    <SDG-CLASSES>
      <SDG-CLASS>
        <SHORT-NAME>SafetyRequirement</SHORT-NAME>
        <DESC>
          <L-2 L="EN">[TPS_SAFEX_00104] Status attribute</L-2>
        </DESC>
        <GID>SAFEX</GID>
        <EXTENDS-META-CLASS>StructuredReq</EXTENDS-META-CLASS>
        <ATTRIBUTES>
          <SDG-PRIMITIVE-ATTRIBUTE>
            <SHORT-NAME>asil</SHORT-NAME>
            <DESC>
              <L-2 L="EN">[TPS_SAFEX_00201] ASIL attribute of safety
                  requirements</L-2>
            </DESC>
            <GID>ASIL</GID>
            <PATTERN>QM|A|B|C|D|QM(A)|QM(B)|QM(C)|QM(D)|A(B)|A\(C\)|A(D)|B(B)
                |B(C)|B(D)|C(C)|C(D)|D(D)</PATTERN>
          </SDG-PRIMITIVE-ATTRIBUTE>
          <SDG-PRIMITIVE-ATTRIBUTE>
            <SHORT-NAME>status</SHORT-NAME>
            <DESC>
              <L-2 L="EN">[TPS_SAFEX_00104] Status attribute</L-2>
            </DESC>
            <GID>STATUS</GID>
          </SDG-PRIMITIVE-ATTRIBUTE>
        </ATTRIBUTES>
      </SDG-CLASS>
```

A.2 Class Tailoring With MultiplicityRestrictions and ValueRestrictions

Example A.2 specifies a `ClassTailoring` that

- Requires exactly one instance of the meta class `System` in the complete model.

- This instance of `System` is a validationRoot element for determining the set of reachable elements.

- The value of the attribute `category` of that `System` shall be "ECU_SYSTEM_DESCRIPTION"

- The number of elements that are referenced by `System.fibexElement` is restricted to 100.

- Exactly one instance of `EcuInstance` shall be referenced in the role `System.fibexElement`

- Exactly one instance of `CanCluster` shall be referenced in the role `System.fibexElement`

Listing A.2: Example of Class Tailoring With MultiplicityRestrictions and ValueRestriction

```
<CONCRETE-CLASS-TAILORING>
  <SHORT-NAME>System</SHORT-NAME>
  <DESC>
    <L-2 L="EN">The model must contain exactly one instance.</L-2>
  </DESC>
  <IN-SCOPE>true</IN-SCOPE>
  <MULTIPLICITY-RESTRICTION>
    <SEVERITY>ERROR</SEVERITY>
    <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
    <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
  </MULTIPLICITY-RESTRICTION>
  <CLASS-CONTENTS>
    <CLASS-CONTENT-CONDITIONAL>
      <SHORT-NAME>Invariant</SHORT-NAME>
      <DESC>
        <L-2 L="EN">The category shall be set to ECU_SYSTEM_DESCRIPTION</L
          -2>
      </DESC>
      <ATTRIBUTE-TAILORINGS>
        <PRIMITIVE-ATTRIBUTE-TAILORING>
          <SHORT-NAME>category</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
          <MULTIPLICITY-RESTRICTION>
            <SEVERITY>ERROR</SEVERITY>
            <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
          </MULTIPLICITY-RESTRICTION>
          <VALUE-RESTRICTION>
            <SEVERITY>ERROR</SEVERITY>
            <PATTERN>ECU_SYSTEM_DESCRIPTION</PATTERN>
          </VALUE-RESTRICTION>
        </PRIMITIVE-ATTRIBUTE-TAILORING>
```

```xml
<REFERENCE-TAILORING>
  <SHORT-NAME>fibexElement</SHORT-NAME>
  <DESC>
    <L-2 L="EN">
    This reference is a collection of all elements that
    belong to the System. We expect at least one element
    and at most 100 elements.
    </L-2>
  </DESC>
  <IN-SCOPE>true</IN-SCOPE>
  <MULTIPLICITY-RESTRICTION>
    <SEVERITY>ERROR</SEVERITY>
    <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
    <UPPER-MULTIPLICITY>100</UPPER-MULTIPLICITY>
  </MULTIPLICITY-RESTRICTION>
  <TYPE-TAILORINGS>
    <CONCRETE-CLASS-TAILORING>
      <SHORT-NAME>ECUInstance</SHORT-NAME>
      <DESC>
        <L-2 L="EN">exactly one ECU instance is required</L-2>
      </DESC>
      <IN-SCOPE>true</IN-SCOPE>
      <MULTIPLICITY-RESTRICTION>
        <SEVERITY>ERROR</SEVERITY>
        <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
        <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
      </MULTIPLICITY-RESTRICTION>
    </CONCRETE-CLASS-TAILORING>
    <CONCRETE-CLASS-TAILORING>
      <SHORT-NAME>CanCluster</SHORT-NAME>
      <DESC>
        <L-2 L="EN">exactly one CanCluster is required</L-2>
      </DESC>
      <IN-SCOPE>true</IN-SCOPE>
      <MULTIPLICITY-RESTRICTION>
        <SEVERITY>ERROR</SEVERITY>
        <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
        <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
      </MULTIPLICITY-RESTRICTION>
    </CONCRETE-CLASS-TAILORING>
  </TYPE-TAILORINGS>
  <UNRESOLVED-REFERENCE-RESTRICTION>
    <SEVERITY>ERROR</SEVERITY>
  </UNRESOLVED-REFERENCE-RESTRICTION>
</REFERENCE-TAILORING>
    </ATTRIBUTE-TAILORINGS>
  </CLASS-CONTENT-CONDITIONAL>
</CLASS-CONTENTS>
<VALIDATION-ROOT>true</VALIDATION-ROOT>
</CONCRETE-CLASS-TAILORING>
```

A.3 Class Tailoring With Global and Local MultiplicityRestrictions

Example A.3 specifies `ClassTailoring`s that express the following semantics:

- `PPortPrototype`s and `RPortPrototype`s are in scope an may be used without restrictions with respect to the multiplicity. Any exception from this rule has to be defined explicitly by adding further multiplicity restrictions.

- `PRPortPrototype`s are not allowed.

- In the context of an `ParameterSwComponentType` an additional restriction applies which disallows the usage of `RPortPrototype`s in the role `port`.

Listing A.3: Example of Class Tailoring With Global and Local MultiplicityRestrictions

```xml
<DATA-EXCHANGE-POINT>
  <SHORT-NAME>MyExchangePoint</SHORT-NAME>
  <!-- -->
  <DATA-FORMAT-TAILORING>
    <CLASS-TAILORINGS>
      <!-- -->
      <CONCRETE-CLASS-TAILORING>
        <SHORT-NAME>PPortPrototype</SHORT-NAME>
        <DESC>
          <L-2 L="EN">No restriction with respect to multiplicity of
            PPortPrototypes</L-2>
        </DESC>
        <IN-SCOPE>true</IN-SCOPE>
        <MULTIPLICITY-RESTRICTION>
          <SEVERITY>INFO</SEVERITY>
          <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY-INFINITE>true</UPPER-MULTIPLICITY-INFINITE>
        </MULTIPLICITY-RESTRICTION>
        <VALIDATION-ROOT>false</VALIDATION-ROOT>
      </CONCRETE-CLASS-TAILORING>
      <CONCRETE-CLASS-TAILORING>
        <SHORT-NAME>PRPortPrototype</SHORT-NAME>
        <DESC>
          <L-2 L="EN">No PRPortPrototypes are allowed in the set of
            reachable elements</L-2>
        </DESC>
        <IN-SCOPE>true</IN-SCOPE>
        <MULTIPLICITY-RESTRICTION>
          <SEVERITY>ERROR</SEVERITY>
          <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY>0</UPPER-MULTIPLICITY>
        </MULTIPLICITY-RESTRICTION>
        <VALIDATION-ROOT>false</VALIDATION-ROOT>
      </CONCRETE-CLASS-TAILORING>
      <CONCRETE-CLASS-TAILORING>
        <SHORT-NAME>RPortPrototype</SHORT-NAME>
        <DESC>
          <L-2 L="EN">No restriction with respect to multiplicity of
            RPortPrototypes</L-2>
        </DESC>
        <IN-SCOPE>true</IN-SCOPE>
```

```xml
  <MULTIPLICITY-RESTRICTION>
    <SEVERITY>INFO</SEVERITY>
    <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
    <UPPER-MULTIPLICITY-INFINITE>true</UPPER-MULTIPLICITY-INFINITE>
  </MULTIPLICITY-RESTRICTION>
  <VALIDATION-ROOT>false</VALIDATION-ROOT>
</CONCRETE-CLASS-TAILORING>
<CONCRETE-CLASS-TAILORING>
  <SHORT-NAME>ParameterSwComponentType</SHORT-NAME>
  <DESC>
    <L-2 L="EN">
No restriction with respect to the number of used
ParameterSwComponentTypes.
In the context of the ParameterSwComponentType
only PPortPrototypes are allowed. (constr_1092)</L-2>
  </DESC>
  <IN-SCOPE>true</IN-SCOPE>
  <MULTIPLICITY-RESTRICTION>
    <SEVERITY>INFO</SEVERITY>
    <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
    <UPPER-MULTIPLICITY-INFINITE>true</UPPER-MULTIPLICITY-INFINITE>
  </MULTIPLICITY-RESTRICTION>
  <CLASS-CONTENTS>
    <CLASS-CONTENT-CONDITIONAL>
      <SHORT-NAME>invariant</SHORT-NAME>
      <ATTRIBUTE-TAILORINGS>
        <AGGREGATION-TAILORING>
          <SHORT-NAME>port</SHORT-NAME>
          <DESC>
            <L-2 L="EN">No restriction with respect to the number of
                PortPrototypes</L-2>
          </DESC>
          <MULTIPLICITY-RESTRICTION>
            <SEVERITY>INFO</SEVERITY>
            <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
            <UPPER-MULTIPLICITY-INFINITE>true</UPPER-MULTIPLICITY-
                INFINITE>
          </MULTIPLICITY-RESTRICTION>
          <TYPE-TAILORINGS>
            <!--
              No additional restriction for PRPortPrototypes:
              Globally defined ClassTailoring applies which
              does not allow the use of  PRPortPrototypes
              in the context of all references and aggregations
            -->
            <!--
              No additional restriction for PPortPrototypes:
              Globally defined ClassTailoring applies which
              allows for unrestricted number of PPortPrototypes
              in the context of all references and aggregations
            -->
            <CONCRETE-CLASS-TAILORING>
              <SHORT-NAME>RPortPrototype</SHORT-NAME>
              <DESC>
                <L-2 L="EN">No RPortPrototypes are allowed at
                    ParameterSwComponentTypes</L-2>
```

```
            </DESC>
            <MULTIPLICITY-RESTRICTION>
              <SEVERITY>ERROR</SEVERITY>
              <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
              <UPPER-MULTIPLICITY>0</UPPER-MULTIPLICITY>
            </MULTIPLICITY-RESTRICTION>
          </CONCRETE-CLASS-TAILORING>
        </TYPE-TAILORINGS>
      </AGGREGATION-TAILORING>
    </ATTRIBUTE-TAILORINGS>
  </CLASS-CONTENT-CONDITIONAL>
</CLASS-CONTENTS>
<VALIDATION-ROOT>true</VALIDATION-ROOT>
</CONCRETE-CLASS-TAILORING>
</CLASS-TAILORINGS>
</DATA-FORMAT-TAILORING>
</DATA-EXCHANGE-POINT>
```

A.4 Class Tailoring That Depends On the Using Role

Example A.4 specifies:

- The `initValue` of a `VariableDataPrototype` is optional if the `Variable-DataPrototype` is used in the roles `implicitInterRunnableVariable` or `implicitInterRunnableVariable` of a `SwcInternalBehavior`.

- The `initValue` of a `VariableDataPrototype` shall not exist if the `Vari-ableDataPrototype` is used in the role `dataElement` of a `Sender-ReceiverInterface`.

Listing A.4: Example of Class Tailoring That Depends On the Using Role

```
<CONCRETE-CLASS-TAILORING>
  <SHORT-NAME>SwcInternalBehavior</SHORT-NAME>
  <IN-SCOPE>true</IN-SCOPE>
  <CLASS-CONTENTS>
    <CLASS-CONTENT-CONDITIONAL>
      <SHORT-NAME>Invariant</SHORT-NAME>
      <ATTRIBUTE-TAILORINGS>
        <AGGREGATION-TAILORING>
          <SHORT-NAME>explicitInterRunnableVariable</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
          <TYPE-TAILORINGS>
            <CONCRETE-CLASS-TAILORING>
              <SHORT-NAME>VariableDataPrototype</SHORT-NAME>
              <IN-SCOPE>true</IN-SCOPE>
              <CLASS-CONTENTS>
                <CLASS-CONTENT-CONDITIONAL>
                  <SHORT-NAME>Invariant</SHORT-NAME>
                  <ATTRIBUTE-TAILORINGS>
                    <AGGREGATION-TAILORING>
                      <SHORT-NAME>initValue</SHORT-NAME>
                      <DESC>
```

```xml
              <L-2 L="EN">[TPS_SWCT_01268] Definition of
                  initValue for a VariableDataPrototype or a
                  ParameterDataPrototype</L-2>
            </DESC>
            <IN-SCOPE>true</IN-SCOPE>
            <MULTIPLICITY-RESTRICTION>
              <SEVERITY>ERROR</SEVERITY>
              <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
              <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
            </MULTIPLICITY-RESTRICTION>
          </AGGREGATION-TAILORING>
        </ATTRIBUTE-TAILORINGS>
      </CLASS-CONTENT-CONDITIONAL>
    </CLASS-CONTENTS>
    <VALIDATION-ROOT>false</VALIDATION-ROOT>
  </CONCRETE-CLASS-TAILORING>
</TYPE-TAILORINGS>
</AGGREGATION-TAILORING>
<AGGREGATION-TAILORING>
  <SHORT-NAME>implicitInterRunnableVariable</SHORT-NAME>
  <IN-SCOPE>true</IN-SCOPE>
  <TYPE-TAILORINGS>
    <CONCRETE-CLASS-TAILORING>
      <SHORT-NAME>VariableDataPrototype</SHORT-NAME>
      <IN-SCOPE>true</IN-SCOPE>
      <CLASS-CONTENTS>
        <CLASS-CONTENT-CONDITIONAL>
          <SHORT-NAME>Invariant</SHORT-NAME>
          <ATTRIBUTE-TAILORINGS>
            <AGGREGATION-TAILORING>
              <SHORT-NAME>initValue</SHORT-NAME>
              <DESC>
                <L-2 L="EN">[TPS_SWCT_01268] Definition of
                    initValue for a VariableDataPrototype or a
                    ParameterDataPrototype</L-2>
              </DESC>
              <IN-SCOPE>true</IN-SCOPE>
              <MULTIPLICITY-RESTRICTION>
                <SEVERITY>ERROR</SEVERITY>
                <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
                <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
              </MULTIPLICITY-RESTRICTION>
            </AGGREGATION-TAILORING>
          </ATTRIBUTE-TAILORINGS>
        </CLASS-CONTENT-CONDITIONAL>
      </CLASS-CONTENTS>
      <VALIDATION-ROOT>false</VALIDATION-ROOT>
    </CONCRETE-CLASS-TAILORING>
  </TYPE-TAILORINGS>
</AGGREGATION-TAILORING>
</ATTRIBUTE-TAILORINGS>
</CLASS-CONTENT-CONDITIONAL>
</CLASS-CONTENTS>
</CONCRETE-CLASS-TAILORING>
<CONCRETE-CLASS-TAILORING>
  <SHORT-NAME>SenderReceiverInterface</SHORT-NAME>
```

```
  <IN-SCOPE>true</IN-SCOPE>
  <CLASS-CONTENTS>
    <CLASS-CONTENT-CONDITIONAL>
      <SHORT-NAME>Invariant</SHORT-NAME>
      <ATTRIBUTE-TAILORINGS>
        <AGGREGATION-TAILORING>
          <SHORT-NAME>dataElement</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
          <TYPE-TAILORINGS>
            <CONCRETE-CLASS-TAILORING>
              <SHORT-NAME>VariableDataPrototype</SHORT-NAME>
              <IN-SCOPE>true</IN-SCOPE>
              <CLASS-CONTENTS>
                <CLASS-CONTENT-CONDITIONAL>
                  <SHORT-NAME>Invariant</SHORT-NAME>
                  <ATTRIBUTE-TAILORINGS>
                    <AGGREGATION-TAILORING>
                      <SHORT-NAME>initValue</SHORT-NAME>
                      <DESC>
                        <L-2 L="EN">[TPS_SWCT_01269] In PortInterfaces,
                          initial values defined for DataPrototypes are
                          ignored</L-2>
                      </DESC>
                      <IN-SCOPE>true</IN-SCOPE>
                      <MULTIPLICITY-RESTRICTION>
                        <UPPER-MULTIPLICITY>0</UPPER-MULTIPLICITY>
                      </MULTIPLICITY-RESTRICTION>
                    </AGGREGATION-TAILORING>
                  </ATTRIBUTE-TAILORINGS>
                </CLASS-CONTENT-CONDITIONAL>
              </CLASS-CONTENTS>
            </CONCRETE-CLASS-TAILORING>
          </TYPE-TAILORINGS>
        </AGGREGATION-TAILORING>
      </ATTRIBUTE-TAILORINGS>
    </CLASS-CONTENT-CONDITIONAL>
  </CLASS-CONTENTS>
</CONCRETE-CLASS-TAILORING>
```

A.5 Class Tailoring That Depends On the Value of an Attribute

Example A.5 specifies a `ClassTailoring` that specifies the content model of an instance of `SwDataDefProps` if it attached to an `ImplementationDataType` with category `VALUE` or `DATA_REFERENCE` as described in table "Allowed Attributes vs. category for ImplementationDataType" in the [1].

Listing A.5: Example of Class Tailoring That Depends On the Value of an Attribute

```
<CONCRETE-CLASS-TAILORING>
  <SHORT-NAME>ImplementationDataType</SHORT-NAME>
  <DESC>
```

```xml
  <L-2 L="EN">Example that demonstates how to express complex
      constraints as defined in [constr_1009] SwDataDefProps applicable
      to ImplementationDataTypes.</L-2>
</DESC>
<IN-SCOPE>true</IN-SCOPE>
<CLASS-CONTENTS>
  <CLASS-CONTENT-CONDITIONAL>
    <SHORT-NAME>Invariant</SHORT-NAME>
    <ATTRIBUTE-TAILORINGS>
      <PRIMITIVE-ATTRIBUTE-TAILORING>
        <SHORT-NAME>category</SHORT-NAME>
        <DESC>
          <L-2 L="EN">[TPS_SWCT_01251] Limited set of values for
              category are applicable for ImplementationDataType.</L-2>
        </DESC>
        <IN-SCOPE>true</IN-SCOPE>
        <MULTIPLICITY-RESTRICTION>
          <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
        </MULTIPLICITY-RESTRICTION>
        <DEFAULT-VALUE-HANDLING>NO-DEFAULT</DEFAULT-VALUE-HANDLING>
        <VALUE-RESTRICTION>
          <PATTERN>VALUE|DATA_REFERENCE|FUNCTION_REFERENCE|
              TYPE_REFERENCE|STRUCTURE|UNION|ARRAY</PATTERN>
        </VALUE-RESTRICTION>
      </PRIMITIVE-ATTRIBUTE-TAILORING>
    </ATTRIBUTE-TAILORINGS>
  </CLASS-CONTENT-CONDITIONAL>
  <CLASS-CONTENT-CONDITIONAL>
    <SHORT-NAME>VALUE</SHORT-NAME>
    <CONDITION>
      <PRIMITIVE-ATTRIBUTE-CONDITION>
        <PATTERN>VALUE</PATTERN>
        <ATTRIBUTE-REF DEST="PRIMITIVE-ATTRIBUTE-TAILORING">
            ExampleClassTailoring/ImplementationDataType/Invariant/
            category</ATTRIBUTE-REF>
      </PRIMITIVE-ATTRIBUTE-CONDITION>
    </CONDITION>
    <ATTRIBUTE-TAILORINGS>
      <AGGREGATION-TAILORING>
        <SHORT-NAME>swDataDefProps</SHORT-NAME>
        <IN-SCOPE>true</IN-SCOPE>
        <MULTIPLICITY-RESTRICTION>
          <SEVERITY>ERROR</SEVERITY>
          <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
        </MULTIPLICITY-RESTRICTION>
        <TYPE-TAILORINGS>
          <CONCRETE-CLASS-TAILORING>
            <SHORT-NAME>SwDataDefProps</SHORT-NAME>
            <IN-SCOPE>true</IN-SCOPE>
            <CLASS-CONTENTS>
              <CLASS-CONTENT-CONDITIONAL>
                <SHORT-NAME>Invariant</SHORT-NAME>
                <ATTRIBUTE-TAILORINGS>
                  <PRIMITIVE-ATTRIBUTE-TAILORING>
                    <SHORT-NAME>additionalNativeTypeQualifier</SHORT-
                        NAME>
```

```xml
          <IN-SCOPE>true</IN-SCOPE>
        </PRIMITIVE-ATTRIBUTE-TAILORING>
        <AGGREGATION-TAILORING>
          <SHORT-NAME>annotation</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
        </AGGREGATION-TAILORING>
        <REFERENCE-TAILORING>
          <SHORT-NAME>baseType</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
          <MULTIPLICITY-RESTRICTION>
            <SEVERITY>ERROR</SEVERITY>
            <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
          </MULTIPLICITY-RESTRICTION>
        </REFERENCE-TAILORING>
        <REFERENCE-TAILORING>
          <SHORT-NAME>compuMethod</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
        </REFERENCE-TAILORING>
        <REFERENCE-TAILORING>
          <SHORT-NAME>dataConstr</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
        </REFERENCE-TAILORING>
        <PRIMITIVE-ATTRIBUTE-TAILORING>
          <SHORT-NAME>displayFormat</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
        </PRIMITIVE-ATTRIBUTE-TAILORING>
        <REFERENCE-TAILORING>
          <SHORT-NAME>implementationDataType</SHORT-NAME>
          <IN-SCOPE>false</IN-SCOPE>
        </REFERENCE-TAILORING>
        <AGGREGATION-TAILORING>
          <SHORT-NAME>invalidValue</SHORT-NAME>
          <IN-SCOPE>true</IN-SCOPE>
        </AGGREGATION-TAILORING>
        <!-- ... -->
      </ATTRIBUTE-TAILORINGS>
    </CLASS-CONTENT-CONDITIONAL>
  </CLASS-CONTENTS>
        </CONCRETE-CLASS-TAILORING>
      </TYPE-TAILORINGS>
    </AGGREGATION-TAILORING>
  </ATTRIBUTE-TAILORINGS>
</CLASS-CONTENT-CONDITIONAL>
<CLASS-CONTENT-CONDITIONAL>
  <SHORT-NAME>DATA_REFERENCE</SHORT-NAME>
  <CONDITION>
    <PRIMITIVE-ATTRIBUTE-CONDITION>
      <PATTERN>DATA_REFERENCE</PATTERN>
      <ATTRIBUTE-REF DEST="PRIMITIVE-ATTRIBUTE-TAILORING">
          ExampleClassTailoring/ImplementationDataType/Invariant/
          category</ATTRIBUTE-REF>
    </PRIMITIVE-ATTRIBUTE-CONDITION>
  </CONDITION>
  <ATTRIBUTE-TAILORINGS>
    <AGGREGATION-TAILORING>
      <SHORT-NAME>swDataDefProps</SHORT-NAME>
```

```
<IN-SCOPE>true</IN-SCOPE>
<MULTIPLICITY-RESTRICTION>
  <SEVERITY>ERROR</SEVERITY>
  <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
</MULTIPLICITY-RESTRICTION>
<TYPE-TAILORINGS>
  <CONCRETE-CLASS-TAILORING>
    <SHORT-NAME>SwDataDefProps</SHORT-NAME>
    <IN-SCOPE>true</IN-SCOPE>
    <CLASS-CONTENTS>
      <CLASS-CONTENT-CONDITIONAL>
        <SHORT-NAME>Invariant</SHORT-NAME>
        <ATTRIBUTE-TAILORINGS>
          <PRIMITIVE-ATTRIBUTE-TAILORING>
            <SHORT-NAME>additionalNativeTypeQualifier</SHORT-
              NAME>
            <IN-SCOPE>true</IN-SCOPE>
          </PRIMITIVE-ATTRIBUTE-TAILORING>
          <AGGREGATION-TAILORING>
            <SHORT-NAME>annotation</SHORT-NAME>
            <IN-SCOPE>true</IN-SCOPE>
          </AGGREGATION-TAILORING>
          <REFERENCE-TAILORING>
            <SHORT-NAME>baseType</SHORT-NAME>
            <IN-SCOPE>false</IN-SCOPE>
            <MULTIPLICITY-RESTRICTION>
              <SEVERITY>ERROR</SEVERITY>
              <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
            </MULTIPLICITY-RESTRICTION>
          </REFERENCE-TAILORING>
          <REFERENCE-TAILORING>
            <SHORT-NAME>compuMethod</SHORT-NAME>
            <IN-SCOPE>false</IN-SCOPE>
          </REFERENCE-TAILORING>
          <REFERENCE-TAILORING>
            <SHORT-NAME>dataConstr</SHORT-NAME>
            <IN-SCOPE>false</IN-SCOPE>
          </REFERENCE-TAILORING>
          <PRIMITIVE-ATTRIBUTE-TAILORING>
            <SHORT-NAME>displayFormat</SHORT-NAME>
            <IN-SCOPE>false</IN-SCOPE>
          </PRIMITIVE-ATTRIBUTE-TAILORING>
          <REFERENCE-TAILORING>
            <SHORT-NAME>implementationDataType</SHORT-NAME>
            <IN-SCOPE>false</IN-SCOPE>
          </REFERENCE-TAILORING>
          <AGGREGATION-TAILORING>
            <SHORT-NAME>invalidValue</SHORT-NAME>
            <IN-SCOPE>false</IN-SCOPE>
          </AGGREGATION-TAILORING>
          <!-- ... -->
        </ATTRIBUTE-TAILORINGS>
      </CLASS-CONTENT-CONDITIONAL>
    </CLASS-CONTENTS>
  </CONCRETE-CLASS-TAILORING>
</TYPE-TAILORINGS>
```

```
      </AGGREGATION-TAILORING>
    </ATTRIBUTE-TAILORINGS>
  </CLASS-CONTENT-CONDITIONAL>
</CLASS-CONTENTS>
</CONCRETE-CLASS-TAILORING>
```

A.6 Class Tailoring That Depends on Existence of Attribute

Example A.6 specifies a `ClassTailoring` that specifies the content model of a class that depends on the existence of an attribute: If there exists an `NvBlockDe-scriptor.romBlock` then `NvBlockDescriptor.nvBlockNeeds.nRomBlocks` is mandatory and its value shall be bigger than 1.

Listing A.6: Example of Class Tailoring That Depends on Existence of Attribute

```
<CONCRETE-CLASS-TAILORING>
  <SHORT-NAME>NvBlockDescriptor</SHORT-NAME>
  <DESC>
    <L-2 L="EN">The input may contain a 'NvBlockDescriptor'.</L-2>
  </DESC>
  <IN-SCOPE>true</IN-SCOPE>
  <MULTIPLICITY-RESTRICTION>
    <SEVERITY>INFO</SEVERITY>
    <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
    <UPPER-MULTIPLICITY-INFINITE>true</UPPER-MULTIPLICITY-INFINITE>
  </MULTIPLICITY-RESTRICTION>
  <CLASS-CONTENTS>
    <CLASS-CONTENT-CONDITIONAL>
      <SHORT-NAME>Invariant</SHORT-NAME>
      <ATTRIBUTE-TAILORINGS>
        <AGGREGATION-TAILORING>
          <SHORT-NAME>romBlock</SHORT-NAME>
          <DESC>
            <L-2 L="EN">The input may contain a 'romBlock'.</L-2>
          </DESC>
          <IN-SCOPE>true</IN-SCOPE>
          <MULTIPLICITY-RESTRICTION>
            <SEVERITY>ERROR</SEVERITY>
            <LOWER-MULTIPLICITY>0</LOWER-MULTIPLICITY>
            <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
          </MULTIPLICITY-RESTRICTION>
        </AGGREGATION-TAILORING>
      </ATTRIBUTE-TAILORINGS>
    </CLASS-CONTENT-CONDITIONAL>
    <CLASS-CONTENT-CONDITIONAL>
      <SHORT-NAME>UsingRomBlock</SHORT-NAME>
      <DESC>
        <L-2 L="EN">Content that is required if romBlock is defined</L-2>
      </DESC>
      <CONDITION>
        <AGGREGATION-CONDITION>
          <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
```

```xml
        <AGGREGATION-REF DEST="AGGREGATION-TAILORING">
            ExampleClassTailoring/NvBlockDescriptor/Invariant/romBlock</
            AGGREGATION-REF>
      </AGGREGATION-CONDITION>
    </CONDITION>
    <ATTRIBUTE-TAILORINGS>
      <AGGREGATION-TAILORING>
        <SHORT-NAME>nvBlockNeeds</SHORT-NAME>
        <DESC>
          <L-2 L="EN">The input may contain 'nvBlockNeeds'.</L-2>
        </DESC>
        <IN-SCOPE>true</IN-SCOPE>
        <MULTIPLICITY-RESTRICTION>
          <SEVERITY>ERROR</SEVERITY>
          <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
          <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
        </MULTIPLICITY-RESTRICTION>
        <TYPE-TAILORINGS>
          <CONCRETE-CLASS-TAILORING>
            <SHORT-NAME>NvBlockNeeds</SHORT-NAME>
            <IN-SCOPE>true</IN-SCOPE>
            <MULTIPLICITY-RESTRICTION>
              <SEVERITY>ERROR</SEVERITY>
              <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
              <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
            </MULTIPLICITY-RESTRICTION>
            <CLASS-CONTENTS>
              <CLASS-CONTENT-CONDITIONAL>
                <SHORT-NAME>Invariant</SHORT-NAME>
                <ATTRIBUTE-TAILORINGS>
                  <PRIMITIVE-ATTRIBUTE-TAILORING>
                    <SHORT-NAME>nRomBlocks</SHORT-NAME>
                    <DESC>
                      <L-2 L="EN">'nRomBlocks' must be present and and
                          greater than 0 in case the enclosing
                          NvBlockDescriptor has a romBlock.</L-2>
                    </DESC>
                    <IN-SCOPE>true</IN-SCOPE>
                    <MULTIPLICITY-RESTRICTION>
                      <SEVERITY>ERROR</SEVERITY>
                      <LOWER-MULTIPLICITY>1</LOWER-MULTIPLICITY>
                      <UPPER-MULTIPLICITY>1</UPPER-MULTIPLICITY>
                    </MULTIPLICITY-RESTRICTION>
                    <VALUE-RESTRICTION>
                      <MIN INTERVAL-TYPE="CLOSED">1</MIN>
                    </VALUE-RESTRICTION>
                  </PRIMITIVE-ATTRIBUTE-TAILORING>
                </ATTRIBUTE-TAILORINGS>
              </CLASS-CONTENT-CONDITIONAL>
            </CLASS-CONTENTS>
            <VALIDATION-ROOT>false</VALIDATION-ROOT>
          </CONCRETE-CLASS-TAILORING>
        </TYPE-TAILORINGS>
      </AGGREGATION-TAILORING>
    </ATTRIBUTE-TAILORINGS>
  </CLASS-CONTENT-CONDITIONAL>
```

```
    </CLASS-CONTENTS>
  </CONCRETE-CLASS-TAILORING>
```

B Glossary

Artifact This is a Work Product Definition that provides a description and definition for tangible work product types. Artifacts may be composed of other artifacts ([25]).

At a high level, an artifact is represented as a single conceptual file.

AUTOSAR Tool This is a software tool which supports one or more tasks defined as AUTOSAR tasks in the methodology. Depending on the supported tasks, an AUTOSAR tool can act as an authoring tool, a converter tool, a processor tool or as a combination of those (see separate definitions).

AUTOSAR Authoring Tool An AUTOSAR Tool used to create and modify AUTOSAR XML Descriptions. Example: System Description Editor.

AUTOSAR Converter Tool An AUTOSAR Tool used to create AUTOSAR XML files by converting information from other AUTOSAR XML files. Example: ECU Flattener

AUTOSAR Definition This is the definition of parameters which can have values. One could say that the parameter values are Instances of the definitions. But in the meta model hierarchy of AUTOSAR, definitions are also instances of the meta model and therefore considered as a description. Examples for AUTOSAR definitions are: `EcucParameterDef`, `PostBuildVariantCriterion`, `SwSystemconst`.

AUTOSAR XML Description In AUTOSAR this means "filled Template". In fact an AUTOSAR XML description is the XML representation of an AUTOSAR model.

The AUTOSAR XML description can consist of several files. Each individual file represents an AUTOSAR partial model and shall validate successfully against the AUTOSAR XML schema.

AUTOSAR Meta-Model This is an UML2.0 model that defines the language for describing AUTOSAR systems. The AUTOSAR meta-model is an UML representation of the AUTOSAR templates. UML2.0 class diagrams are used to describe the attributes and their interrelationships. Stereotypes, UML tags and OCL expressions (object constraint language) are used for defining specific semantics and constraints.

AUTOSAR Meta-Model Tool The AUTOSAR Meta-Model Tool is the tool that generates different views (class tables, list of constraints, diagrams, XML Schema etc.) on the AUTOSAR meta-model.

AUTOSAR Model This is a representation of an AUTOSAR product. The AUTOSAR model represents aspects suitable to the intended use according to the AUTOSAR methodology.

Strictly speaking, this is an instance of the AUTOSAR meta-model. The information contained in the AUTOSAR model can be anything that is representable according to the AUTOSAR meta-model.

AUTOSAR Partial Model In AUTOSAR, the possible partitioning of models is marked in the meta-model by ≪atpSplitable≫. One partial model is represented in an AUTOSAR XML description by one file. The partial model does not need to fulfill all semantic constraints applicable to an AUTOSAR model.

AUTOSAR Processor Tool An AUTOSAR Tool used to create non-AUTOSAR files by processing information from AUTOSAR XML files. Example: RTE Generator

AUTOSAR Specification Element An AUTOSAR Specification Element is a named element that is part of an AUTOSAR specification. Examples: requirement, constraint, specification item, class or attribute in the meta model, methodology, deliverable, methodology activity, model element, bsw module etc.

AUTOSAR Template The term "Template" is used in AUTOSAR to describe the format different kinds of descriptions. The term template comes from the idea, that AUTOSAR defines a kind of form which shall be filled out in order to describe a model. The filled form is then called the description.

In fact the AUTOSAR templates are now defined as a meta-model.

AUTOSAR Validation Tool A specialized AUTOSAR Tool which is able to check an AUTOSAR model against the rules defined by a profile.

AUTOSAR XML Schema This is a W3C XML schema that defines the language for exchanging AUTOSAR models. This Schema is derived from the AUTOSAR meta-model. The AUTOSAR XML Schema defines the AUTOSAR data exchange format.

Blueprint This is a model from which other models can be derived by copy and refinement. Note that in contrast to meta model resp. types, this process is *not* an instantiation.

Instance Generally this is a particular exemplar of a model or of a type.

Life Cycle Life Cycle is the course of development/evolutionary stages of a model element during its life time.

Meta-Model This defines the building blocks of a model. In that sense, a Meta-Model represents the language for building models.

Meta-Data This includes pertinent information about data, including information about the authorship, versioning, access-rights, timestamps etc.

Model A Model is an simplified representation of reality. The model represents the aspects suitable for an intended purpose.

Partial Model This is a part of a model which is intended to be persisted in one particular artifact.

Pattern in GST : This is an approach to simplify the definition of the meta model by applying a model transformation. This transformation creates an enhanced model out of an annotated model.

Profile Authoring Support Data Data that is used for efficient authoring of a profile. E.g. list of referable constraints, meta-classes, meta-attributes or other reusable model assets (blueprints)

Profile Authoring Tool A specialized `AUTOSAR Tool` which focuses on the authoring of profiles for data exchange points. It e.g. provides support for the creation of profiles from scratch, modification of existing profiles or composition of existing profiles.

Profile Compatibility Checker Tool A specialized `AUTOSAR Tool` which focuses on checking the compatibility of profiles for data exchange. Note that this compatibility check includes manual compatibility checks by engineers and automated assistance using more formal algorithms.

Profile Consistency Checker Tool A specialized `AUTOSAR Tool` which focuses on checking the consistency of profiles.

Property A property is a structural feature of an object. As an example a "connector" has the properties "receive port" and "send port"

Properties are made variant by the ≪atpVariation≫.

Prototype This is the implementation of a role of a type within the definition of another type. In other words a type may contain Prototypes that in turn are typed by "Types". Each one of these prototypes becomes an instance when this type is instantiated.

Type A type provides features that can appear in various roles of this type.

Value This is a particular value assigned to a "Definition".

Variability Variability of a system is its quality to describe a set of variants. These variants are characterized by variant specific property settings and / or selections. As an example, such a system property selection manifests itself in a particular "receive port" for a connection.

This is implemented using the ≪atpVariation≫.

Variant A system variant is a concrete realization of a system, so that all its properties have been set respectively selected. The software system has no variability anymore with respect to the binding time.

This is implemented using `EvaluatedVariantSet`.

Variation Binding A variant is the result of a variation binding process that resolves the variability of the system by assigning particular values/selections to all the system's properties.

This is implemented by `VariationPoint`.

Variation Binding Time The variation binding time determines the step in the methodology at which the variability given by a set of variable properties is resolved.

This is implemented by `vh.LatestBindingtime` at the related properties .

Variation Definition Time The variation definition time determines the step in the methodology at which the variation points are defined.

Variation Point A variation point indicates that a property is subject to variation. Furthermore, it is associated with a condition and a binding time which define the system context for the selection / setting of a concrete variant.

This is implemented by `VariationPoint.`

C Change History

C.1 Change History R4.0.3

C.1.1 Added Constraints

Number	Heading
[constr_2500]	`PortInterfaces`s shall be of same kind
[constr_2526]	`PortInterfaces` need to be compatible to the blueprints
[constr_2527]	Blueprints shall live in package of a proper category
[constr_2528]	`PortPrototype`s shall not refer to blueprints of a `PortInterface`
[constr_2529]	`PortPrototypeBlueprint`s and derived `PortPrototype`s shall reference proper `PortInterface`s
[constr_2540]	Tagged text category
[constr_2542]	Compatibility of `introduction` of blueprint and blueprinted element
[constr_2543]	Specify a name pattern in blueprints
[constr_2546]	References from Blueprint to Blueprint need to be replaced in derived objects
[constr_2553]	`shortName` shall follow the pattern defined in the Blueprint
[constr_2554]	Derived objects shall match the blueprints
[constr_2555]	Derived objects may have more attributes than the blueprints
[constr_2556]	No Blueprint Motivated `VariationPoint`s in AUTOSAR Descriptions
[constr_2563]	`BswModuleDescription` blueprints should not have a `BswModuleBehavior`
[constr_2564]	`VariationPoint` in Blueprints of `PackageableElements`
[constr_2565]	Trace shall not be nested
[constr_2566]	Blueprintmapping shall map appropriate elements
[constr_2568]	`SwComponentType`s shall be of same kind
[constr_2569]	Purely Bluprint Motivated `VariationPoint`s
[constr_2570]	No Blueprints in system descriptions
[constr_2571]	Outgoing references from Blueprints

Table C.1: Added Constraints in 4.0.3

C.1.2 Added Specification Items

Number	Heading
[TPS_STDT_00037]	Port Direction
[TPS_STDT_00038]	Life Cycle Support
[TPS_STDT_00040]	Influence of ECUC
[TPS_STDT_00041]	Constraints may be Violated in Blueprints
[TPS_STDT_00042]	namePattern for short names of TraceableText in Template Documents
[TPS_STDT_00043]	Blueprinting `LifeCycleDefinitionGroups`
[TPS_STDT_00044]	Transferring `VariationPoint`
[TPS_STDT_00045]	Transferring Objects in General
[TPS_STDT_00046]	Configuration dependent properties
[TPS_STDT_00047]	Ignore Blueprint Attributes
[TPS_STDT_00048]	Express Decisions when Deriving Objects
[TPS_STDT_00049]	Blueprinting Enumerators
[TPS_STDT_00050]	namePattern for AUTOSAR delivered Files
[TPS_STDT_00051]	Handling references when deriving objects from blueprints

[TPS_STDT_00052]	Characteristics of TraceableText
[TPS_STDT_00053]	Expression of obligation
[TPS_STDT_00054]	Organisation of `TraceableText`
[TPS_STDT_00055]	General Syntax for Name Patterns

Table C.2: Added Specification Items in 4.0.3

C.2 Change History R4.1.1

C.2.1 Added Constraints

Number	Heading

Table C.3: Added Constraints in 4.1.1

C.2.2 Added Specification Items

Number	Heading
[TPS_STDT_00056]	Identifying not applicable requirements
[TPS_STDT_00057]	Identifying generally fulfilled requirements
[TPS_STDT_00058]	Identifying requirements which need more specialization
[TPS_STDT_00059]	`TraceableText`
[TPS_STDT_00060]	`StructuredReq`
[TPS_STDT_00062]	Blueprinting Elements of AccessControl
[TPS_STDT_00063]	Blueprinting `BuildActionManifest`
[TPS_STDT_00064]	Applied Life Cycle Information Sets on AUTOSAR provided Models (M1)
[TPS_STDT_00065]	Nested Blueprint Can be Used as Blueprint of its own
[TPS_STDT_00066]	Blueprinting `PortInterface`
[TPS_STDT_00067]	Standardized Path for Standardized Elements
[TPS_STDT_00068]	Expressing "stem"-Relation of Keywords
[TPS_STDT_00069]	Attributes of Keyword
[TPS_STDT_00070]	Classification of Keywords
[TPS_STDT_00071]	Blueprinting `ConsistencyNeeds`
[TPS_STDT_00072]	Same Meta Class For Blueprints and Derived Objects
[TPS_STDT_00073]	Early definition of ConsistencyNeeds
[TPS_STDT_00074]	Categorization of Blueprints of `ConsistencyNeeds`
[TPS_STDT_00075]	Categories for `DataPrototypeGroup` in a Blueprint of `ConsistencyNeeds`
[TPS_STDT_00076]	Categories for `RunnableEntityGroup` in a Blueprint of `ConsistencyNeeds`
[TPS_STDT_00077]	Blueprinting `KeywordSet`
[TPS_STDT_00078]	Representation of requirements in AUTOSAR documents

Table C.4: Added Specification Items in 4.1.1

C.3 Change History R4.1.2

C.3.1 Added Constraints

Number	Heading

Table C.5: Added Constraints in 4.1.2

C.3.2 Added Specification Items

Number	Heading
[TPS_STDT_00006]	Applying expressionPattern
[TPS_STDT_00010]	General Syntax for Expression Patterns
[TPS_STDT_00021]	Specialization of `BlueprintFormula`
[TPS_STDT_00079]	Blueprinting `VfbTiming`
[TPS_STDT_00080]	Representation of specification items in AUTOSAR documents
[TPS_STDT_00081]	Representation of constraint items in AUTOSAR documents

Table C.6: Added Specification Items in 4.1.2

C.4 Change History R4.1.3

C.4.1 Added Constraints in 4.1.3

Number	Heading
[constr_2589]	In VFB Timing Blueprint `TDEventVfbPort` shall reference `PortPrototypeBlueprint`

Table C.7: Added Constraints in 4.1.3

C.4.2 Changed Constraints in 4.1.3

C.4.3 Deleted Constraints in 4.1.3

C.4.4 Added Traceables in 4.1.3

Id	Heading
[TPS_STDT_00026]	Blueprinting `SwAddrMethod`

Table C.8: Added Traceables in 4.1.3

C.4.5 Changed Traceables in 4.1.3

Id	Heading
[TPS_STDT_00055]	General Syntax for Name Patterns
[TPS_STDT_00057]	Identifying generally fulfilled requirements

Table C.9: Changed Traceables in 4.1.3

C.4.6 Deleted Traceables in 4.1.3

C.5 Change History R4.2.1

C.5.1 Added Constraints in 4.2.1

Id	Heading
[constr_2590]	One BlueprintPolicy is allowed
[constr_2591]	BlueprintPolicyNotModifiable
[constr_2592]	No BlueprintPolicy
[constr_2593]	Expression for identifying the attribute a BlueprintPolicy relates to

Table C.10: Added Constraints in 4.2.1

C.5.2 Changed Constraints in 4.2.1

Id	Heading
[constr_2540]	Tagged text category

Table C.11: Changed Constraints in 4.2.1

C.5.3 Deleted Constraints in 4.2.1

C.5.4 Added Traceables in 4.2.1

Id	Heading
[TPS_STDT_00029]	Representation of test items in AUTOSAR documents
[TPS_STDT_00032]	BlueprintPolicy
[TPS_STDT_00039]	Xpath Expressions for `BlueprintPolicy`
[TPS_STDT_00061]	`PortPrototypeBlueprint` can own both `RPortComSpec`s and `PPortComSpec`s
[TPS_STDT_00082]	Multiple existence of initValue in the context of a `PortPrototypeBlueprint`

Table C.12: Added Traceables in 4.2.1

C.5.5 Changed Traceables in 4.2.1

Id	Heading
[TPS_STDT_00004]	Abbreviated Name
[TPS_STDT_00012]	Defining Keywords
[TPS_STDT_00021]	Specialization of `BlueprintFormula`
[TPS_STDT_00041]	Constraints may be violated in Blueprints
[TPS_STDT_00067]	Standardized Path for Standardized Elements
[TPS_STDT_00068]	Expressing "stem"-Relation of Keywords
[TPS_STDT_00069]	Attributes of Keyword
[TPS_STDT_00070]	Classification of Keywords

Table C.13: Changed Traceables in 4.2.1

C.5.6 Deleted Traceables in 4.2.1

C.6 Change History R4.2.2

C.6.1 Added Constraints in 4.2.2

C.6.2 Changed Constraints in 4.2.2

Id	Heading
[constr_2592]	No BlueprintPolicy

Table C.14: Changed Constraints in 4.2.2

C.6.3 Deleted Constraints in 4.2.2

C.6.4 Added Traceables in 4.2.2

C.6.5 Changed Traceables in 4.2.2

Id	Heading

[TPS_STDT_00039]	Xpath Expressions for `BlueprintPolicy`
[TPS_STDT_00077]	Blueprinting `KeywordSet`
[TPS_STDT_00080]	Representation of specification items in AUTOSAR documents
[TPS_STDT_00081]	Representation of constraint items in AUTOSAR documents

Table C.15: Changed Traceables in 4.2.2

C.6.6 Deleted Traceables in 4.2.2

C.7 Change History R4.3.0

C.7.1 Added Constraints in 4.3.0

Id	Heading
[constr_2597]	`ClientServerOperationBlueprintMapping` constraints number of arguments
[constr_2598]	`ClientServerOperationBlueprintMapping` constraints the types of arguments
[constr_2603]	Use of "applies to" in context of the specification level
[constr_2604]	Allowed uptraces in context of "applies to" values
[constr_2608]	Custom extensions shall be part of the `Documentation` that is referenced by the `Baseline`
[constr_2609]	Single revision per AUTOSAR standard
[constr_2610]	No alternativeName if matching via shortName
[constr_2611]	Referenced AUTOSAR Specification Elements shall be part of the AUTOSAR Specification Baseline
[constr_2612]	`shortName` of `ConcreteClassTailoring` shall match the name of an AUTOSAR specified concrete meta-class
[constr_2613]	`shortName` of `AbstractClassTailoring` shall match the name of an AUTOSAR specified abstract meta-class
[constr_2614]	`PrimitiveAttributeCondition.attribute` shall reference invariant owned `PrimitiveAttributeTailoring`, only
[constr_2615]	`AggregationCondition.aggregation` shall reference invariant owned `AggregationTailoring`, only
[constr_2616]	`ReferenceCondition.reference` shall reference invariant owned `ReferenceTailoring`, only
[constr_2617]	`ClassTailoring.variationRestriction` only applicable for «atpVariation» classes
[constr_2618]	ShortName of AttributeTailoring shall match owned or inherited attributes
[constr_2619]	No `AttributeTailoring` for Derived or Abstract Attributes
[constr_2620]	`shortName` of `PrimitiveAttributeTailoring` shall be a primitive attribute in the referenced Baseline
[constr_2621]	The `shortName` of `AggregationTailoring` shall match the name of an AUTOSAR specified aggregation of the meta-class
[constr_2622]	The `shortName` of `ReferenceTailoring` shall match the name of an AUTOSAR specified reference of the meta-class
[constr_2623]	Referenced `SdgClass` shall be part of a `SdgDef` that is referenced by the `Baseline`

| [constr_2624] | `AttributeTailoring.variationRestriction` only applicable for «atpVariation» attributes |

Table C.16: Added Constraints in 4.3.0

C.7.2 Changed Constraints in 4.3.0

Id	Heading
[constr_2546]	References in derived model elements
[constr_2553]	`shortName` shall follow the pattern defined in the Blueprint

Table C.17: Changed Constraints in 4.3.0

C.7.3 Deleted Constraints in 4.3.0

Id	Heading
[constr_2542]	Compatibility of `longName`, `desc` and `introduction` of blueprint and blueprinted element
[constr_2543]	Specify a name pattern in blueprints
[constr_2555]	Derived objects may have more attributes than the blueprints

Table C.18: Deleted Constraints in 4.3.0

C.7.4 Added Traceables in 4.3.0

Id	Heading
[TPS_STDT_00083]	Blueprinting `ClientServerInterfaceToBswModuleEntryBlueprintMapping`
[TPS_STDT_00084]	`ClientServerOperationBlueprintMapping` predetermines the implementation of an `ClientServerOperation`
[TPS_STDT_00085]	Compatibility of `longName`, `desc` and `introduction` of blueprint and blueprinted element
[TPS_STDT_00086]	Specify a name pattern in blueprints
[TPS_STDT_00087]	Derived objects may have more attributes than the blueprints
[TPS_STDT_00088]	Representation of constraint items in AUTOSAR non template documents
[TPS_STDT_00089]	Identifying specification items which are constraints in AUTOSAR non template documents
[TPS_STDT_00090]	Blueprinting `BswEntryRelationshipSet`
[TPS_STDT_00091]	Blueprinting `BswEntryRelationshipSet`
[TPS_STDT_00100]	Motivation of Description of Data Exchange Points
[TPS_STDT_00101]	Compatibility of `ConcreteClassTailoring`s
[TPS_STDT_00102]	Referencing AUTOSAR Specification Elements via shortName
[TPS_STDT_00103]	Referencing AUTOSAR Specification Elements via alternativeName
[TPS_STDT_00104]	Referencing Custom Specification Elements
[TPS_STDT_00105]	Serialized Profile
[TPS_STDT_00106]	Effective Profile
[TPS_STDT_00107]	Validation Semantics of global `ConcreteClassTailoring.multiplicityRestriction` with `validationRoot`==true
[TPS_STDT_00108]	Validation Semantics of global `ConcreteClassTailoring.multiplicityRestriction` with `validationRoot`==false

[TPS_STDT_00109]	AUTOSAR Standardized Concrete Meta-Classes
[TPS_STDT_00110]	Identification of Potential Interoperability Issues
[TPS_STDT_00111]	AUTOSAR Standardized Constraints
[TPS_STDT_00112]	Validation Semantics of `ClassTailoring.multiplicityRestriction` in the context of `AggregationTailoring.typeTailoring`
[TPS_STDT_00113]	Validation Semantics of `AbstractClassTailoring.multiplicityRestriction`
[TPS_STDT_00114]	`MultiplicityRestrictionWithSeverity` in the context of `ClassTailoring` vs. `AggregationTailoring`/`ReferenceTailoring`
[TPS_STDT_00115]	Analysis of Tool Compatibility
[TPS_STDT_00116]	Limitation of Analysis of `Profile of Data Exchange Point`s
[TPS_STDT_00117]	Agreed Profile of Data Exchange Point
[TPS_STDT_00118]	Compliance with Profile of Data Exchange Point
[TPS_STDT_00119]	Validation Semantics of `ClassTailoring.multiplicityRestriction` in the context of `ReferenceTailoring.typeTailoring`
[TPS_STDT_00120]	Purpose of `DataExchangePoint`
[TPS_STDT_00121]	High-level Overview Description of `DataExchangePoint`
[TPS_STDT_00122]	Purpose of `Baseline`
[TPS_STDT_00123]	Guidance on how to specify `SpecificationDocumentScope` and `DocumentElementScope`
[TPS_STDT_00124]	Purpose of `SpecElementScope`
[TPS_STDT_00125]	Trigger for Evaluation of Constraints
[TPS_STDT_00126]	Definition: Data Format Elements
[TPS_STDT_00127]	Validation Environment
[TPS_STDT_00128]	Compatibility of `SpecificationDocumentScope`s
[TPS_STDT_00129]	Semantics of `DataFormatElementScope` with `inScope`==true
[TPS_STDT_00130]	Navigation strategy for validation
[TPS_STDT_00131]	Compatibility of `AggregationTailoring`
[TPS_STDT_00132]	Purpose of `SdgTailoring`
[TPS_STDT_00133]	Compatibility of `ReferenceTailoring`
[TPS_STDT_00134]	Compatibility of `PrimitiveAttributeTailoring`
[TPS_STDT_00135]	Compatibility of `ClassContentConditional`
[TPS_STDT_00136]	Compatibility of `AttributeTailoring`
[TPS_STDT_00138]	Purpose of `ReferenceTailoring`
[TPS_STDT_00139]	AUTOSAR Standardized References of Meta-Class
[TPS_STDT_00140]	Purpose of `AggregationTailoring`
[TPS_STDT_00141]	AUTOSAR Standardized Aggregations of Meta-Class
[TPS_STDT_00142]	Purpose of `PrimitiveAttributeTailoring`
[TPS_STDT_00143]	AUTOSAR Standardized Primitive Attributes of Meta-Class
[TPS_STDT_00144]	Purpose of `AttributeTailoring`
[TPS_STDT_00145]	Purpose of `ClassTailoring`
[TPS_STDT_00146]	AUTOSAR Standardized Abstract Meta-Classes
[TPS_STDT_00147]	Purpose of `ConstraintTailoring`
[TPS_STDT_00156]	Purpose of `SpecificationScope`
[TPS_STDT_00157]	Purpose of `DataFormatTailoring`
[TPS_STDT_00159]	Semantics of Attribute that is in Scope
[TPS_STDT_00160]	Compatibility of `DocumentElementScope`s
[TPS_STDT_00163]	Validation Semantics of `ConcreteClassTailoring`
[TPS_STDT_00164]	Semantics of a Constraint that is out of Scope
[TPS_STDT_00165]	Semantics of Constraint that is in Scope
[TPS_STDT_00167]	Semantics of SdgTailoring that is in scope
[TPS_STDT_00168]	Share documentation of Rationale
[TPS_STDT_00169]	Handling of unresolved references

[TPS_STDT_00170]	Local documentation of Rationale
[TPS_STDT_00172]	Purpose of `RestrictionWithSeverity`
[TPS_STDT_00173]	Purpose of `ValueRestrictionWithSeverity`
[TPS_STDT_00174]	Purpose of `MultiplicityRestrictionWithSeverity`
[TPS_STDT_00175]	Purpose of `VariationRestrictionWithSeverity`
[TPS_STDT_00176]	Context specific Tailoring
[TPS_STDT_00177]	Global `ClassTailoring`
[TPS_STDT_00178]	Role Specific `ClassTailoring`
[TPS_STDT_00179]	Conditional `ClassTailoring`
[TPS_STDT_00180]	Invariant Content Model
[TPS_STDT_00181]	Conditional Content Model
[TPS_STDT_00182]	Validation Semantics of `AbstractClassTailoring`
[TPS_STDT_00183]	Compatibility of `Baseline`s
[TPS_STDT_00186]	Scope and Restrictions of Data Format Elements
[TPS_STDT_00187]	Purpose of `DocumentElementScope`
[TPS_STDT_00188]	Purpose of `SpecificationDocumentScope`
[TPS_STDT_00190]	Default Scope of concrete `Meta Class`es
[TPS_STDT_00191]	Purpose of `Baseline Profile of Data Exchange Point`
[TPS_STDT_00192]	Default Scope of `AUTOSAR Specification`s
[TPS_STDT_00193]	Default Scope of `AUTOSAR Specification Elements`
[TPS_STDT_00195]	Default Scope of `Meta Attribute`s
[TPS_STDT_00196]	Default Validation Root of concrete `Meta Class`es
[TPS_STDT_00197]	Default `multiplicityRestriction` of `Meta Class`es
[TPS_STDT_00198]	Default `multiplicityRestriction` of `Meta Attribute`s
[TPS_STDT_00199]	Default `variationRestriction` of `Meta Attribute`s
[TPS_STDT_00200]	Default `variationRestriction` of `Meta Class`es
[TPS_STDT_00201]	Compatibility of `VariationRestrictionWithSeverity.variation`
[TPS_STDT_00202]	Compatibility of `VariationRestrictionWithSeverity.validBindingTime`
[TPS_STDT_00203]	Default `PrimitiveAttributeTailoring.valueRestriction`
[TPS_STDT_00204]	Default `PrimitiveAttributeTailoring.defaultValueHandling`
[TPS_STDT_00205]	Compatibility of `ValueRestrictionWithSeverity`
[TPS_STDT_00206]	Compatibility of `UnresolvedReferenceRestrictionWithSeverity`
[TPS_STDT_00207]	Default `ReferenceTailoring.unresolvedReferenceRestriction`
[TPS_STDT_00208]	Compatibility of `ConstraintTailoring`s
[TPS_STDT_00209]	Compatibility of `SdgTailoring`s
[TPS_STDT_00210]	Compatibility of `MultiplicityRestrictionWithSeverity`

Table C.19: Added Traceables in 4.3.0

C.7.5 Changed Traceables in 4.3.0

Id	Heading
[TPS_STDT_00005]	Compliance with Blueprints
[TPS_STDT_00029]	Representation of test items in AUTOSAR documents
[TPS_STDT_00042]	namePattern for `shortName`s of `TraceableText` in Standardization Documents
[TPS_STDT_00044]	Transferring `VariationPoint`
[TPS_STDT_00077]	Blueprinting `KeywordSet`
[TPS_STDT_00078]	Representation of requirements in AUTOSAR documents
[TPS_STDT_00080]	Representation of specification items in AUTOSAR documents
[TPS_STDT_00081]	Representation of constraint items in AUTOSAR documents

Document ID 535: AUTOSAR_TPS_StandardizationTemplate.pdf

Table C.20: Changed Traceables in 4.3.0

C.7.6 Deleted Traceables in 4.3.0

C.8 Change History R4.3.1

C.8.1 Added Constraints in 4.3.1

C.8.2 Changed Constraints in 4.3.1

C.8.3 Deleted Constraints in 4.3.1

C.8.4 Added Traceables in 4.3.1

C.8.5 Changed Traceables in 4.3.1

C.8.6 Deleted Traceables in 4.3.1

D Mentioned Class Tables

For the sake of completeness, this chapter contains a set of class tables representing meta-classes mentioned in the context of this document but which are not contained directly in the scope of describing specific meta-model semantics.

Class	ARElement (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::ARPackage			
Note	An element that can be defined stand-alone, i.e. without being part of another element (except for packages of course).			
Base	ARObject, CollectableElement, Identifiable, MultilanguageReferrable, Packageable Element, Referrable			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table D.1: ARElement

Class	ARPackage			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::ARPackage			
Note	AUTOSAR package, allowing to create top level packages to structure the contained ARElements. ARPackages are open sets. This means that in a file based description system multiple files can be used to partially describe the contents of a package. This is an extended version of MSR's SW-SYSTEM.			
Base	ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
arPackage	ARPackage	*	aggr	This represents a sub package within an ARPackage, thus allowing for an unlimited package hierarchy. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=blueprintDerivationTime xml.sequenceOffset=30
element	PackageableEle ment	*	aggr	Elements that are part of this package **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=systemDesignTime xml.sequenceOffset=20

| referenceBase | ReferenceBase | * | aggr | This denotes the reference bases for the package. This is the basis for all relative references within the package. The base needs to be selected according to the base attribute within the references.

Stereotypes: atpSplitable
Tags: atp.Splitkey=shortLabel
xml.sequenceOffset=10 |

Table D.2: ARPackage

Class	**AclObjectSet**			
Package	M2::AUTOSARTemplates::GenericStructure::RolesAndRights			
Note	This meta class represents the ability to denote a set of objects for which roles and rights (access control lists) shall be defined. It basically can define the objects based on • the nature of objects • the involved blueprints • the artifact in which the objects are serialized • the definition of the object (in a definition - value pattern) • individual reference objects **Tags:** atp.recommendedPackage=AclObjectSets			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
aclObjectClass	ReferrableSubtypesEnum	*	attr	This specifies that the considered objects as instances of the denoted meta class.
aclScope	AclScopeEnum	1	attr	this indicates the scope of the referenced objects.
collection	Collection	0..1	ref	This indicates that the relevant objects are specified via a collection.
derivedFromBlueprint	AtpBlueprint	*	ref	This association indicates that the considered objects are the ones being derived from the associated blueprint. **Stereotypes:** atpUriDef
engineeringObject	AutosarEngineeringObject	*	aggr	This indicates an engineering object. The AclPermission relates to all objects in this partial model. This also implies that the other objects in this set shall be placed in the specified engineering object. Note that semantic constraints apply with respect to «atpSplitable»

| object | Referrable | * | ref | This association applies a particular (usually small) set of objects (e.g. a singular package). Main usage is, if one does not want to create a collection specifically for access control. |
| objectDefin ition | AtpDefinition | * | ref | This denotes an object by its definition. For example the right to manipulate the value of a particular ecuc parameter is denoted by reference to the definition of the parameter.

Note that this can also be a reference to a Standard Module Definition. Therefore it is stereotyped by atpUriDef.

Stereotypes: atpUriDef |

Table D.3: AclObjectSet

Class	**AclOperation**			
Package	M2::AUTOSARTemplates::GenericStructure::RolesAndRights			
Note	This meta class represents the ability to denote a particular operation which may be performed on objects in an AUTOSAR model. **Tags:** atp.recommendedPackage=AclOperations			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
impliedOp eration	AclOperation	*	ref	This indicates that the related operations are also implied. Therefore the permission is also granted for this operation.

Table D.4: AclOperation

Class	**AclPermission**			
Package	M2::AUTOSARTemplates::GenericStructure::RolesAndRights			
Note	This meta class represents the ability to represent permissions granted on objects in an AUTOSAR model. **Tags:** atp.recommendedPackage=AclPermissions			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
aclContext	NameToken	*	attr	This attribute is intended to specify the context under which the AclPemission is applicable. The values are subject to mutual agreement between the involved stakeholders. For examples the values can be the names of binding times.
aclObject	AclObjectSet	*	ref	This denotes an object to which the AclPermission applies.

aclOperation	AclOperation	*	ref	This denotes an operation which is granted by the given AclPermission.
aclRole	AclRole	*	ref	This denotes the role (individual or even organization) for which the AclPermission. is granted.
aclScope	AclScopeEnum	1	attr	This indicates the scope of applied permissions: explicit, descendant, dependent;

Table D.5: AclPermission

Class	**AclRole**			
Package	M2::AUTOSARTemplates::GenericStructure::RolesAndRights			
Note	This meta class represents the ability to specify a particular role which is used to grant access rights to AUTOSAR model. The purpose of this meta-class is to support the mutual agreements between the involved parties. **Tags:** atp.recommendedPackage=AclRoles			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
ldapUrl	UriString	0..1	attr	This is an URL which allows to represent users or organizations taking the particular role.

Table D.6: AclRole

Class	**AliasNameSet**			
Package	M2::AUTOSARTemplates::CommonStructure::FlatMap			
Note	This meta-class represents a set of AliasNames. The AliasNameSet can for example be an input to the A2L-Generator. **Tags:** atp.recommendedPackage=AliasNameSets			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
aliasName	AliasNameAssignment	1..*	aggr	AliasNames contained in the AliasNameSet. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortLabel vh.latestBindingTime=preCompileTime

Table D.7: AliasNameSet

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

Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table D.8: ApplicationDataType

Class	ArgumentDataPrototype
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface
Note	An argument of an operation, much like a data element, but also carries direction information and is owned by a particular ClientServerOperation.
Base	ARObject, AtpFeature, AtpPrototype, AutosarDataPrototype, DataPrototype, Identifiable, MultilanguageReferrable, Referrable

Attribute	Type	Mul.	Kind	Note
direction	ArgumentDirectionEnum	1	attr	This attribute specifies the direction of the argument prototype.
serverArgumentImplPolicy	ServerArgumentImplPolicyEnum	0..1	attr	This defines how the argument type of the servers RunnableEntity is implemented. If the attribute is not defined this has the same semantics as if the attribute is set to the value useArgumentType for primitive arguments and structures and to the value useArrayBaseType for arrays.

Table D.9: ArgumentDataPrototype

Class	AtomicSwComponentType (abstract)
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components
Note	An atomic software component is atomic in the sense that it cannot be further decomposed and distributed across multiple ECUs.
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, SwComponentType

Attribute	Type	Mul.	Kind	Note

internalBehavior	SwcInternalBehavior	0..1	aggr	The SwcInternalBehaviors owned by an AtomicSwComponentType can be located in a different physical file. Therefore the aggregation is «atpSplitable». **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=internalBehavior, variationPoint.shortLabel vh.latestBindingTime=preCompileTime
symbolProps	SymbolProps	0..1	aggr	This represents the SymbolProps for the AtomicSwComponentType. **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=shortName

Table D.10: AtomicSwComponentType

Enumeration	**BindingTimeEnum**
Package	M2::AUTOSARTemplates::GenericStructure::VariantHandling
Note	This enumerator specifies the applicable binding times for the pre build variation points.
Literal	**Description**
codeGeneration-Time	- Coding by hand, based on requirements document. - Tool based code generation, e.g. from a model. - The model may contain variants. - Only code for the selected variant(s) is actually generated. **Tags:** atp.EnumerationValue=0
linkTime	Configure what is included in object code, and what is omitted Based on which variant(s) are selected E.g. for modules that are delivered as object code (as opposed to those that are delivered as source code) **Tags:** atp.EnumerationValue=1
preCompileTime	This is typically the C-Preprocessor. Exclude parts of the code from the compilation process, e.g., because they are not required for the selected variant, because they are incompatible with the selected variant, because they require resources that are not present in the selected variant. Object code is only generated for the selected variant(s). The code that is excluded at this stage code will not be available at later stages. **Tags:** atp.EnumerationValue=2

systemDe-signTime	
	• Designing the VFB. • Software Component types (PortInterfaces). • SWC Prototypes and the Connections between SWCprototypes. • Designing the Topology • ECUs and interconnecting Networks • Designing the Communication Matrix and Data Mapping **Tags:** atp.EnumerationValue=3

Table D.11: BindingTimeEnum

Class	≪`atpMixedString`≫ **BlueprintFormula**			
Package	M2::AUTOSARTemplates::StandardizationTemplate::BlueprintFormula			
Note	This class express the extension of the Formula Language to provide formalized blueprint-Value resp. blueprintCondition.			
Base	ARObject, FormulaExpression, SwSystemconstDependentFormula			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
ecuc	EcucDefinitionEl ement	1	ref	The EcucDefinitionElement serves as a argument for the formular.
verbatim	MultiLanguageV erbatim	1	aggr	This represents an informal term in the expression as verbatim text. Note that the result of this is same as formula keyword "undefined".

Table D.12: BlueprintFormula

Class	**BlueprintMapping**			
Package	M2::AUTOSARTemplates::StandardizationTemplate::BlueprintDedicated::Generic Blueprint			
Note	This meta-class represents the ability to map two an object and its blueprint.			
Base	ARObject, AtpBlueprintMapping			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
blueprint	AtpBlueprint	1	ref	This represents the mapped blueprint.
derivedObj ect	AtpBlueprintabl e	1	ref	This represents the object which was derived from the blueprint.

Table D.13: BlueprintMapping

Class	BswInternalBehavior			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswBehavior			
Note	Specifies the behavior of a BSW module or a BSW cluster w.r.t. the code entities visible by the BSW Scheduler. It is possible to have several different BswInternalBehaviors referring to the same BswModuleDescription.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, Internal Behavior, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
arTypedPe rInstanceM emory	VariableDataPr ototype	*	aggr	Defines an AUTOSAR typed memory-block that needs to be available for each instance of the Basic Software Module. The aggregation of arTypedPerInstanceMemory is subject to variability with the purpose to support variability in the Basic Software Module's implementations. Typically different algorithms in the implementation are requiring different number of memory objects. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
bswPerInst anceMemo ryPolicy	BswPerInstance MemoryPolicy	*	aggr	Policy for a arTypedPerInstanceMemory The policy selects the options of the Schedule Manager API generation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
clientPolicy	BswClientPolicy	*	aggr	Policy for a requiredClientServerEntry. The policy selects the options of the Schedule Manager API generation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=clientPolicy, variation Point.shortLabel vh.latestBindingTime=preCompileTime
distinguish edPartition	BswDistinguish edPartition	*	aggr	Indicates an abstract partition context in which the enclosing BswModuleEntity can be executed. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variationPoint. ShortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=60
entity	BswModuleEntit y	*	aggr	A code entity for which the behavior is described **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=5

event	BswEvent	*	aggr	An event required by this module behavior. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=10
exclusiveA reaPolicy	BswExclusiveAr eaPolicy	*	aggr	Policy for an ExclusiveArea in this BswInternalBehavior. The policy selects the options of the Schedule Manager API generation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=exclusiveAreaPolicy, variation Point.shortLabel vh.latestBindingTime=preCompileTime
includedDa taTypeSet	IncludedDataTy peSet	*	aggr	The includedDataTypeSet is used by a basic software module for its implementation. **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=includedDataTypeSet
internalTrig geringPoin t	BswInternalTrig geringPoint	*	aggr	An internal triggering point. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=2
internalTrig geringPoin tPolicy	BswInternalTrig geringPointPolic y	*	aggr	Policy for an internalTriggeringPoint in this BswInternalBehavior.. The policy selects the options of the Schedule Manager API generation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=internalTriggeringPointPolicy, variationPoint.shortPoint vh.latestBindingTime=preCompileTime
modeRece iverPolicy	BswModeRecei verPolicy	*	aggr	Implementation policy for the reception of mode switches. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=modeReceiverPolicy, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=25
modeSend erPolicy	BswModeSende rPolicy	*	aggr	Implementation policy for providing a mode group. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=modeSenderPolicy, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=20

parameter Policy	BswParameterP olicy	*	aggr	Policy for a perInstanceParameter in this BswInternalBehavior. The policy selects the options of the Schedule Manager API generation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=parameterPolicy, variatio Point.shortLabel vh.latestBindingTime=preCompileTime
perInstanc eParamete r	ParameterData Prototype	*	aggr	Describes a read only memory object containing characteristic value(s) needed by this BswInternalBehavior. The role name perInstanceParameter is chosen in analogy to the similar role in the context of SwcInternalBehavior. In contrast to constantMemory, this object is not allocated locally by the module's code, but by the BSW Scheduler and it is accessed from the BSW module via the BSW Scheduler API. The main use case is the support of software emulation of calibration data. The aggregation is subject to variability with the purpose to support implementation variants. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=atp.Splitkey shortName, variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=45
receptionP olicy	BswDataRecept ionPolicy	*	aggr	Data reception policy for inter-partition and/or inter-core communication. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=receptionPolicy, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=55
releasedTri ggerPolicy	BswReleasedTri ggerPolicy	*	aggr	Policy for a releasedTrigger. The policy selects the options of the Schedule Manager API generation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=releasedTriggerPolicy, variationPoint.shortLabel vh.latestBindingTime=preCompileTime
scheduler NamePrefi x	BswSchedulerN amePrefix	*	aggr	Optional definition of one or more prefixes to be used for the BswScheduler. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=schedulerNamePrefix, variationPoint.ShortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=50

sendPolicy	BswDataSendPolicy	*	aggr	Policy for a providedData. The policy selects the options of the Schedule Manager API generation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=sendPolicy, variation Point.shortLabel vh.latestBindingTime=preCompileTime
serviceDependency	BswServiceDependency	*	aggr	Defines the requirements on AUTOSAR Services for a particular item. The aggregation is subject to variability with the purpose to support the conditional existence of ServiceNeeds. The aggregation is splitable in order to support that ServiceNeeds might be provided in later development steps. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=serviceDependency, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=40
triggerDirectImplementation	BswTriggerDirectImplementation	*	aggr	Specifies a trigger to be directly implemented via OS calls. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=triggerDirectImplementation, variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=15
variationPointProxy	VariationPointProxy	*	aggr	Proxy of a variation points in the C/C++ implementation. **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=shortName

Table D.14: BswInternalBehavior

Class	**BswModuleDescription**			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswOverview			
Note	Root element for the description of a single BSW module or BSW cluster. In case it describes a BSW module, the short name of this element equals the name of the BSW module. **Tags:** atp.recommendedPackage=BswModuleDescriptions			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpFeature, AtpStructureElement, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*

bswModuleDependency	BswModuleDependency	*	aggr	Describes the dependency to another BSW module. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=20
bswModuleDocumentation	SwComponentDocumentation	0..1	aggr	This adds a documentation to the BSW module. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=bswModuleDocumentation, variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=6
expectedEntry	BswModuleEntry	*	ref	Indicates an entry which is required by this module. Replacement of outgoingCallback / requiredEntry. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=expectedEntry, variationPoint.shortLabel vh.latestBindingTime=preCompileTime
implementedEntry	BswModuleEntry	*	ref	Specifies an entry provided by this module which can be called by other modules. This includes "main" functions, interrupt routines, and callbacks. Replacement of providedEntry / expectedCallback. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=implementedEntry, variationPoint.shortLabel vh.latestBindingTime=preCompileTime
internalBehavior	BswInternalBehavior	*	aggr	The various BswInternalBehaviors associated with a BswModuleDescription can be distributed over several physical files. Therefore the aggregation is «atpSplitable». **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=shortName xml.sequenceOffset=65
moduleId	PositiveInteger	0..1	attr	Refers to the BSW Module Identifier defined by the AUTOSAR standard. For non-standardized modules, a proprietary identifier can be optionally chosen. **Tags:** xml.sequenceOffset=5

providedClientServerEntry	BswModuleClientServerEntry	*	aggr	Specifies that this module provides a client server entry which can be called from another parition or core.This entry is declared locally to this context and will be connected to the requiredClientServerEntry of another or the same module via the configuration of the BSW Scheduler. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=45
providedData	VariableDataPrototype	*	aggr	Specifies a data prototype provided by this module in order to be read from another partition or core.The providedData is declared locally to this context and will be connected to the requiredData of another or the same module via the configuration of the BSW Scheduler. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=55
providedModeGroup	ModeDeclarationGroupPrototype	*	aggr	A set of modes which is owned and provided by this module or cluster. It can be connected to the requiredModeGroups of other modules or clusters via the configuration of the BswScheduler. It can also be synchronized with modes provided via ports by an associated ServiceSwComponentType, EcuAbstractionSwComponentType or ComplexDeviceDriverSwComponentType. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=25
releasedTrigger	Trigger	*	aggr	A Trigger released by this module or cluster. It can be connected to the requiredTriggers of other modules or clusters via the configuration of the BswScheduler. It can also be synchronized with Triggers provided via ports by an associated ServiceSwComponentType, EcuAbstractionSwComponentType or ComplexDeviceDriverSwComponentType. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=35

requiredClientServerEntry	BswModuleClientServerEntry	*	aggr	Specifies that this module requires a client server entry which can be implemented on another parition or core.This entry is declared locally to this context and will be connected to the providedClientServerEntry of another or the same module via the configuration of the BSW Scheduler. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=50
requiredData	VariableDataPrototype	*	aggr	Specifies a data prototype required by this module in oder to be provided from another partition or core.The requiredData is declared locally to this context and will be connected to the providedData of another or the same module via the configuration of the BswScheduler. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=60
requiredModeGroup	ModeDeclarationGroupPrototype	*	aggr	Specifies that this module or cluster depends on a certain mode group. The requiredModeGroup is local to this context and will be connected to the providedModeGroup of another module or cluster via the configuration of the BswScheduler. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=30
requiredTrigger	Trigger	*	aggr	Specifies that this module or cluster reacts upon an external trigger.This requiredTrigger is declared locally to this context and will be connected to the providedTrigger of another module or cluster via the configuration of the BswScheduler. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=40

Table D.15: BswModuleDescription

Class	BswModuleEntry			
Package	M2::AUTOSARTemplates::BswModuleTemplate::BswInterfaces			
Note	This class represents a single API entry (C-function prototype) into the BSW module or cluster. The name of the C-function is equal to the short name of this element with one exception: In case of multiple instances of a module on the same CPU, special rules for "infixes" apply, see description of class BswImplementation. **Tags:** atp.recommendedPackage=BswModuleEntrys			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	Type	Mul.	Kind	Note
argument (ordered)	SwServiceArg	*	aggr	An argument belonging to this BswModuleEntry. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=blueprintDerivation Time xml.sequenceOffset=45
bswEntryKind	BswEntryKindEnum	0..1	attr	This describes whether the entry is concrete or abstract. If the attribute is missing the entry is considered as concrete. **Tags:** xml.sequenceOffset=40
callType	BswCallType	1	attr	The type of call associated with this service. **Tags:** xml.sequenceOffset=25
executionContext	BswExecutionContext	1	attr	Specifies the execution context which is required (in case of entries into this module) or guaranteed (in case of entries called from this module) for this service. **Tags:** xml.sequenceOffset=30
functionPrototypeEmitter	NameToken	0..1	attr	This attribute is used to control the generation of function prototypes. If set to "RTE", the RTE generates the function prototypes in the Module Interlink Header File.
isReentrant	Boolean	1	attr	Reentrancy from the viewpoint of function callers: • True: Enables the service to be invoked again, before the service has finished. • False: It is prohibited to invoke the service again before is has finished. **Tags:** xml.sequenceOffset=15

isSynchronous	Boolean	1	attr	Synchronicity from the viewpoint of function callers: • True: This calls a synchronous service, i.e. the service is completed when the call returns. • False: The service (on semantical level) may not be complete when the call returns. **Tags:** xml.sequenceOffset=20
returnType	SwServiceArg	0..1	aggr	The return type belonging to this bswModuleEntry. **Tags:** xml.sequenceOffset=40
role	Identifier	0..1	attr	Specifies the role of the entry in the given context. It shall be equal to the standardized name of the service call, especially in cases where no ServiceIdentifier is specified, e.g. for callbacks. Note that the ShortName is not always sufficient because it maybe vendor specific (e.g. for callbacks which can have more than one instance). **Tags:** xml.sequenceOffset=10
serviceId	PositiveInteger	0..1	attr	Refers to the service identifier of the Standardized Interfaces of AUTOSAR basic software. For non-standardized interfaces, it can optionally be used for proprietary identification. **Tags:** xml.sequenceOffset=5
swServiceImplPolicy	SwServiceImplPolicyEnum	1	attr	Denotes the implementation policy as a standard function call, inline function or macro. This has to be specified on interface level because it determines the signature of the call. **Tags:** xml.sequenceOffset=35

Table D.16: BswModuleEntry

Class	**BuildAction**			
Package	M2::AUTOSARTemplates::GenericStructure::BuildActionManifest			
Note	This meta-class represents the ability to specify a build action.			
Base	ARObject, AtpBlueprint, AtpBlueprintable, BuildActionEntity, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
createdData	BuildActionIoElement	*	aggr	This represents the artifacts which are cated by the processor.
followUpAction	BuildAction	*	ref	This association specifies a set of follow up actions. **Tags:** xml.sequenceOffset=-80

inputData	BuildActionIoElement	*	aggr	This represents the artifacts which are read by the processor.
modifiedData	BuildActionIoElement	*	aggr	This denotes the data which are modifed by the action.
predecessorAction	BuildAction	*	ref	This association specifies a set of predecessors. These actions must be finished before but necessarily immediately after the given action.. These actions need to be performed in the specified order. **Tags:** xml.sequenceOffset=-90
requiredEnvironment	BuildActionEnvironment	1	ref	This represents the environment which is required to use the specified Processor.

Table D.17: BuildAction

Class	**BuildActionEnvironment**			
Package	M2::AUTOSARTemplates::GenericStructure::BuildActionManifest			
Note	This meta-class represents the ability to specify a build action environment.			
Base	ARObject, AtpBlueprint, AtpBlueprintable, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
sdg	Sdg	*	aggr	This represents a general data structure intended to denote parameters for the BuildActionEnvironment.

Table D.18: BuildActionEnvironment

Class	**BuildActionManifest**			
Package	M2::AUTOSARTemplates::GenericStructure::BuildActionManifest			
Note	This meta-class represents the ability to specify a manifest for processing artifacts. An example use case is the processing of ECUC parameter values. **Tags:** atp.recommendedPackage=BuildActionManifests xml.globalElement=false			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
buildAction	BuildAction	*	aggr	This represents a particular action in the build chain. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=blueprintDerivationTime
buildActionEnvironment	BuildActionEnvironment	*	aggr	This represents a build action environment. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=blueprintDerivationTime

dynamicAction	BuildAction	*	ref	This denots an Action which is to be executed as part of the dynamic action set.
startAction	BuildAction	*	ref	This specifies the list of actions to be performed at the beginning of the process. **Tags:** xml.sequenceOffset=-90
tearDownAction	BuildAction	*	ref	This specifies the set of action which shall be performed after all other actions in the manifest were performed. **Tags:** xml.sequenceOffset=-80

Table D.19: BuildActionManifest

Class	**ClientServerInterfaceToBswModuleEntryBlueprintMapping**			
Package	M2::AUTOSARTemplates::StandardizationTemplate::ClientServerInterfaceToBswModuleEntryMapping			
Note	This represents a mapping between one ClientServerInterface blueprint and BswModuleEntry blueprint in order to express the intended implementation of ClientServerOperations by specific BswModuleEntries under consideration of PortDefinedArguments. Such a mapping enables the formal check whether the number of arguments and the data types of arguments of the operation + additional PortDefinedArguments matches the signature of the BswModuleEntry. **Tags:** atp.recommendedPackage=BlueprintMappingSets			
Base	ARElement, ARObject, AtpBlueprint, CollectableElement, Identifiable, Multilanguage Referrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
clientServerInterface	ClientServerInterface	1	ref	The referenced ClientServerInterface represents the client server interface the mapping is dedicated to.
operationMapping	ClientServerOperationBlueprintMapping	1..*	aggr	This specifies the operations used in the mapping between the ClientServerInterface and the BswModuleEntry. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime
portDefinedArgumentBlueprint (ordered)	PortDefinedArgumentBlueprint	*	aggr	This specifies the PortDefinedArguments used in the mapping between the ClientServerInterface and the BswModuleEntry. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime

Table D.20: ClientServerInterfaceToBswModuleEntryBlueprintMapping

Class	ClientServerOperation			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	An operation declared within the scope of a client/server interface.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
argument (ordered)	ArgumentDataPrototype	*	aggr	An argument of this ClientServerOperation **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=blueprintDerivationTime
possibleError	ApplicationError	*	ref	Possible errors that may by raised by the referring operation.

Table D.21: ClientServerOperation

Class	Collection			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::ElementCollection			
Note	This meta-class specifies a collection of elements. A collection can be utilized to express additional aspects for a set of elements. Note that Collection is an ARElement. Therefore it is applicable e.g. for EvaluatedVariant, even if this is not obvious. Usually the category of a Collection is "SET". On the other hand, a Collection can also express an arbitrary relationship between elements. This is denoted by the category "RELATION" (see also [TPS_GST_00347]). In this case the collection represents an association from "sourceElement" to "targetElement" in the role "role". **Tags:** atp.recommendedPackage=Collections			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	Type	Mul.	Kind	Note
autoCollect	AutoCollectEnum	0..1	attr	This attribute reflects how far the referenced objects are part of the collection. **Tags:** xml.sequenceOffset=20
collectedInstance	AtpFeature	*	iref	This instance ref supports the use case that a particular instance is part of the collection. **Tags:** xml.sequenceOffset=60
element	Identifiable	*	ref	This is an element in the collection. Note that Collection itself is collectable. Therefore collections can be nested. In case of category="RELATION" this represents the target end of the relation. **Tags:** xml.sequenceOffset=40

elementRole	Identifier	0..1	attr	This attribute allows to denote a particular role of the collection. Note that the applicable semantics shall be mutually agreed between the two parties. In particular it denotes the role of element in the context of sourceElement. **Tags:** xml.sequenceOffset=30
sourceElement	Identifiable	*	ref	Only if Category = "RELATION". This represents the source of a relation. **Tags:** xml.sequenceOffset=50
sourceInstance	AtpFeature	*	iref	Only if Category = "RELATION". This represents the source instance of a relation. **Tags:** xml.sequenceOffset=70

Table D.22: Collection

Class	CompuMethod			
Package	M2::MSR::AsamHdo::ComputationMethod			
Note	This meta-class represents the ability to express the relationship between a physical value and the mathematical representation. Note that this is still independent of the technical implementation in data types. It only specifies the formula how the internal value corresponds to its physical pendant. **Tags:** atp.recommendedPackage=CompuMethods			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
compuInternalToPhys	Compu	0..1	aggr	This specifies the computation from internal values to physical values. **Tags:** xml.sequenceOffset=80
compuPhysToInternal	Compu	0..1	aggr	This represents the computation from physical values to the internal values. **Tags:** xml.sequenceOffset=90
displayFormat	DisplayFormatString	0..1	attr	This property specifies, how the physical value shall be displayed e.g. in documents or measurement and calibration tools. **Tags:** xml.sequenceOffset=20
unit	Unit	0..1	ref	This is the physical unit of the Physical values for which the CompuMethod applies. **Tags:** xml.sequenceOffset=30

Table D.23: CompuMethod

Class	CompuScale			
Package	M2::MSR::AsamHdo::ComputationMethod			
Note	This meta-class represents the ability to specify one segment of a segmented computation method.			
Base	ARObject			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
desc	MultiLanguage OverviewParagr aph	0..1	aggr	<desc> represents a general but brief description of the object in question. **Tags:** xml.sequenceOffset=30
compuInve rseValue	CompuConst	0..1	aggr	This is the inverse value of the constraint. This supports the case that the scale is not reversible per se. **Tags:** xml.sequenceOffset=60
compuScal eContents	CompuScaleCo ntents	0..1	aggr	This represents the computation details of the scale. **Tags:** xml.roleElement=false; xml.roleWrapper Element=false; xml.sequenceOffset=70; xml.type Element=false; xml.typeWrapperElement=false
lowerLimit	Limit	0..1	attr	This specifies the lower limit of the scale. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime xml.sequenceOffset=40
mask	PositiveInteger	0..1	attr	In difference to all the other computational methods every COMPU-SCALE will be applied including the bit MASK. Therefore it is allowed for this type of COMPU-METHOD, that COMPU-SCALES overlap. To calculate the string reverse to a value, the string has to be split and the according value for each substring has to be summed up. The sum is finally transmitted. The processing has to be done in order of the COMPU-SCALE elements. **Tags:** xml.sequenceOffset=35
shortLabel	Identifier	0..1	attr	This element specifies a short name for the particular scale. The name can for example be used to derive a programming language identifier. **Tags:** xml.sequenceOffset=20
symbol	CIdentifier	0..1	attr	The symbol, if provided, is used by code generators to get a C identifier for the CompuScale. The name will be used as is for the code generation, therefore it needs to be unique within the generation context. **Tags:** xml.sequenceOffset=25

upperLimit	Limit	0..1	attr	This specifies the upper limit of a of the scale. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime xml.sequenceOffset=50

Table D.24: CompuScale

Class	ConsistencyNeeds			
Package	M2::AUTOSARTemplates::SWComponentTemplate::ImplicitCommunicationBehavior			
Note	This meta-class represents the ability to define requirements on the implicit communication behavior.			
Base	ARObject, AtpBlueprint, AtpBlueprintable, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
dpgDoesNotRequireCoherency	DataPrototypeGroup	*	aggr	This group of VariableDataPrototypes does not require coherency with respect to the implicit communication behavior. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variationPoint.shortLabel vh.latestBindingTime=preCompileTime
dpgRequiresCoherency	DataPrototypeGroup	*	aggr	This group of VariableDataPrototypes requires coherency with respect to the implicit communication behavior, i.e. all read and write access to VariableDataPrototypes in the DataPrototypeGroup by the RunnableEntitys of the RunnableEntityGroup need to be handled in a coherent manner. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variationPoint.shortLabel vh.latestBindingTime=preCompileTime
regDoesNotRequireStability	RunnableEntityGroup	*	aggr	This group of RunnableEntities does not require stability with respect to the implicit communication behavior. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variationPoint.shortLabel vh.latestBindingTime=preCompileTime

| regRequire sStability | RunnableEntity Group | * | aggr | This group of RunnableEntities requires stability with respect to the implicit communication behavior, i.e. all read and write access to VariableDataPrototypes in the DataPrototypeGroup by the RunnableEntitys of the RunnableEntityGroup need to be handled in a stable manner.

Stereotypes: atpSplitable; atpVariation
Tags: atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime |

Table D.25: ConsistencyNeeds

Class	**ConsistencyNeedsBlueprintSet**			
Package	M2::AUTOSARTemplates::StandardizationTemplate::BlueprintDedicated:: ConsistencyNeedsBlueprintSet			
Note	This meta class represents the ability to specify a set of blueprint for ConsistencyNeeds. **Tags:** atp.recommendedPackage=ConsistencyNeedsBlueprintSets			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
consistenc yNeeds	ConsistencyNee ds	*	aggr	This represents a particular blueprint of consistencyNeeds. Note that it is **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime

Table D.26: ConsistencyNeedsBlueprintSet

Class	**DataConstr**			
Package	M2::MSR::AsamHdo::Constraints::GlobalConstraints			
Note	This meta-class represents the ability to specify constraints on data. **Tags:** atp.recommendedPackage=DataConstrs			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
dataConstr Rule	DataConstrRule	*	aggr	This is one particular rule within the data constraints. **Tags:** xml.roleElement=true; xml.roleWrapper Element=true; xml.sequenceOffset=30; xml.type Element=false; xml.typeWrapperElement=false

Table D.27: DataConstr

Class	DataFormatTailoring			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::Data FormatTailoring			
Note	This class collects all rules that tailor the AUTOSAR templates for a specific data exchange point.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
classTailori ng	ClassTailoring	*	aggr	Specification of tailorings of Meta Classes **Tags:** xml.sequenceOffset=10
constraintT ailoring	ConstraintTailori ng	*	aggr	Specification of tailorings of Constraints that are not explicitly owned by any Meta-Class **Tags:** xml.sequenceOffset=20

Table D.28: DataFormatTailoring

Class	DataPrototypeGroup			
Package	M2::AUTOSARTemplates::SWComponentTemplate::ImplicitCommunicationBehavior			
Note	This meta-class represents the ability to define a collection of DataPrototypes that are subject to the formal definition of implicit communication behavior. The definition of the collection can be nested.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
dataProtot ypeGroup	DataPrototypeG roup	*	iref	This represents the ability to define nested groups of VariableDataPrototypes. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime
implicitDat aAccess	VariableDataPr ototype	*	iref	This represents a collection of VariableDataPrototypes that belong to the enclosing DataPrototypeGroup **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime

Table D.29: DataPrototypeGroup

Class	DataTypeMappingSet			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::Datatypes			
Note	This class represents a list of mappings between ApplicationDataTypes and ImplementationDataTypes. In addition, it can contain mappings between ImplementationDataTypes and ModeDeclarationGroups. **Tags:** atp.recommendedPackage=DataTypeMappingSets			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	Type	Mul.	Kind	Note

Document ID 535: AUTOSAR_TPS_StandardizationTemplate.pdf
— AUTOSAR CONFIDENTIAL —

dataTypeMap	DataTypeMap	*	aggr	This is one particular association between an ApplicationDataType and its ImplementationDataType.
modeRequestTypeMap	ModeRequestTypeMap	*	aggr	This is one particular association between an ModeDeclarationGroup and its ImplementationDataType.

Table D.30: DataTypeMappingSet

Class	Documentation			
Package	M2::AUTOSARTemplates::GenericStructure::DocumentationOnM1			
Note	This meta-class represents the ability to handle a so called standalone documentation. Standalone means, that such a documentation is not embedded in another ARElement or identifiable object. The standalone documentation is an entity of its own which denotes its context by reference to other objects and instances. **Tags:** atp.recommendedPackage=Documentations			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
context	Documentation Context	*	aggr	This is the context of the particular documentation.
documentationContent	PredefinedChapter	0..1	aggr	This is the content of the documentation related to the specified contexts. **Tags:** xml.sequenceOffset=200

Table D.31: Documentation

Class	≪**atpMixed**≫ DocumentationBlock			
Package	M2::MSR::Documentation::BlockElements			
Note	This class represents a documentation block. It is made of basic text structure elements which can be displayed in a table cell.			
Base	ARObject			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
defList	DefList	0..1	aggr	This represents a definition list in the documentation block. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=40
figure	MlFigure	0..1	aggr	This represents a figure in the documentation block. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=70

formula	MlFormula	0..1	aggr	This is a formula in the definition block. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=60
labeledList	LabeledList	0..1	aggr	This represents a labeled list. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=50
list	List	0..1	aggr	This represents numbered or unnumbered list. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=30
msrQuery P2	MsrQueryP2	0..1	aggr	This represents automatically contributed contents provided by an msrquery in the context of DocumentationBlock.
note	Note	0..1	aggr	This represents a note in the text flow. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=80
p	MultiLanguageP aragraph	0..1	aggr	This is one particular paragraph. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=10
structured Req	StructuredReq	0..1	aggr	This aggregation supports structured requirements embedded in a documentation block. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=100
trace	TraceableText	0..1	aggr	This represents traceable text in the documentation block. This allows to specify requirements/constraints in any documentation block. The kind of the trace is specified in the category. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=90
verbatim	MultiLanguageV erbatim	0..1	aggr	This represents one particular verbatim text. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=postBuild xml.sequenceOffset=20

Table D.32: DocumentationBlock

Class	≪atpVariation≫ EcucAbstractStringParamDef (abstract)
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate
Note	Abstract class that is used to collect the common properties for StringParamDefs, LinkerSymbolDef, FunctionNameDef and MultilineStringParamDefs. atpVariation: [RS_ECUC_0083] **Tags:** vh.latestBindingTime=codeGenerationTime
Base	ARObject, AtpDefinition, EcucCommonAttributes, EcucDefinitionElement, Ecuc ParameterDef, Identifiable, MultilanguageReferrable, Referrable

Attribute	Type	Mul.	Kind	Note
defaultValue	VerbatimString	0..1	attr	Default value of the string configuration parameter.
maxLength	PositiveInteger	0..1	attr	Max length allowed for this string.
minLength	PositiveInteger	0..1	attr	Min length allowed for this string.
regularExpression	RegularExpression	0..1	attr	This represents the regular expression which shall be used to validate the string parameter value.

Table D.33: EcucAbstractStringParamDef

Class	EcucBooleanParamDef
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate
Note	Configuration parameter type for Boolean. Allowed values are true and false. **Tags:** xml.sequenceOffset=0
Base	ARObject, AtpDefinition, EcucCommonAttributes, EcucDefinitionElement, Ecuc ParameterDef, Identifiable, MultilanguageReferrable, Referrable

Attribute	Type	Mul.	Kind	Note
defaultValue	Boolean	0..1	attr	Default value of the boolean configuration parameter. atpVariation: [RS_ECUC_00083] **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=codeGenerationTime

Table D.34: EcucBooleanParamDef

Class	EcucChoiceReferenceDef
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate
Note	Specify alternative references where in the ECU Configuration description only one of the specified references will actually be used.
Base	ARObject, AtpDefinition, EcucAbstractInternalReferenceDef, EcucAbstractReference Def, EcucCommonAttributes, EcucDefinitionElement, Identifiable, Multilanguage Referrable, Referrable

Attribute	Type	Mul.	Kind	Note
destination	EcucContainerDef	*	ref	All the possible parameter containers for the reference are specified. **Stereotypes:** atpUriDef

Table D.35: EcucChoiceReferenceDef

Class	EcucContainerDef (abstract)			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	Base class used to gather common attributes of configuration container definitions.			
Base	ARObject, AtpDefinition, EcucDefinitionElement, Identifiable, Multilanguage Referrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
destination Uri	EcucDestination UriDef	*	ref	Several destinationUris can be defined for an EcucContainerDef. With such destinationUris an EcucContainerDef is applicable for several EcucUriReferenceDefs. **Stereotypes:** atpUriDef
multiplicity ConfigClass s	EcucMultiplicity ConfigurationCl ass	*	aggr	Specifies which MultiplicityConfigurationClass this container is available for which ConfigurationVariant. This aggregation is optional if the surrounding EcucModuleDef has the Category STANDARDIZED_MODULE_DEFINITION. If the category attribute of the EcucModuleDef is set to VENDOR_SPECIFIC_MODULE_DEFINITION, then this aggregation is mandatory. **Tags:** xml.namePlural=MULTIPLICITY-CONFIG-C LASSES
postBuildV ariantMulti plicity	Boolean	0..1	attr	Indicates if a container may have different number of instances in different post-build variants (previously known as post-build selectable configuration sets). TRUE means yes, FALSE means no.
requiresInd ex	Boolean	0..1	attr	Used to define whether the value element for this definition shall be provided with an index.

Table D.36: EcucContainerDef

Class	EcucContainerValue			
Package	M2::AUTOSARTemplates::ECUCDescriptionTemplate			
Note	Represents a Container definition in the ECU Configuration Description.			
Base	ARObject, EcucIndexableValue, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
definition	EcucContainerD ef	1	ref	Reference to the definition of this Container in the ECU Configuration Parameter Definition. **Tags:** xml.sequenceOffset=-10

parameter Value	EcucParameter Value	*	aggr	Aggregates all ECU Configuration Values within this Container. atpVariation: [RS_ECUC_00079] **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=definition, variationPoint.short Label vh.latestBindingTime=postBuild
referenceV alue	EcucAbstractRe ferenceValue	*	aggr	Aggregates all References with this container. atpVariation: [RS_ECUC_00079] **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=definition, variationPoint.short Label vh.latestBindingTime=postBuild
subContai ner	EcucContainerV alue	*	aggr	Aggregates all sub-containers within this container. atpVariation: [RS_ECUC_00078] **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=definition, shortName, variationPoint.shortLabel vh.latestBindingTime=postBuild

Table D.37: EcucContainerValue

Class	**EcucDefinitionCollection**			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	This represents the anchor point of an ECU Configuration Parameter Definition within the AUTOSAR templates structure. **Tags:** atp.recommendedPackage=EcucDefinitionCollections			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
module	EcucModuleDef	1..*	ref	References to the module definitions of individual software modules.

Table D.38: EcucDefinitionCollection

Class	EcucEnumerationParamDef			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	Configuration parameter type for Enumeration. **Tags:** xml.sequenceOffset=0			
Base	ARObject, AtpDefinition, EcucCommonAttributes, EcucDefinitionElement, Ecuc ParameterDef, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
defaultValue	Identifier	0..1	attr	Default value of the enumeration configuration parameter. This string needs to be one of the literals specified for this enumeration.
literal	EcucEnumerationLiteralDef	*	aggr	Aggregation on the literals used to define this enumeration parameter. This aggregation is optional if the surrounding EcucModuleDef has the category STANDARDIZED_MODULE_DEFINITION. If the category attribute of the EcucModuleDef is set to VENDOR_SPECIFIC_MODULE_DEFINITION then this aggregation is mandatory. **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=shortName

Table D.39: EcucEnumerationParamDef

Class	EcucFloatParamDef			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	Configuration parameter type for Float. **Tags:** xml.sequenceOffset=0			
Base	ARObject, AtpDefinition, EcucCommonAttributes, EcucDefinitionElement, Ecuc ParameterDef, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
defaultValue	Float	0..1	attr	Default value of the float configuration parameter. atpVariation: [RS_ECUC_00083] **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=codeGenerationTime
max	Limit	0..1	attr	Max value allowed for the parameter defined. atpVariation: [RS_ECUC_00084] **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=codeGenerationTime
min	Limit	0..1	attr	Min value allowed for the parameter defined. atpVariation: [RS_ECUC_00084] **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=codeGenerationTime

Table D.40: EcucFloatParamDef

Class	EcucIntegerParamDef			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	Configuration parameter type for Integer. **Tags:** xml.sequenceOffset=0			
Base	ARObject, AtpDefinition, EcucCommonAttributes, EcucDefinitionElement, Ecuc ParameterDef, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
defaultValue	UnlimitedInteger	0..1	attr	Default value of the integer configuration parameter. atpVariation: [RS_ECUC_00083] **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=codeGenerationTime
max	UnlimitedInteger	0..1	attr	Max value allowed for the parameter defined. atpVariation: [RS_ECUC_00084] **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=codeGenerationTime
min	UnlimitedInteger	0..1	attr	Min value allowed for the parameter defined. atpVariation: [RS_ECUC_00084] **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=codeGenerationTime

Table D.41: EcucIntegerParamDef

Class	EcucModuleDef			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	Used as the top-level element for configuration definition for Software Modules, including BSW and RTE as well as ECU Infrastructure. **Tags:** atp.recommendedPackage=EcucModuleDefs			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpDefinition, Collectable Element, EcucDefinitionElement, Identifiable, MultilanguageReferrable, Packageable Element, Referrable			
Attribute	Type	Mul.	Kind	Note
apiService Prefix	CIdentifier	0..1	attr	For CDD modules this attribute holds the apiServicePrefix. The shortName of the module definition of a Complex Driver is always "Cdd". Therefore for CDD modules the module apiServicePrefix is described with this attribute.

container	EcucContainerDef	1..*	aggr	Aggregates the top-level container definitions of this specific module definition. **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=shortName xml.sequenceOffset=11
postBuildVariantSupport	Boolean	0..1	attr	Indicates if a module supports different post-build variants (previously known as post-build selectable configuration sets). TRUE means yes, FALSE means no.
refinedModuleDef	EcucModuleDef	0..1	ref	Optional reference from the Vendor Specific Module Definition to the Standardized Module Definition it refines. In case this EcucModuleDef has the category STANDARDIZED_MODULE_DEFINITION this reference shall not be provided. In case this EcucModuleDef has the category VENDOR_SPECIFIC_MODULE_DEFINITION this reference is mandatory. **Stereotypes:** atpUriDef
supportedConfigVariant	EcucConfigurationVariantEnum	*	attr	Specifies which ConfigurationVariants are supported by this software module. This attribute is optional if the EcucModuleDef has the category STANDARDIZED_MODULE_DEFINITION. If the category attribute of the EcucModuleDef is set to VENDOR_SPECIFIC_MODULE_DEFINITION then this attribute is mandatory.

Table D.42: EcucModuleDef

Class	**EcucNumericalParamValue**			
Package	M2::AUTOSARTemplates::ECUCDescriptionTemplate			
Note	Holding the value which is subject to variant handling.			
Base	ARObject, EcucIndexableValue, EcucParameterValue			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
value	Numerical	1	attr	Value which is subject to variant handling. atpVariation: [RS_ECUC_00080] **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime

Table D.43: EcucNumericalParamValue

Class	EcucParameterDef (abstract)			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	Abstract class used to define the similarities of all ECU Configuration Parameter types defined as subclasses.			
Base	ARObject, AtpDefinition, EcucCommonAttributes, EcucDefinitionElement, Identifiable, MultilanguageReferrable, Referrable			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
derivation	EcucDerivation Specification	0..1	aggr	A derivation of a Configuration Parameter value can be specified by an informal Calculation Formula or by a formal language that can be used to specify the computational rules.
symbolicN ameValue	Boolean	1	attr	Specifies that this parameter's value is used, together with the aggregating container, to derive a symbolic name definition. See chapter "Representation of Symbolic Names" in Ecuc specification for more details.
withAuto	Boolean	0..1	attr	Specifies whether it shall be allowed on the value side to specify this parameter value as "AUTO". If withAuto is "true" it shall be possible to set the "isAutoValue" attribute of the respective parameter to "true". This means that the actual value will not be considered during ECU Configuration but will be (re-)calculated by the code generator and stored in the value attribute afterwards. These implicit updated values might require a re-generation of other modules which reference these values. If withAuto is "false" it shall not be possible to set the "isAutoValue" attribute of the respective parameter to "true". If withAuto is not present the default is "false".

Table D.44: EcucParameterDef

Class	EcucParameterValue (abstract)			
Package	M2::AUTOSARTemplates::ECUCDescriptionTemplate			
Note	Common class to all types of configuration values.			
Base	ARObject, EcucIndexableValue			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
annotation	Annotation	*	aggr	Possibility to provide additional notes while defining the ECU Configuration Parameter Values. These are not intended as documentation but are mere design notes. **Tags:** xml.sequenceOffset=10

definition	EcucParameter Def	1	ref	Reference to the definition of this EcucParameterValue subclasses in the ECU Configuration Parameter Definition. **Tags:** xml.sequenceOffset=-10
isAutoValue	Boolean	0..1	attr	If withAuto is set to "true" for this parameter definition the isAutoValue can be set to "true". If isAutoValue is set to "true" the actual value will not be considered during ECU Configuration but will be (re-)calculated by the code generator and stored in the value attribute afterwards. These implicit updated values might require a re-generation of other modules which reference these values. If isAutoValue is not present the default is "false". **Tags:** xml.sequenceOffset=20

Table D.45: EcucParameterValue

Class	**EcucReferenceDef**			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	Specify references within the ECU Configuration Description between parameter containers.			
Base	ARObject, AtpDefinition, EcucAbstractInternalReferenceDef, EcucAbstractReference Def, EcucCommonAttributes, EcucDefinitionElement, Identifiable, Multilanguage Referrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
destination	EcucContainerD ef	1	ref	Exactly one reference to a parameter container is allowed as destination. **Stereotypes:** atpUriDef

Table D.46: EcucReferenceDef

Class	**EcucSymbolicNameReferenceDef**			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	This meta-class specifies that the implementation of the reference is done using a symbolic name defined by the referenced Container's shortName.			
Base	ARObject, AtpDefinition, EcucAbstractInternalReferenceDef, EcucAbstractReference Def, EcucCommonAttributes, EcucDefinitionElement, Identifiable, Multilanguage Referrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
destination	EcucParamConf ContainerDef	1	ref	Exactly one reference to a parameter container is allowed as destination. **Stereotypes:** atpUriDef

Table D.47: EcucSymbolicNameReferenceDef

Class	EcucTextualParamValue			
Package	M2::AUTOSARTemplates::ECUCDescriptionTemplate			
Note	Holding a value which is not subject to variation.			
Base	ARObject, EcucIndexableValue, EcucParameterValue			
Attribute	Type	Mul.	Kind	Note
value	VerbatimString	1	attr	Value of the parameter, not subject to variant handling.

Table D.48: EcucTextualParamValue

Class	EcucUriReferenceDef			
Package	M2::AUTOSARTemplates::ECUCParameterDefTemplate			
Note	Definition of reference with a destination that is specified via a destinationUri. With such a reference it is possible to define a reference to a EcucContainerDef in a different module independent from the concrete definition of the target container.			
Base	ARObject, AtpDefinition, EcucAbstractInternalReferenceDef, EcucAbstractReference Def, EcucCommonAttributes, EcucDefinitionElement, Identifiable, Multilanguage Referrable, Referrable			
Attribute	Type	Mul.	Kind	Note
destination Uri	EcucDestination UriDef	1	ref	Any EcucContainerDef with a destinationUri that is identical to the destinationUri that is referenced here defines a valid target. **Stereotypes:** atpUriDef

Table D.49: EcucUriReferenceDef

Class	FlatMap			
Package	M2::AUTOSARTemplates::CommonStructure::FlatMap			
Note	Contains a flat list of references to software objects. This list is used to identify instances and to resolve name conflicts. The scope is given by the RootSwCompositionPrototype for which it is used, i.e. it can be applied to a system, system extract or ECU-extract. An instance of FlatMap may also be used in a preliminary context, e.g. in the scope of a software component before integration into a system. In this case it is not referred by a RootSwCompositionPrototype. **Tags:** atp.recommendedPackage=FlatMaps			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	Type	Mul.	Kind	Note

| instance | FlatInstanceDescriptor | 1..* | aggr | A descriptor instance aggregated in the flat map.

The variation point accounts for the fact, that the system in scope can be subject to variability, and thus the existence of some instances is variable.

The aggregation has been made splitable because the content might be contributed by different stakeholders at different times in the workflow. Plus, the overall size might be so big that eventually it becomes more manageable if it is distributed over several files.

Stereotypes: atpSplitable; atpVariation
Tags: atp.Splitkey=shortName, variation Point.shortLabel
vh.latestBindingTime=postBuild |

Table D.50: FlatMap

Class	Identifiable (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Identifiable			
Note	Instances of this class can be referred to by their identifier (within the namespace borders). In addition to this, Identifiables are objects which contribute significantly to the overall structure of an AUTOSAR description. In particular, Identifiables might contain Identifiables.			
Base	ARObject, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
desc	MultiLanguage OverviewParagraph	0..1	aggr	This represents a general but brief (one paragraph) description what the object in question is about. It is only one paragraph! Desc is intended to be collected into overview tables. This property helps a human reader to identify the object in question. More elaborate documentation, (in particular how the object is built or used) should go to "introduction". **Tags:** xml.sequenceOffset=-60
category	CategoryString	0..1	attr	The category is a keyword that specializes the semantics of the Identifiable. It affects the expected existence of attributes and the applicability of constraints. **Tags:** xml.sequenceOffset=-50
adminData	AdminData	0..1	aggr	This represents the administrative data for the identifiable object. **Tags:** xml.sequenceOffset=-40

annotation	Annotation	*	aggr	Possibility to provide additional notes while defining a model element (e.g. the ECU Configuration Parameter Values). These are not intended as documentation but are mere design notes. **Tags:** xml.sequenceOffset=-25
introductio n	Documentation Block	0..1	aggr	This represents more information about how the object in question is built or is used. Therefore it is a DocumentationBlock. **Tags:** xml.sequenceOffset=-30
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 uuid attribute has no semantic meaning for an AUTOSAR model and there is no requirement for AUTOSAR tools to manage the timestamp. **Tags:** xml.attribute=true

Table D.51: Identifiable

Class	**ImplementationDataType**			
Package	M2::AUTOSARTemplates::CommonStructure::ImplementationDataTypes			
Note	Describes a reusable data type on the implementation level. This will typically correspond to a typedef in C-code. **Tags:** atp.recommendedPackage=ImplementationDataTypes			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, AutosarDataType, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
dynamicAr raySizePro file	String	0..1	attr	Specifies the profile which the array will follow in case this data type is a variable size array.

subElement (ordered)	Implementation DataTypeElement	*	aggr	Specifies an element of an array, struct, or union data type. The aggregation of ImplementionDataTypeElement is subject to variability with the purpose to support the conditional existence of elements inside a ImplementationDataType representing a structure. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime
symbolProps	SymbolProps	0..1	aggr	This represents the SymbolProps for the ImplementationDataType. **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=shortName
typeEmitter	NameToken	0..1	attr	This attribute is used to control which part of the AUTOSAR toolchain is supposed to trigger data type definitions.

Table D.52: ImplementationDataType

Class	**LifeCycleInfo**			
Package	M2::AUTOSARTemplates::GenericStructure::LifeCycles			
Note	LifeCycleInfo describes the life cycle state of an element together with additional information like what to use instead			
Base	ARObject			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
lcObject	Referrable	1	ref	Element(s) have the life cycle as described in lcState.
lcState	LifeCycleState	0..1	ref	This denotes the particular state assigned to the object. If no lcState is given then the default life cycle state of LifeCycleInfoSet is assumed.
periodBegin	LifeCyclePeriod	0..1	aggr	Starting point of period in which the element has the denoted life cycle state lcState. If no periodBegin is given then the default period begin of LifeCycleInfoSet is assumed.
periodEnd	LifeCyclePeriod	0..1	aggr	Expiry date, i.e. end point of period the element does not have the denoted life cycle state lcState any more. If no periodEnd is given then the default period begin of LifeCycleInfoSet is assumed.
remark	Documentation Block	0..1	aggr	Remark describing for example - why the element was given the specified life cycle - the semantics of useInstead

useInstead	Referrable	*	ref	Element(s) that should be used instead of the one denoted in referrable. Only relevant in case of life cycle states lcState unlike "valid". In case there are multiple references the exact semantics must be individually described in the remark.

Table D.53: LifeCycleInfo

Class	**LifeCycleInfoSet**			
Package	M2::AUTOSARTemplates::GenericStructure::LifeCycles			
Note	This meta class represents the ability to attach a life cycle information to a particular set of elements. The information can be defined for a particular period. This supports the definition of transition plans. If no period is specified, the life cycle state applies forever. **Tags:** atp.recommendedPackage=LifeCycleInfoSets			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
defaultLcState	LifeCycleState	1	ref	This denotes the default life cycle state. To be used in all LifeCycleInfo elements within the LifeCycleInfoSet if no life cycle state is stated there explicitly. I.e. the defaultLcState can be overwritten in LifeCycleInfo elements.
defaultPeriodBegin	LifeCyclePeriod	0..1	aggr	Default starting point of period in which all the specified lifeCycleInfo apply. Note that the default period can be overridden for each lifeCycleInfo individually.
defaultPeriodEnd	LifeCyclePeriod	0..1	aggr	Default expiry date, i.e. default end point of period for which all specified lifeCycleInfo apply. Note that the default period can be overridden for each lifeCycleInfo individually.
lifeCycleInfo	LifeCycleInfo	*	aggr	This represents one particular life cycle information.
usedLifeCycleStateDefinitionGroup	LifeCycleStateDefinitionGroup	1	ref	This denotes the life cycle states applicable to the current life cycle info set.

Table D.54: LifeCycleInfoSet

Class	LifeCycleState
Package	M2::AUTOSARTemplates::GenericStructure::LifeCycles
Note	This meta class represents one particular state in the LifeCycle.
Base	ARObject, AtpBlueprint, AtpBlueprintable, Identifiable, MultilanguageReferrable, Referrable
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table D.55: LifeCycleState

Class	LifeCycleStateDefinitionGroup
Package	M2::AUTOSARTemplates::GenericStructure::LifeCycles
Note	This meta class represents the ability to define the states and properties of one particular life cycle. **Tags:** atp.recommendedPackage=LifeCycleStateDefintionGroups
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable
Attribute	Type	Mul.	Kind	Note
lcState	LifeCycleState	*	aggr	Describes a single life cycle state of this life cycle state definition group.

Table D.56: LifeCycleStateDefinitionGroup

Primitive	Limit
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::PrimitiveTypes
Note	This class represents the ability to express a numerical limit. Note that this is in fact a NumericalVariationPoint but has the additional attribute intervalType. **Tags:** xml.xsd.customType=LIMIT-VALUE; xml.xsd.pattern=(0[xX][0-9a-fA-F]+)|(0[0-7]+)|(0[bB][0-1]+)|(([+\-]?[1-9][0-9]+(\.[0-9]+)?|[+\-]?[0-9](\.[0-9]+)?)([eE]([+\-]?)[0-9]+)?)|\.0|INF|-INF|NaN; xml.xsd.type=string
Attribute	Datatype	Mul.	Kind	Note
intervalType	IntervalTypeEnum	0..1	attr	This specifies the type of the interval. If the attribute is missing the interval shall be considered as "CLOSED". **Tags:** xml.attribute=true

Table D.57: Limit

Class	ModeDeclarationGroup			
Package	M2::AUTOSARTemplates::CommonStructure::ModeDeclaration			
Note	A collection of Mode Declarations. Also, the initial mode is explicitly identified. Tags: atp.recommendedPackage=ModeDeclarationGroups			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	Type	Mul.	Kind	Note
initialMode	ModeDeclaration	1	ref	The initial mode of the ModeDeclarationGroup. This mode is active before any mode switches occurred.
modeDecl aration	ModeDeclaration	1..*	aggr	The ModeDeclarations collected in this ModeDeclarationGroup. Stereotypes: atpVariation Tags: vh.latestBindingTime=blueprintDerivation Time
modeMana gerErrorBe havior	ModeErrorBeha vior	0..1	aggr	This represents the ability to define the error behavior expected by the mode manager in case of errors on the mode user side (e.g. terminated mode user).
modeTran sition	ModeTransition	*	aggr	This represents the avaliable ModeTransitions of the ModeDeclarationGroup
modeUser ErrorBeha vior	ModeErrorBeha vior	0..1	aggr	This represents the definition of the error behavior expected by the mode user in case of errors on the mode manager side (e.g. terminated mode manager).
onTransitio nValue	PositiveInteger	0..1	attr	The value of this attribute shall be taken into account by the RTE generator for programmatically representing a value used for the transition between two statuses.

Table D.58: ModeDeclarationGroup

Class	MultilanguageReferrable (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Identifiable			
Note	Instances of this class can be referred to by their identifier (while adhering to namespace borders). They also may have a longName. But they are not considered to contribute substantially to the overall structure of an AUTOSAR description. In particular it does not contain other Referrables.			
Base	ARObject, Referrable			
Attribute	Type	Mul.	Kind	Note
longName	MultilanguageL ongName	0..1	aggr	This specifies the long name of the object. Long name is targeted to human readers and acts like a headline.

Table D.59: MultilanguageReferrable

Class	**NonqueuedReceiverComSpec**				
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication				
Note	Communication attributes specific to non-queued receiving.				
Base	ARObject, RPortComSpec, ReceiverComSpec				
Attribute	*Type*	*Mul.*	*Kind*	*Note*	
aliveTimeout	TimeValue	1	attr	Specify the amount of time (in seconds) after which the software component (via the RTE) needs to be notified if the corresponding data item have not been received according to the specified timing description. If the aliveTimeout attribute is 0 no timeout monitoring shall be performed.	
enableUpdate	Boolean	1	attr	This attribute controls whether application code is entitled to check whether the value of the corresponding VariableDataPrototype has been updated.	
filter	DataFilter	0..1	aggr	The applicable filter algorithm for filtering the value of the corresponding dataElement.	
handleDataStatus	Boolean	0..1	attr	If this attribute is set to true than the Rte_IStatus API shall exist. If the attribute does not exist or is set to false then the Rte_IStatus API may still exist in response to the existence of further conditions.	
handleNeverReceived	Boolean	1	attr	This attribute specifies whether for the corresponding VariableDataPrototype the "never received" flag is available. If yes, the RTE is supposed to assume that initially the VariableDataPrototype has not been received before. After the first reception of the corresponding VariableDataPrototype the flag is cleared. • If the value of this attribute is set to "true" the flag is required. • If set to "false", the RTE shall not support the "never received" functionality for the corresponding VariableDataPrototype.	
handleTimeoutType	HandleTimeoutEnum	1	attr	This attribute controls the behavior with respect to the handling of timeouts.	
initValue	ValueSpecification	0..1	aggr	Initial value to be used in case the sending component is not yet initialized. If the sender also specifies an initial value the receiver's value will be used.	
timeoutSubstitutionValue	ValueSpecification	0..1	aggr	This attribute represents the substitution value applicable in the case of a timeout.	

Table D.60: NonqueuedReceiverComSpec

Class	NonqueuedSenderComSpec			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Communication attributes for non-queued sender/receiver communication (sender side)			
Base	ARObject, PPortComSpec, SenderComSpec			
Attribute	Type	Mul.	Kind	Note
initValue	ValueSpecification	1	aggr	Initial value to be sent if sender component is not yet fully initialized, but receiver needs data already.

Table D.61: NonqueuedSenderComSpec

Class	PPortComSpec (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication			
Note	Communication attributes of a provided PortPrototype. This class will contain attributes that are valid for all kinds of provide ports, independent of client-server or sender-receiver communication patterns.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table D.62: PPortComSpec

Class	PPortPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	Component port providing a certain port interface.			
Base	ARObject, AbstractProvidedPortPrototype, AtpBlueprintable, AtpFeature, AtpPrototype, Identifiable, MultilanguageReferrable, PortPrototype, Referrable			
Attribute	Type	Mul.	Kind	Note
providedInterface	PortInterface	1	tref	The interface that this port provides. **Stereotypes:** isOfType

Table D.63: PPortPrototype

Class	PRPortPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	This kind of PortPrototype can take the role of both a required and a provided PortPrototype.			
Base	ARObject, AbstractProvidedPortPrototype, AbstractRequiredPortPrototype, AtpBlueprintable, AtpFeature, AtpPrototype, Identifiable, MultilanguageReferrable, PortPrototype, Referrable			
Attribute	Type	Mul.	Kind	Note
providedRequiredInterface	PortInterface	1	tref	This represents the PortInterface used to type the PRPortPrototype **Stereotypes:** isOfType

Table D.64: PRPortPrototype

Document ID 535: AUTOSAR_TPS_StandardizationTemplate.pdf
— AUTOSAR CONFIDENTIAL —

Class	PackageableElement (abstract)			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::ARPackage			
Note	This meta-class specifies the ability to be a member of an AUTOSAR package.			
Base	ARObject, CollectableElement, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
–	–	–	–	–

Table D.65: PackageableElement

Class	PortDefinedArgumentValue			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior::PortAPI Options			
Note	A PortDefinedArgumentValue is passed to a RunnableEntity dealing with the ClientServerOperations provided by a given PortPrototype. Note that this is restricted to PPortPrototypes of a ClientServerInterface.			
Base	ARObject			
Attribute	Type	Mul.	Kind	Note
value	ValueSpecification	1	aggr	Specifies the actual value.
valueType	Implementation DataType	1	tref	The implementation type of this argument value. It should not be composite type or a pointer. **Stereotypes:** isOfType

Table D.66: PortDefinedArgumentValue

Class	PortInterface (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	Abstract base class for an interface that is either provided or required by a port of a software component.			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	Type	Mul.	Kind	Note
isService	Boolean	1	attr	This flag is set if the PortInterface is to be used for communication between an • ApplicationSwComponentType or • ServiceProxySwComponentType or • SensorActuatorSwComponentType or • ComplexDeviceDriverSwComponentType • ServiceSwComponentType • EcuAbstractionSwComponentType and a ServiceSwComponentType (namely an AUTOSAR Service) located on the same ECU. Otherwise the flag is not set.

serviceKind	ServiceProvider Enum	0..1	attr	This attribute provides further details about the nature of the applied service.

Table D.67: PortInterface

Class	PortInterfaceMapping (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	Specifies one PortInterfaceMapping to support the connection of Ports typed by two different PortInterfaces with PortInterface elements having unequal names and/or unequal semantic (resolution or range).			
Base	ARObject, AtpBlueprint, AtpBlueprintable, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
–	–	–	–	–

Table D.68: PortInterfaceMapping

Class	PortInterfaceMappingSet			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	Specifies a set of (one or more) PortInterfaceMappings. **Tags:** atp.recommendedPackage=PortInterfaceMappingSets			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
portInterfaceMapping	PortInterfaceMapping	1..*	aggr	Specifies one PortInterfaceMapping to support the connection of Ports typed by two different PortInterfaces with PortInterface elements having unequal names and/or unequal semantic (resolution or range). **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=blueprintDerivationTime

Table D.69: PortInterfaceMappingSet

Class	PortPrototype (abstract)			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	Base class for the ports of an AUTOSAR software component. The aggregation of PortPrototypes is subject to variability with the purpose to support the conditional existence of ports.			
Base	ARObject, AtpBlueprintable, AtpFeature, AtpPrototype, Identifiable, Multilanguage Referrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*

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 voilatile data port.
parameterPortAnnotation	ParameterPortAnnotation	*	aggr	Annotations on this parameter port.
senderReceiverAnnotation	SenderReceiverAnnotation	*	aggr	Collection of annotations of this ports sender/receiver communication.
triggerPortAnnotation	TriggerPortAnnotation	*	aggr	Annotations on this trigger port.

Table D.70: PortPrototype

Class	**RPortComSpec (abstract)**
Package	M2::AUTOSARTemplates::SWComponentTemplate::Communication
Note	Communication attributes of a required PortPrototype. This class will contain attributes that are valid for all kinds of require-ports, independent of client-server or sender-receiver communication patterns.
Base	ARObject
Attribute	***Type***	***Mul.***	***Kind***	***Note***
–	–	–	–	–

Table D.71: RPortComSpec

Class	**RPortPrototype**			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	Component port requiring a certain port interface.			
Base	ARObject, AbstractRequiredPortPrototype, AtpBlueprintable, AtpFeature, AtpPrototype, Identifiable, MultilanguageReferrable, PortPrototype, Referrable			
Attribute	***Type***	***Mul.***	***Kind***	***Note***
requiredInterface	PortInterface	1	tref	The interface that this port requires, i.e. the port depends on another port providing the specified interface. **Stereotypes:** isOfType

Table D.72: RPortPrototype

Class	**Referrable (abstract)**			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Identifiable			
Note	Instances of this class can be referred to by their identifier (while adhering to namespace borders).			
Base	ARObject			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
shortName	Identifier	1	attr	This specifies an identifying shortName for the object. It needs to be unique within its context and is intended for humans but even more for technical reference. **Tags:** xml.enforceMinMultiplicity=true; xml.sequenceOffset=-100
shortName Fragment	ShortNameFragment	*	aggr	This specifies how the Referrable.shortName is composed of several shortNameFragments. **Tags:** xml.sequenceOffset=-90

Table D.73: Referrable

Class	**RunnableEntity**			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior			
Note	A RunnableEntity represents the smallest code-fragment that is provided by an AtomicSwComponentType and are executed under control of the RTE. RunnableEntities are for instance set up to respond to data reception or operation invocation on a server.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, ExecutableEntity, Identifiable, MultilanguageReferrable, Referrable			
Attribute	**Type**	**Mul.**	**Kind**	**Note**
argument (ordered)	RunnableEntity Argument	*	aggr	This represents the formal definition of a an argument to a RunnableEntity.
asynchron ousServer CallResult Point	AsynchronousS erverCallResult Point	*	aggr	The server call result point admits a runnable to fetch the result of an asynchronous server call. The aggregation of AsynchronousServerCallResultPoint is subject to variability with the purpose to support the conditional existence of client server PortPrototypes and the variant existence of server call result points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime

　Document ID 535: AUTOSAR_TPS_StandardizationTemplate.pdf

canBeInvokedConcurrently	Boolean	1	attr	If the value of this attribute is set to "true" the enclosing RunnableEntity can be invoked concurrently (even for one instance of the corresponding AtomicSwComponentType). This implies that it is the responsibility of the implementation of the RunnableEntity to take care of this form of concurrency. Note that the default value of this attribute is set to "false".
dataReadAccess	VariableAccess	*	aggr	RunnableEntity has implicit read access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype. The aggregation of dataReadAccess is subject to variability with the purpose to support the conditional existence of sender receiver ports or the variant existence of dataReadAccess in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
dataReceivePointByArgument	VariableAccess	*	aggr	RunnableEntity has explicit read access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype. The result is passed back to the application by means of an argument in the function signature. The aggregation of dataReceivePointByArgument is subject to variability with the purpose to support the conditional existence of sender receiver PortPrototype or the variant existence of data receive points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
dataReceivePointByValue	VariableAccess	*	aggr	RunnableEntity has explicit read access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype. The result is passed back to the application by means of the return value. The aggregation of dataReceivePointByValue is subject to variability with the purpose to support the conditional existence of sender receiver ports or the variant existence of data receive points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime

dataSendPoint	VariableAccess	*	aggr	RunnableEntity has explicit write access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype. The aggregation of dataSendPoint is subject to variability with the purpose to support the conditional existence of sender receiver PortPrototype or the variant existence of data send points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
dataWriteAccess	VariableAccess	*	aggr	RunnableEntity has implicit write access to dataElement of a sender-receiver PortPrototype or nv data of a nv data PortPrototype. The aggregation of dataWriteAccess is subject to variability with the purpose to support the conditional existence of sender receiver ports or the variant existence of dataWriteAccess in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
externalTriggeringPoint	ExternalTriggeringPoint	*	aggr	The aggregation of ExternalTriggeringPoint is subject to variability with the purpose to support the conditional existence of trigger ports or the variant existence of external triggering points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=externalTriggeringPoint, variationPoint.shortLabel vh.latestBindingTime=preCompileTime
internalTriggeringPoint	InternalTriggeringPoint	*	aggr	The aggregation of InternalTriggeringPoint is subject to variability with the purpose to support the variant existence of internal triggering points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime

Document ID 535: AUTOSAR_TPS_StandardizationTemplate.pdf

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modeAcce ssPoint	ModeAccessPoi nt	*	aggr	The runnable has a mode access point. The aggregation of ModeAccessPoint is subject to variability with the purpose to support the conditional existence of mode ports or the variant existence of mode access points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=modeAccessPoint, variation Point.shortLabel vh.latestBindingTime=preCompileTime
modeSwitc hPoint	ModeSwitchPoi nt	*	aggr	The runnable has a mode switch point. The aggregation of ModeSwitchPoint is subject to variability with the purpose to support the conditional existence of mode ports or the variant existence of mode switch points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
parameter Access	ParameterAcce ss	*	aggr	The presence of a ParameterAccess implies that a RunnableEntity needs read only access to a ParameterDataPrototype which may either be local or within a PortPrototype. The aggregation of ParameterAccess is subject to variability with the purpose to support the conditional existence of parameter ports and component local parameters as well as the variant existence of ParameterAccess (points) in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime

readLocal Variable	VariableAccess	*	aggr	The presence of a readLocalVariable implies that a RunnableEntity needs read access to a VariableDataPrototype in the role of implicitInterRunnableVariable or explicitInterRunnableVariable. The aggregation of readLocalVariable is subject to variability with the purpose to support the conditional existence of implicitInterRunnableVariable and explicitInterRunnableVariable or the variant existence of readLocalVariable (points) in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
serverCall Point	ServerCallPoint	*	aggr	The RunnableEntity has a ServerCallPoint. The aggregation of ServerCallPoint is subject to variability with the purpose to support the conditional existence of client server PortPrototypes or the variant existence of server call points in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
symbol	CIdentifier	1	attr	The symbol describing this RunnableEntity's entry point. This is considered the API of the RunnableEntity and is required during the RTE contract phase.
waitPoint	WaitPoint	*	aggr	The WaitPoint associated with the RunnableEntity.
writtenLoc alVariable	VariableAccess	*	aggr	The presence of a writtenLocalVariable implies that a RunnableEntity needs write access to a VariableDataPrototype in the role of implicitInterRunnableVariable or explicitInterRunnableVariable. The aggregation of writtenLocalVariable is subject to variability with the purpose to support the conditional existence of implicitInterRunnableVariable and explicitInterRunnableVariable or the variant existence of writtenLocalVariable (points) in the implementation. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime

Table D.74: RunnableEntity

Class	RunnableEntityGroup
Package	M2::AUTOSARTemplates::SWComponentTemplate::ImplicitCommunicationBehavior
Note	This meta-class represents the ability to define a collection of RunnableEntities. The collection can be nested.
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, MultilanguageReferrable, Referrable

Attribute	Type	Mul.	Kind	Note
runnableEntity	RunnableEntity	*	iref	This represents a collection of RunnableEntitys that belong to the enclosing RunnableEntityGroup. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime
runnableEntityGroup	RunnableEntityGroup	*	iref	This represents the ability to define nested groups of RunnableEntitys. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime

Table D.75: RunnableEntityGroup

Class	SdgClass
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialDataDef
Note	An SdgClass specifies the name and structure of the SDG that may be used to store proprietary data in an AUTOSAR model. The SdgClass is similar to an UML stereotype.
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable, SdgElementWithGid

Attribute	Type	Mul.	Kind	Note
attribute (ordered)	SdgAttribute	*	aggr	Defintion of the structure of the Sdg **Tags:** xml.sequenceOffset=30
caption	Boolean	0..1	attr	Specifies if a caption is required. Note: only Sdgs that have a caption can be referenced **Tags:** xml.sequenceOffset=20
extendsMetaClass	MetaClassName	0..1	attr	The AUTOSAR Meta-Class that may be extended by this SdgClass. **Tags:** xml.sequenceOffset=10
sdgConstraint	TraceableText	*	ref	Semantic constraints that restrict the structure of the special data group. **Tags:** xml.sequenceOffset=40

Table D.76: SdgClass

Class	SdgDef			
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::SpecialData Def			
Note	A SdgDef groups several SdgClasses which belong to the same extension. The concept of an SdgDef is similiar to an UML Profile. **Tags:** atp.recommendedPackage=SdgDefs			
Base	ARElement, ARObject, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	Type	Mul.	Kind	Note
sdgClass	SdgClass	*	aggr	The owned sdgClasses which define the structure of the Sdgs **Tags:** xml.namePlural=SDG-CLASSES

Table D.77: SdgDef

Primitive	SectionInitializationPolicyType
Package	M2::AUTOSARTemplates::GenericStructure::GeneralTemplateClasses::Primitive Types
Note	SectionInitializationPolicyType describes the intended initialization of MemorySections. The following values are standardized in AUTOSAR Methodology: • **NO-INIT**: No initialization and no clearing is performed. Such data elements shall not be read before one has written a value into it. • **INIT**: To be used for data that are initialized by every reset to the specified value (initValue). • **POWER-ON-INIT**: To be used for data that are initialized by "Power On" to the specified value (initValue). Note: there might be several resets between power on resets. • **CLEARED**: To be used for data that are initialized by every reset to zero. • **POWER-ON-CLEARED**: To be used for data that are initialized by "Power On" to zero. Note: there might be several resets between power on resets. Please note that the values are defined similar to the representation of enumeration types in the XML schema to ensure backward compatibility. **Tags:** xml.xsd.customType=SECTION-INITIALIZATION-POLICY-TYPE; xml.xsd.type=NMTOKEN

Table D.78: SectionInitializationPolicyType

Class	SenderReceiverInterface			
Package	M2::AUTOSARTemplates::SWComponentTemplate::PortInterface			
Note	A sender/receiver interface declares a number of data elements to be sent and received. Tags: atp.recommendedPackage=PortInterfaces			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, CollectableElement, DataInterface, Identifiable, MultilanguageReferrable, PackageableElement, PortInterface, Referrable			
Attribute	Type	Mul.	Kind	Note
dataElement	VariableDataPrototype	1..*	aggr	The data elements of this SenderReceiverInterface.
invalidation Policy	InvalidationPolicy	*	aggr	InvalidationPolicy for a particular dataElement

Table D.79: SenderReceiverInterface

Class	SwAddrMethod			
Package	M2::MSR::DataDictionary::AuxillaryObjects			
Note	Used to assign a common addressing method, e.g. common memory section, to data or code objects. These objects could actually live in different modules or components. Tags: atp.recommendedPackage=SwAddrMethods			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	Type	Mul.	Kind	Note
memoryAllocationKeywordPolicy	MemoryAllocationKeywordPolicyType	0..1	attr	Enumeration to specify the name pattern of the Memory Allocation Keyword.
option	Identifier	*	attr	This attribute introduces the ability to specify further intended properties of the MemorySection in with the related objects shall be placed. These properties are handled as to be selected. The intended options are mentioned in the list. In the Memory Mapping configuration, this option list is used to determine an appropriate MemMapAddressingModeSet.
sectionInitializationPolicy	SectionInitializationPolicyType	0..1	attr	Specifies the expected initialization of the variables (inclusive those which are implementing VariableDataPrototypes). Therefore this is an implementation constraint for initialization code of BSW modules (especially RTE) as well as the start-up code which initializes the memory segment to which the AutosarDataPrototypes referring to the SwAddrMethod's are later on mapped. If the attribute is not defined it has the identical semantic as the attribute value "INIT"

sectionType	MemorySection Type	0..1	attr	Defines the type of memory sections which can be associated with this addresssing method.

Table D.80: SwAddrMethod

Class	**SwBaseType**			
Package	M2::MSR::AsamHdo::BaseTypes			
Note	This meta-class represents a base type used within ECU software. **Tags:** atp.recommendedPackage=BaseTypes			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, BaseType, Collectable Element, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
–	–	–	–	–

Table D.81: SwBaseType

Class	**SwComponentPrototype**			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Composition			
Note	Role of a software component within a composition.			
Base	ARObject, AtpFeature, AtpPrototype, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
type	SwComponentType	1	tref	Type of the instance. **Stereotypes:** isOfType

Table D.82: SwComponentPrototype

Class	**SwComponentType (abstract)**			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Components			
Note	Base class for AUTOSAR software components.			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, AtpClassifier, AtpType, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
consistency Needs	ConsistencyNeeds	*	aggr	This represents the collection of ConsistencyNeeds owned by the enclosing SwComponentType. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime

Table D.82: SwComponentPrototype

port	PortPrototype	*	aggr	The PortPrototypes through which this SwComponentType can communicate. The aggregation of PortPrototype is subject to variability with the purpose to support the conditional existence of PortPrototypes. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
portGroup	PortGroup	*	aggr	A port group being part of this component. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime
swComponentDocumentation	SwComponentDocumentation	0..1	aggr	This adds a documentation to the SwComponentType. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=swComponentDocumentation, variationPoint.shortLabel vh.latestBindingTime=preCompileTime xml.sequenceOffset=-10
unitGroup	UnitGroup	*	ref	This allows for the specification of which UnitGroups are relevant in the context of referencing SwComponentType.

Table D.83: SwComponentType

Class	SwServiceArg			
Package	M2::MSR::DataDictionary::ServiceProcessTask			
Note	Specifies the properties of a data object exchanged during the call of an SwService, e.g. an argument or a return value. The SwServiceArg can also be used in the argument list of a C-macro. For this purpose the category shall be set to "MACRO". A reference to implementationDataType can optional be added if the actual argument has an implementationDataType.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable			
Attribute	*Type*	*Mul.*	*Kind*	*Note*

direction	ArgumentDirectionEnum	0..1	attr	Specifies the direction of the data transfer. The direction shall indicate the direction of the actual information that is being consumed by the caller and/or the callee, not the direction of formal arguments in C. The attribute is optional for backwards compatibility reasons. For example, if a pointer is used to pass a memory address for the expected result, the direction shall be "out". If a pointer is used to pass a memory address with content to be read by the callee, its direction shall be "in". **Tags:** xml.sequenceOffset=10
swArraysize	ValueList	0..1	aggr	This turns the argument of the service to an array. **Tags:** xml.sequenceOffset=20
swDataDefProps	SwDataDefProps	0..1	aggr	Data properties of this SwServiceArg. **Tags:** xml.sequenceOffset=30

Table D.84: SwServiceArg

Class	SwcBswMapping
Package	M2::AUTOSARTemplates::CommonStructure::SwcBswMapping
Note	Maps an SwcInternalBehavior to an BswInternalBehavior. This is required to coordinate the API generation and the scheduling for AUTOSAR Service Components, ECU Abstraction Components and Complex Driver Components by the RTE and the BSW scheduling mechanisms. **Tags:** atp.recommendedPackage=SwcBswMappings
Base	ARElement, ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Collectable Element, Identifiable, MultilanguageReferrable, PackageableElement, Referrable

Attribute	Type	Mul.	Kind	Note
bswBehavior	BswInternalBehavior	1	ref	The mapped BswInternalBehavior
runnableMapping	SwcBswRunnableMapping	*	aggr	A mapping between a pair of SWC and BSW runnables. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime
swcBehavior	SwcInternalBehavior	1	ref	The mapped SwcInternalBehavior.
synchronizedModeGroup	SwcBswSynchronizedModeGroupPrototype	*	aggr	A pair of SWC and BSW mode group prototypes to be synchronized by the scheduler. **Stereotypes:** atpVariation **Tags:** vh.latestBindingTime=preCompileTime

| synchroniz edTrigger | SwcBswSynchr onizedTrigger | * | aggr | A pair of SWC and BSW Triggers to be synchronized by the scheduler.

Stereotypes: atpVariation
Tags: vh.latestBindingTime=preCompileTime |

Table D.85: SwcBswMapping

Class	**SwcInternalBehavior**			
Package	M2::AUTOSARTemplates::SWComponentTemplate::SwcInternalBehavior			
Note	The SwcInternalBehavior of an AtomicSwComponentType describes the relevant aspects of the software-component with respect to the RTE, i.e. the RunnableEntities and the RTEEvents they respond to.			
Base	ARObject, AtpClassifier, AtpFeature, AtpStructureElement, Identifiable, Internal Behavior, MultilanguageReferrable, Referrable			
Attribute	***Type***	***Mul.***	***Kind***	***Note***
arTypedPe rInstanceM emory	VariableDataPr ototype	*	aggr	Defines an AUTOSAR typed memory-block that needs to be available for each instance of the SW-component. This is typically only useful if supportsMultipleInstantiation is set to "true" or if the component defines NVRAM access via permanent blocks. The aggregation of arTypedPerInstanceMemory is subject to variability with the purpose to support variability in the software component's implementations. Typically different algorithms in the implementation are requiring different number of memory objects. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
event	RTEEvent	*	aggr	This is a RTEEvent specified for the particular SwcInternalBehavior. The aggregation of RTEEvent is subject to variability with the purpose to support the conditional existence of RTE events. Note: the number of RTE events might vary due to the conditional existence of PortPrototypes using DataReceivedEvents or due to different scheduling needs of algorithms. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime

exclusiveAreaPolicy	SwcExclusiveAreaPolicy	*	aggr	Options how to generate the ExclusiveArea related APIs. When no SwcExclusiveAreaPolicy is specified for an ExclusiveArea the default values apply. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=exclusiveAreaPolicy vh.latestBindingTime=preCompileTime
explicitInterRunnableVariable	VariableDataPrototype	*	aggr	Implement state message semantics for establishing communication among runnables of the same component. The aggregation of explicitInterRunnableVariable is subject to variability with the purpose to support variability in the software components implementations. Typically different algorithms in the implementation are requiring different number of memory objects. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
handleTerminationAndRestart	HandleTerminationAndRestartEnum	1	attr	This attribute controls the behavior with respect to stopping and restarting. The corresponding AtomicSwComponentType may either not support stop and restart, or support only stop, or support both stop and restart.
implicitInterRunnableVariable	VariableDataPrototype	*	aggr	Implement state message semantics for establishing communication among runnables of the same component. The aggregation of implicitInterRunnableVariable is subject to variability with the purpose to support variability in the software components implementations. Typically different algorithms in the implementation are requiring different number of memory objects. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
includedDataTypeSet	IncludedDataTypeSet	*	aggr	The includedDataTypeSet is used by a software component for its implementation. **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=includedDataTypeSet
includedModeDeclarationGroupSet	IncludedModeDeclarationGroupSet	*	aggr	This aggregation represents the included ModeDeclarationGroups **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=includedModeDeclaration GroupSet

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instantiationDataDefProps	InstantiationDataDefProps	*	aggr	The purpose of this is that within the context of a given SwComponentType some data def properties of individual instantiations can be modified. The aggregation of InstantiationDataDefProps is subject to variability with the purpose to support the conditional existence of PortPrototypes and component local memories like "perInstanceParameter" or "arTypedPerInstanceMemory". **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=instantiationDataDefProps, variationPoint.shortLabel vh.latestBindingTime=preCompileTime
perInstanceMemory	PerInstanceMemory	*	aggr	Defines a per-instance memory object needed by this software component. The aggregation of PerInstanceMemory is subject to variability with the purpose to support variability in the software components implementations. Typically different algorithms in the implementation are requiring different number of memory objects. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
perInstanceParameter	ParameterDataPrototype	*	aggr	Defines parameter(s) or characteristic value(s) that needs to be available for each instance of the software-component. This is typically only useful if supportsMultipleInstantiation is set to "true". The aggregation of perInstanceParameter is subject to variability with the purpose to support variability in the software components implementations. Typically different algorithms in the implementation are requiring different number of memory objects. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
portAPIOption	PortAPIOption	*	aggr	Options for generating the signature of port-related calls from a runnable to the RTE and vice versa. The aggregation of PortPrototypes is subject to variability with the purpose to support the conditional existence of ports. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=portAPIOption, variation Point.shortLabel vh.latestBindingTime=preCompileTime

Document ID 535: AUTOSAR_TPS_StandardizationTemplate.pdf
— AUTOSAR CONFIDENTIAL —

runnable	RunnableEntity	*	aggr	This is a RunnableEntity specified for the particular SwcInternalBehavior. The aggregation of RunnableEntity is subject to variability with the purpose to support the conditional existence of RunnableEntities. Note: the number of RunnableEntities might vary due to the conditional existence of PortPrototypes using DataReceivedEvents or due to different scheduling needs of algorithms. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
serviceDep endency	SwcServiceDep endency	*	aggr	Defines the requirements on AUTOSAR Services for a particular item. The aggregation of SwcServiceDependency is subject to variability with the purpose to support the conditional existence of ports as well as the conditional existence of ServiceNeeds. The SwcServiceDependency owned by an SwcInternalBehavior can be located in a different physical file in order to support that SwcServiceDependency might be provided in later development steps or even by different expert domain (e.g OBD expert for Obd related Service Needs) tools. Therefore the aggregation is «atpSplitable». **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
sharedPar ameter	ParameterData Prototype	*	aggr	Defines parameter(s) or characteristic value(s) shared between SwComponentPrototypes of the same SwComponentType The aggregation of sharedParameter is subject to variability with the purpose to support variability in the software components implementations. Typically different algorithms in the implementation are requiring different number of memory objects. **Stereotypes:** atpSplitable; atpVariation **Tags:** atp.Splitkey=shortName, variation Point.shortLabel vh.latestBindingTime=preCompileTime
supportsM ultipleInsta ntiation	Boolean	1	attr	Indicate whether the corresponding software-component can be multiply instantiated on one ECU. In this case the attribute will result in an appropriate component API on programming language level (with or without instance handle).

| variationPointProxy | VariationPointProxy | * | aggr | Proxy of a variation points in the C/C++ implementation. **Stereotypes:** atpSplitable **Tags:** atp.Splitkey=shortName |

Table D.86: SwcInternalBehavior

Class	**TDEventVfbPort (abstract)**			
Package	M2::AUTOSARTemplates::CommonStructure::Timing::TimingDescription::TimingDescriptionEvents::TDEventVfb			
Note	This is the abstract parent class to describe specific timing event types at Virtual Function Bus (VFB) level.			
Base	ARObject, Identifiable, MultilanguageReferrable, Referrable, TDEventVfb, TimingDescription, TimingDescriptionEvent			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
isExternal	Boolean	1	attr	This attribute is used to refer to external events that are related to hardware I/O, like physical sensors and actuators, at Virtual Function Bus (VFB) level.
port	PortPrototype	0..1	ref	The port scope of the timing event.
portPrototypeBlueprint	PortPrototypeBlueprint	0..1	ref	The PortPrototypeBlueprint is the scope of the timing event.

Table D.87: TDEventVfbPort

Class	**UnresolvedReferenceRestrictionWithSeverity**			
Package	M2::AUTOSARTemplates::StandardizationTemplate::DataExchangePoint::DataFormatTailoring			
Note	This restriction defines the severity level of unresolved references.			
Base	ARObject, RestrictionWithSeverity			
Attribute	*Type*	*Mul.*	*Kind*	*Note*
–	–	–	–	–

Table D.88: UnresolvedReferenceRestrictionWithSeverity

Class	VariableDataPrototype			
Package	M2::AUTOSARTemplates::SWComponentTemplate::Datatype::DataPrototypes			
Note	A VariableDataPrototype is used to contain values in an ECU application. This means that most likely a VariableDataPrototype allocates "static" memory on the ECU. In some cases optimization strategies might lead to a situation where the memory allocation can be avoided. In particular, the value of a VariableDataPrototype is likely to change as the ECU on which it is used executes.			
Base	ARObject, AtpFeature, AtpPrototype, AutosarDataPrototype, DataPrototype, Identifiable, MultilanguageReferrable, Referrable			
Attribute	Type	Mul.	Kind	Note
initValue	ValueSpecification	0..1	aggr	Specifies initial value(s) of the VariableDataPrototype

Table D.89: VariableDataPrototype

Class	VfbTiming			
Package	M2::AUTOSARTemplates::CommonStructure::Timing			
Note	A model element used to define timing descriptions and constraints at VFB level. TimingDescriptions aggregated by VfbTiming are restricted to event chains referring to events which are derived from the class TDEventVfb. **Tags:** atp.recommendedPackage=TimingExtensions			
Base	ARElement, ARObject, AtpBlueprint, AtpBlueprintable, CollectableElement, Identifiable, MultilanguageReferrable, PackageableElement, Referrable, TimingExtension			
Attribute	Type	Mul.	Kind	Note
component	SwComponentType	1	ref	This defines the scope of a VfbTiming. All corresponding timing descriptions and constraints must be defined within this scope.

Table D.90: VfbTiming

E Variation Points in this Template

Variation Point	Latest Binding Time
BlueprintPolicyList.maxNumberOfElements	blueprintDerivationTime
BlueprintPolicyList.minNumberOfElements	blueprintDerivationTime
ClientServerInterfaceToBswModuleEntryBlueprintMapping.operation-Mapping	preCompileTime
ClientServerInterfaceToBswModuleEntryBlueprintMapping.portDe-finedArgumentBlueprint	preCompileTime
ConsistencyNeedsBlueprintSet.consistencyNeeds	preCompileTime
SwDataDefProps	codeGenerationTime
SwDataDefProps.swValueBlockSize	preCompileTime
SwTextProps.swMaxTextSize	preCompileTime
ValueList.vf	preCompileTime

Table E.1: Usage of variation points