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Document Change History

Release	Changed by	Change Description
4.2.1	AUTOSAR Release Management	• Editorial changes
4.1.1	AUTOSAR Administration	• Finalized for Release 4.1
3.1.4	AUTOSAR Administration	• Modeling of header files has been revised • Description of parameter modeling has been reworked • Legal disclaimer revised
3.1.1	AUTOSAR Administration	• Legal disclaimer revised
3.0.1	AUTOSAR Administration	• Added description for range stereotype • Change Requirements for function parameter and structure attributes • Document meta information extended • Small layout adaptations made
2.1.1	AUTOSAR Administration	• Usage of packages clarified • Sequence diagram modeling clarified • Legal disclaimer revised
2.0	AUTOSAR Administration	• Initial release

Disclaimer

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Table of Contents

1 Scope of this Document

This Modeling Guideline contains guidelines for the usage of the Enterprise Architect UML Modeling Tool (EA) that is used for the detailed architecture design of the AUTOSAR Basic Software.

Each guideline has its unique identifier starting with the prefix “TR_BSWUML_” (BSW = Basic Software). For any review annotations, remarks or questions please refer to this unique ID rather than chapter or page numbers!

2 Related Documentation

2.1 Deliverables of AUTOSAR work packages

[1] List of Basic Software Modules
AUTOSAR_TR_BSWModuleList.pdf

[2] General Requirements on Basic Software Modules
AUTOSAR_SRS_BSWGeneral.pdf

[3] Layered Software Architecture
AUTOSAR_EXP_LayeredSoftwareArchitecture.pdf

2.2 Related standards and norms

[4] UML 2.0, Unified Modeling Language: Superstructure, Version 2.0, OMG document formal/05-07-04."

3 Terms and abbreviations

Terms	***Definitions***
BSW Module Component	Each BSW module is modeled using one “UML Component” and several “Interface Classes” within the BSW UML model. The “UML Component” represents the internal behavior or C-file(s) of the BSW module. It is called “BSW Module Component”
UML Component	Model element defined by [4].
Interface class	UML 2.0 class with stereotype “interface”.
BSW Module Interface	Each BSW module is modeled using one “UML Component” and several “Interface Classes” within the BSW UML model. The “Interface classes” represent the header files of a specific BSW module. They are called “BSW Module Interfaces”
Tree view	The “project view” window within the Enterprise Architect is called “Tree view”.

4 Requirements on the modeling of the Basic Software

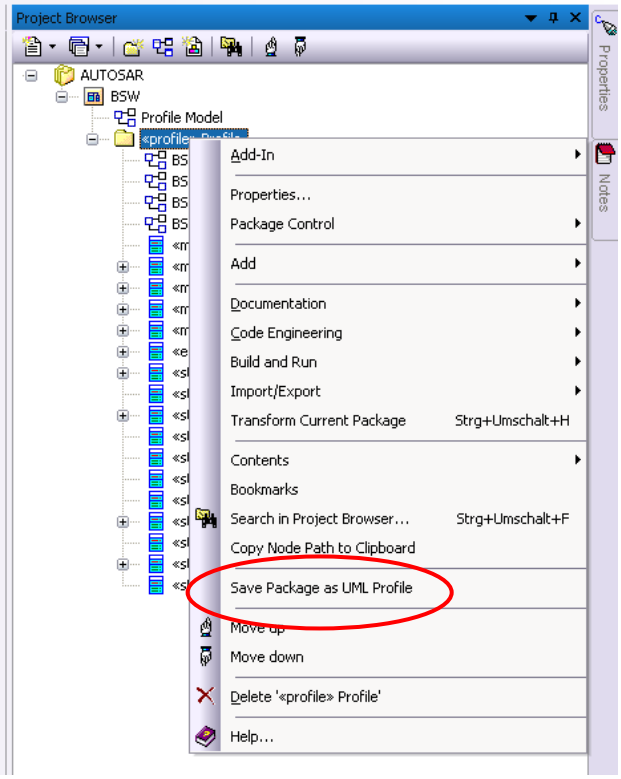
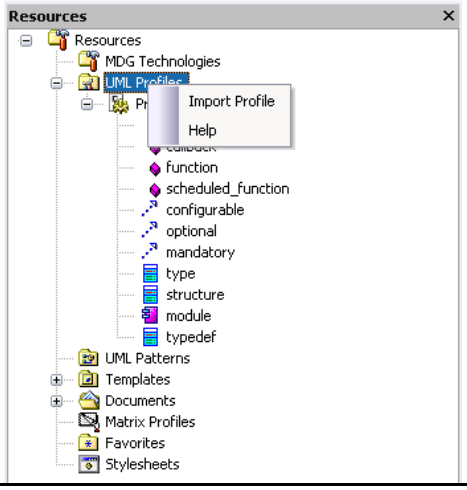
4.1 General

4.1.1 [TR_BSWUML_00017] UML 2.0

ID:	TR_BSWUML_00017
Initiator:	WP Architecture
Date:	14.10.2004
Short Description:	UML 2.0 shall be used for modeling the BSW UML model.
Type:	Changed
Importance:	high
Description:	The UML specification 2.0 shall be used for modeling the AUTOSAR Basic Software with the tool Enterprise Architect (EA).
Rationale:	Not defining new modeling techniques when there are techniques already available and standardized.
Use Case:	Modeling the Basic Software of AUTOSAR.
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.1.2 [TR_BSWUML_00065] Application of the BSW UML Profile

ID:	TR_BSWUML_00065
Initiator:	Technical Office
Date:	27.04.2007
Short Description:	BSW UML profile
Type:	Application of the BSW UML Profile
Importance:	high
Description:	The latest version of the BSW UML profile has to be applied to the BSW UML model. When a new version of the BSW UML profile has been released, it has to be reapplied to the BSW UML model. To apply the profile, it has to be exported to XML via the “Save Package as UML Profile” menu entry.

	 The exported XML file than has to be reimported on the BSW UML model file via the “Import Profile” menu. 
Rationale:	The BSW UML profile is needed to store additional BSW specific information in the model.
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	
Contributes to:	

4.1.3 [TR_BSWUML_00001] Allowed elements

ID:	TR_BSWUML_00001
Initiator:	WP Architecture

Date:	27.04.2007
Short Description:	Allowed elements
Type:	
Importance:	high
Description:	The following elements of UML are allowed to use within the Basic software overall UML model: - package - class (‘typedef’) for classes describing C typedefs - class (‘type’) for classes describing C types - class (‘structure’) for classes describing C structs - enumeration for C enums - operation (‘function’) for functions - operation (‘scheduled_function’) for scheduled functions - operation (‘callback’) for callbacks - component (‘module’) for components describing the interfaces of a BSW module - interface - lifeline - fragment - note - node (with stereotype peripheral or cluster) - state (including initial, final, fork/join, choice, exit) - action - decision - activity - boundary Other elements shall not be used.
Rationale:	Restriction of different modeling techniques.
Use Case:	Modeling of the complete communication stack
Dependencies:	[TR_BSWUML_00053] Allowed diagrams
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.1.4 [TR_BSWUML_00002] Allowed relationships

ID:	TR_BSWUML_00002
Initiator:	WP Architecture
Date:	07.10.2004
Short Description:	Allowed relationships
Type:	Changed
Importance:	high
Description:	The following relationships are allowed to use within the Basic software overall UML model: - realize - nesting - dependency (‘mandatory’) : for mandatory interfaces of a component - dependency (‘optional’) : for optional interfaces of a component - dependency (‘configurable”) : for configurable interfaces of a component - message - Self-message - Call - transition - activity edge

	Other relationships shall not be used.
Rationale:	Restriction of different modeling techniques.
Use Case:	Modeling of the complete communication stack
Dependencies:	[TR_BSWUML_00053] Allowed diagrams
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.1.5 [TR_BSWUML_00053] Allowed set of diagrams

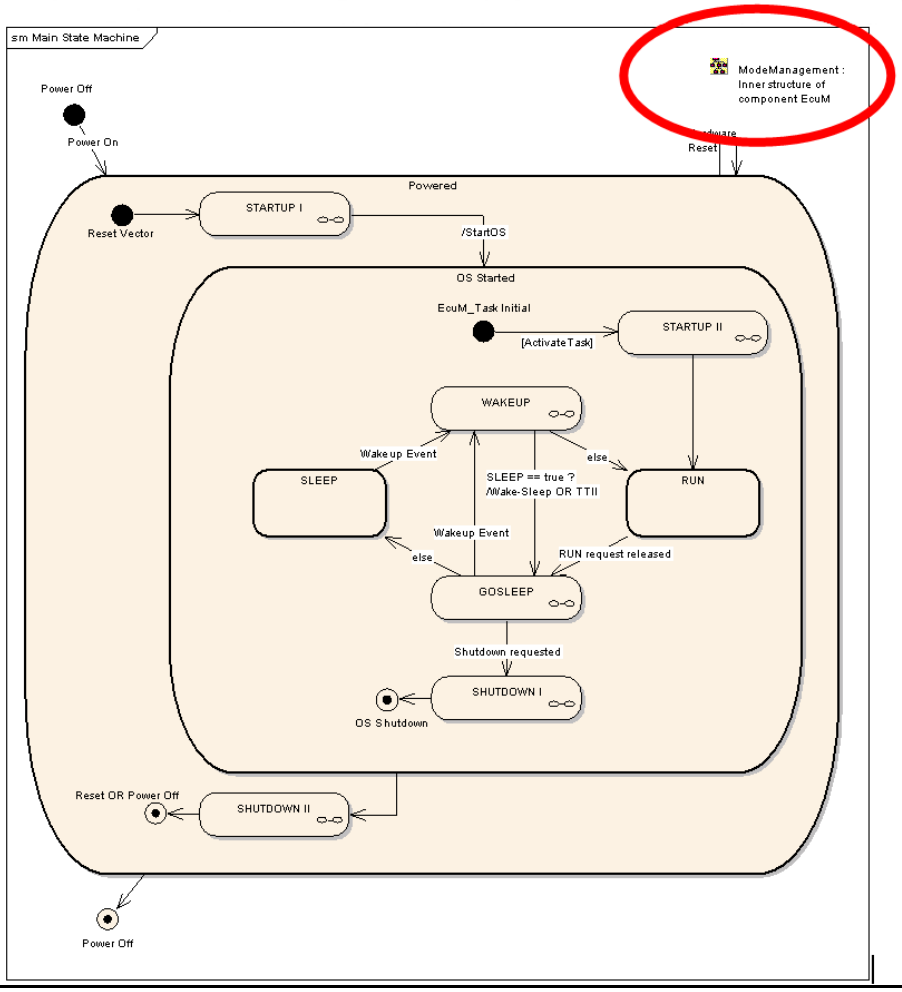
ID:	TR_BSWUML_00053
Initiator:	WP Architecture
Date:	07.10.2004
Short Description:	Allowed set of diagrams
Type:	Changed
Importance:	high
Description:	Only a reduced set of diagrams shall be used. Allowed structural diagrams are : - Package diagrams and - Component diagrams. Allowed sequence diagrams are: - Sequence diagrams - Activity diagrams and - State machine diagrams.
Rationale:	Restriction of different modeling techniques.
Use Case:	Modeling of the complete communication stack
Dependencies:	[TR_BSWUML_00001] Allowed elements [TR_BSWUML_00002] Allowed relationships
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.1.6 [TR_BSWUML_00060] Documentation of elements

ID:	TR_BSWUML_00060
Initiator:	Technical office
Date:	27.04.2007
Short Description:	Elements used for generating SWS tables must be documented
Type:	
Importance:	High
Description:	Documentation (‘Notes’) must be provided for the following element types: • class (‘type’, ‘typedef’, ‘structure’) • attributes • operation (‘function’, ‘scheduled_function’, ‘callback’) • enumeration • parameter
Rationale:	BSW documentation generator needs description for these elements to be able to generate the tables.
Use Case:	

Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.1.7 [TR_BSWUML_00047] Links between diagrams shall be hyperlinks

ID:	TR_BSWUML_00047
Initiator:	WP Mode Management
Date:	14.02.2005
Short Description:	Links between diagrams shall be hyperlinks
Type:	Changed
Importance:	High
Description:	If the relationship between two diagrams shall be visualized, then the link shall be modeled as a hyperlink.
Rationale:	Easier navigation between diagrams.
Use Case:	
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2 Structural Design

4.2.1 [TR_BSWUML_00054] Use of Packages

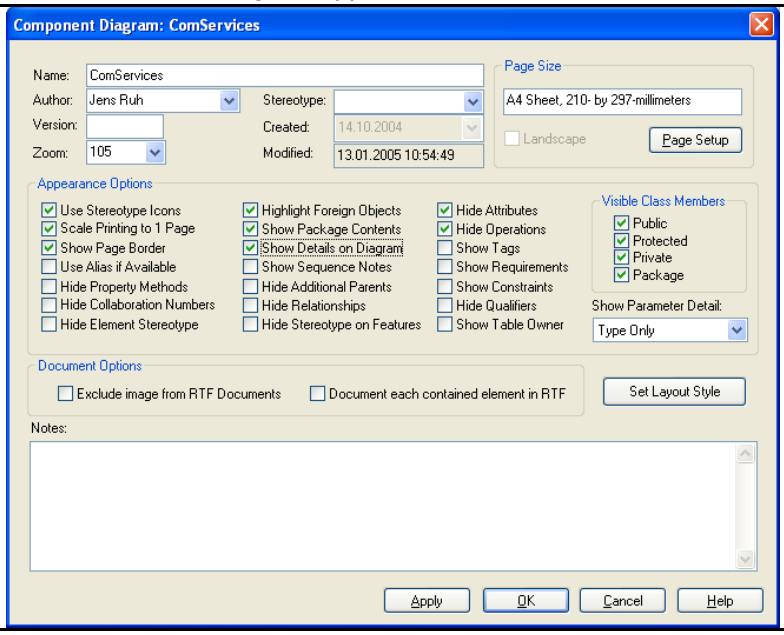
ID:	TR_BSWUML_00054
Initiator:	Technical Office
Date:	31.07.2006
Short Description:	Use of Packages
Type:	New
Importance:	High
Description:	Packages may be used in three ways: (1) To group (only) sub-packages, (2) to represent one BSW module, grouping the BSW module component and its interfaces or (3) placed below a package of the second type to group additional elements detailing a BSW module. Packages of the first or second type shall only be added by the technical office.
Rationale:	Clear structure of the BSW UML model.
Use Case:	Modeling of the complete software architecture
Dependencies:	[TR_BSWUML_00003] Diagrams usage [TR_BSWUML_00009] Version numbers of software modules [TR_BSWUML_00035] Sub elements of BSW modules
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.2 [TR_BSWUML_00003] Diagrams usage

ID:	TR_BSWUML_00003
Initiator:	WP Architecture
Date:	07.10.2004
Short Description:	Diagram usage
Type:	Changed .
Importance:	high
Description:	Each package containing only sub-packages shall at least have one structural “Component” diagram which shows the contents and, if possible, the relationships of the packages which it contains. Each package representing a BSW module shall at least have one structural “Component” diagram which shows at least the "realize", "mandatory", “optional” and “configurable” relationships of the BSW module component which it contains. The name of this diagram shall be equal to the BSW module component name. This diagram shall be placed below the appropriate diagram within the tree view.
Rationale:	Have for each structural element a diagram showing the elements containing it.
Contributes to:	--

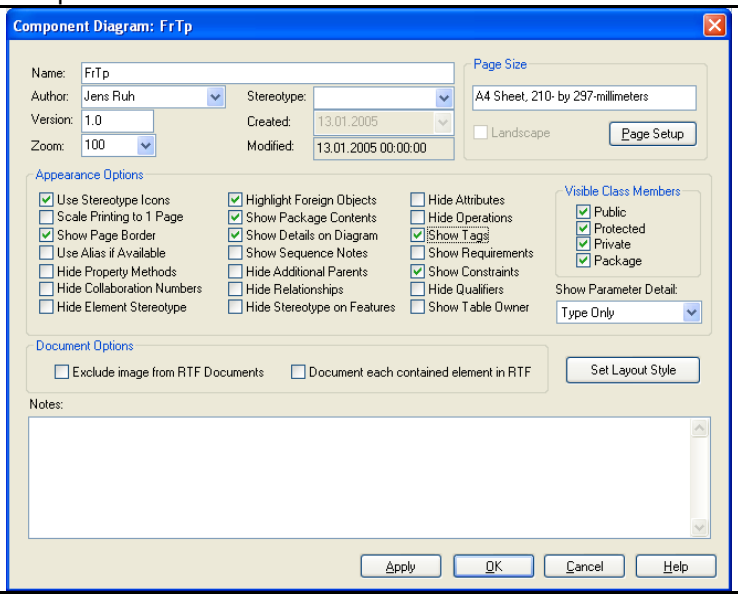
4.2.3 [TR_BSWUML_00038] Component diagram appearance options

ID:	TR_BSWUML_00038

Initiator:	WP Architecture
Date:	08.02.2005
Short Description:	Component diagram appearance options
Type:	New
Importance:	high
Description:	In general only the following appearance options of component diagrams shall be set: - Use stereotype icons - yes - Scale printing to 1 page - optional - Show page border - yes - Highlight foreign objects - yes - Show package contents - optional - Show details on diagram - yes - Hide operations - yes - Hide attributes - yes If a user requires more options, he shall ask the technical office for clearance: technical.office@autosar.org.
Rationale:	Harmonization of diagram appearance.
Use Case:	
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

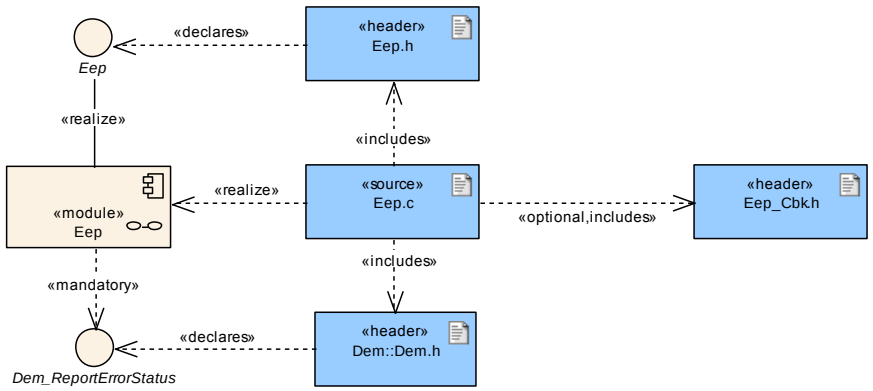
4.2.4 [TR_BSWUML_00039] Component diagram appearance of BSW module diagrams

ID:	TR_BSWUML_00039
Initiator:	WP Architecture
Date:	13.01.2005
Short Description:	Component diagram appearance of BSW module diagrams
Type:	new
Importance:	high

Description:	Diagrams placed below the BSW module package shall apply the following changes to the appearance options compared to TR_BSWUML_00038: - Hide attributes - No - Hide operations - No - Show constraints - yes - Show Tags - yes
Rationale:	Visualizing all attributes, operations and constraints of a BSW module component.
Use Case:	
Dependencies:	TR_BSWUML_00038
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.5 [TR_BSWUML_00004] Header File Modeling

ID:	TR_BSWUML_00004
Initiator:	WP Architecture
Date:	03.09.2009
Short Description:	Header File Modeling
Type:	Changed
Importance:	High
Description:	Each file of a basic software module being of external relevance shall be modeled as an own public document artifact (see Toolbox>Component). The document artifacts shall be declared as either header or source file using the stereotypes “header” and “source”. Document artifacts can include other artifacts using a dependency with stereotype “include”. With the additional stereotype “optional”, optional inclusion can be expressed. Document artifacts with stereotype “header” can relate to interfaces, using a dependency with stereotype “declares”, artifacts with stereotype “source” can relate to modules, using a dependency with stereotype “realize”. The following consistency constraints apply: A source file realizing a module shall include header files declaring all interfaces that are realized and required by the module.
Rationale:	Enabling the showing of “include” relationships between source and header files.

Use Case:	Modeling of Eep header file inclusion 
Dependencies:	SRS_BSW_00370, SRS_BSW_00346, SRS_BSW_00353, SRS_BSW_00361
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.6 [TR_BSWUML_00005] Basic Software Module Modeling

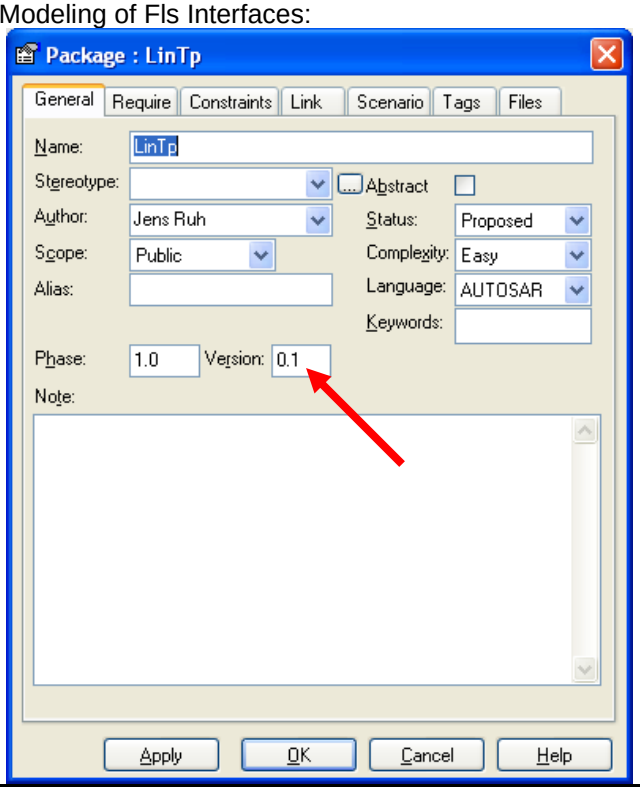
ID:	TR_BSWUML_00005
Initiator:	WP Architecture
Date:	27.04.2007
Short Description:	Basic Software Module Modeling
Type:	new
Importance:	high
Description:	Each basic software module source code file(s) shall be modeled as an UML package containing one component with stereotype “module” (the “BSW Module Component”) and the appropriate interfaces (the “BSW Module Interfaces”). The name of the package and component shall be the Prefix of the basic software module (specified within the basic software list).
Rationale:	Restriction of different modeling techniques.
Use Case:	Modeling of ECU State Manager. Name of this component: EcuM
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.7 [TR_BSWUML_00010] Component Definition

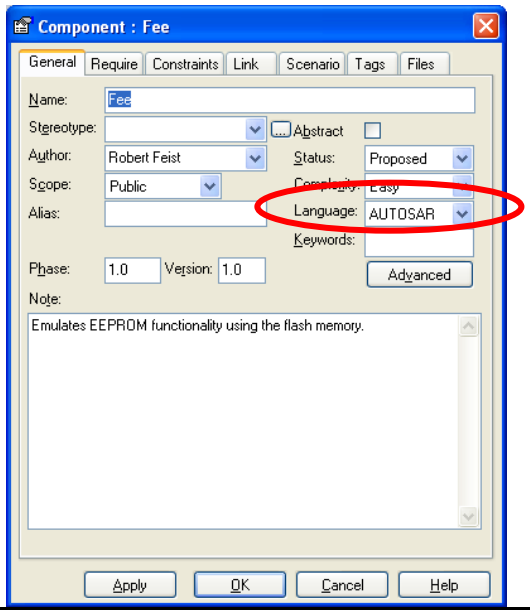
ID:	TR_BSWUML_00010
Initiator:	WP Architecture
Date:	08.10.2004
Short Description:	Component Definition
Type:	new

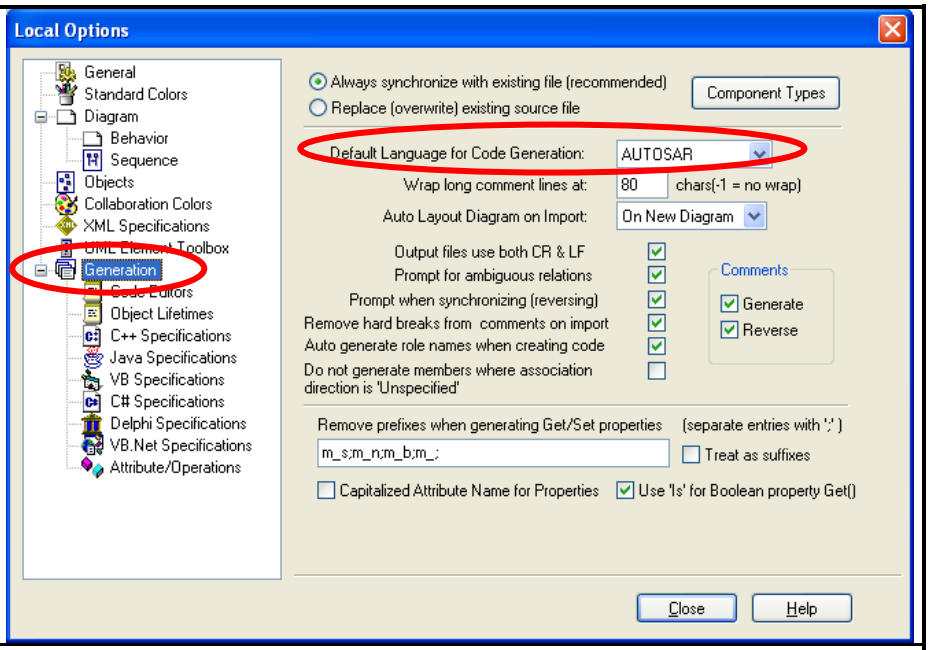
Importance:	high
Description:	Each “BSW Module Component” in the cluster diagram shall be marked as “Composite Element”.
Rationale:	Easier navigation within the model
Use Case:	Look into the details of one specific component.
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.8 [TR_BSWUML_00009] Version numbers of software modules

ID:	TR_BSWUML_00009
Initiator:	WP Architecture
Date:	07.10.2004
Short Description:	Version numbers of software modules
Type:	Changed
Importance:	High
Description:	For each component which has the ‘module’ stereotype (represents a BSW module) the version must be specified according to the modules version number.
Rationale:	Model everything in the same style so that it is easier to understand
Use Case:	Modeling of Fls Interfaces: 
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

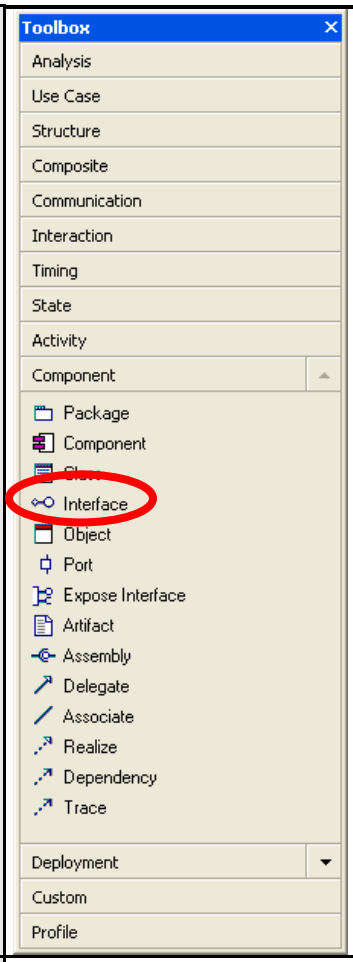
4.2.9 [TR_BSWUML_00025] 'Language' definition of Components

ID:	TR_BSWUML_00025
Initiator:	WP Architecture
Date:	26.11.2004
Short Description:	'Language' definition of Components
Type:	Changed (supporting material added)
Importance:	high
Description:	The 'Language' Attribute of at least each Component which represents a Software module shall be set to AUTOSAR. 
Rationale:	The AUTOSAR language defines a set of basic types which shall be used within AUTOSAR.
Use Case:	Using AUTOSAR type uint8 as return value.
Dependencies:	--
Conflicts:	--
Supporting Material:	If you set in the options menu AUTOSAR to the default language the correct language will be set automatically: Tools -> Options ->

	
Contributes to:	--

4.2.10 [TR_BSWUML_00052] Interface creation

ID:	TR_BSWUML_00052
Initiator:	WP Architecture
Date:	07.11.2005
Short Description:	Interface creation
Type:	new
Importance:	high
Description:	Interfaces shall only be created by dragging “Interface” from the toolbox into a diagram.

	
Rationale:	There are two ways in EA to create an interface class: (a) Create a regular class and afterwards add the stereotype <<interface>>. (b) Directly drag a new interface into a diagram (e.g. from the toolbox window). Only (b) leads to a real interface in the EA sense: o correct icon in the project view o class and all operations are enforced to be abstract
Use Case:	Modeling of the complete communication stack
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.11 [TR_BSWUML_00006] Interface Modeling

ID:	TR_BSWUML_00006
Initiator:	WP Architecture
Date:	07.10.2004
Short Description:	Interface Modeling
Type:	new
Importance:	high
Description:	Each external interface class shall be modeled in “circle notation” within the

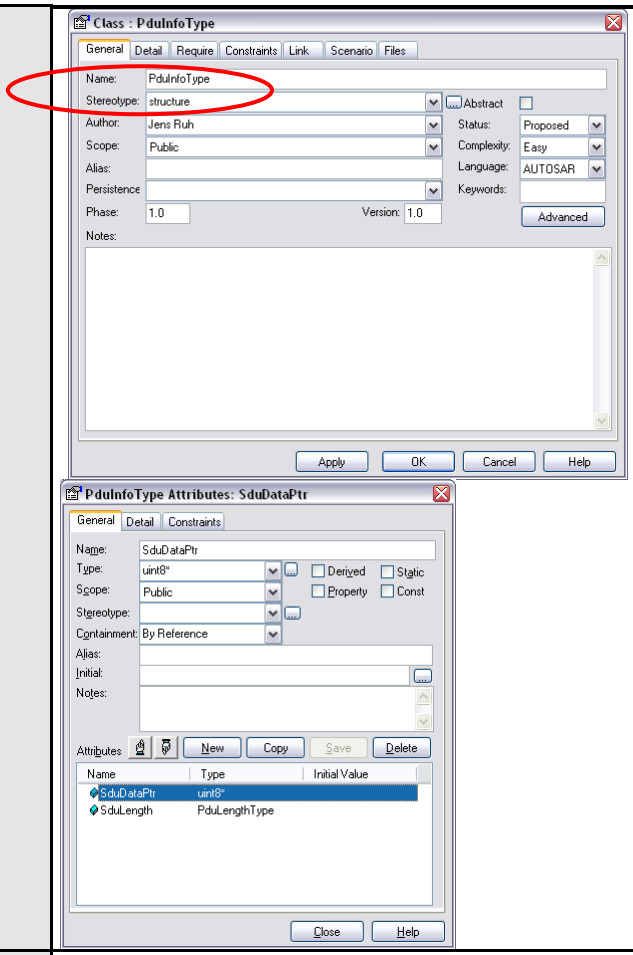
	"component diagram" of a package containing the basic software module components and/or classes. Interfaces are the containers for subsequent API elements, they can contain type definitions and functions. See according sections for descriptions, how to model elements of interfaces.
Rationale:	Restriction of different modeling techniques.
Use Case:	Modeling of ECU State manager.
Dependencies:	Type definitions: TR_BSWUML_00026, TR_BSWUML_00027, TR_BSWUML_00028, [TR_BSWUML_00059 Function definitions: TR_BSWUML_00062, TR_BSWUML_00063
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.12 [TR_BSWUML_00011] Accessing interfaces of other components

ID:	TR_BSWUML_00011
Initiator:	WP Architecture
Date:	27.04.2007
Short Description:	Accessing interfaces of other components
Type:	Changed
Importance:	high
Description:	If a basic software module requires the access of another module this relation shall be modeled as a "mandatory" dependency between the component of the basic software module requiring the access and the appropriate Interface class of the other basic software module. If the interface to be accessed is not in the same package a link to the interface shall be copied into the appropriate diagram. The link shall be modeled in circle notation.
Rationale:	Restriction of modeling techniques
Use Case:	Eep Interface "uses" interface of Eep driver.
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.13 [TR_BSWUML_00027] Definition of structures

ID:	TR_BSWUML_00027
Initiator:	WP Architecture
Date:	27.04.2007
Short Description:	Definition of structures
Type:	
Importance:	high
Description:	Each type definition which represents a structure declaration shall be modeled as a class with the stereotype 'structure'. All possible entries shall be defined as attributes of that class. The attributes shall have the scope "public". The ordering of the attributes shall be the same as expected in the generated table. For each attribute the appropriate type shall be specified:

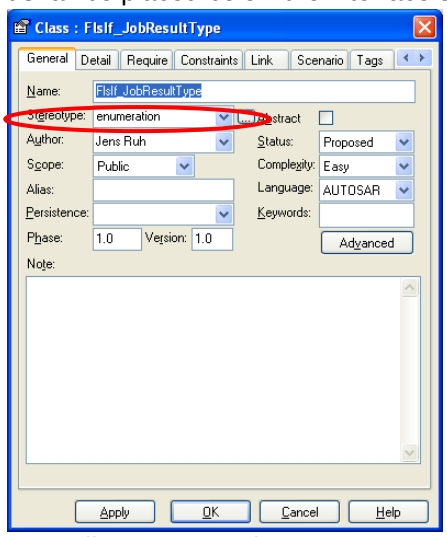
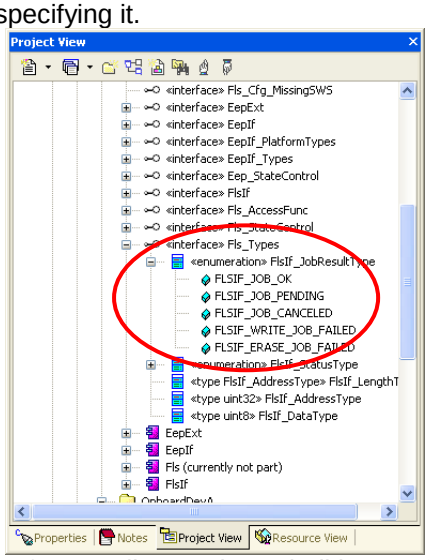
	
Rationale:	All types have to be defined in the same way, so that there are no inconsistencies within the model.

Use Case:	The example shown in the description represents the following Std_Types enumeration:
	`typedef struct PduInfoType`
	`{`
	`uint8* SduDataPtr,`
	`uint16 Length`
	`};`

Dependencies:	Definition of simple types TR_BSWUML_00028
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.14 [TR_BSWUML_00026] Definition of enumerations

ID:	TR_BSWUML_00026
Initiator:	WP Architecture
Date:	26.11.2004
Short Description:	Definition of enumerations
Type:	Changed
Importance:	high
Description:	Each type definition representing an enumeration shall be modeled as a n UML enumeration.

	All possible entries have to be defined as attributes of this class. The order of the attributes from top to bottom shall represent the order of the enumeration specified. The Attributes shall have no type and the ‘scope’ has to be set to ‘public’. It shall be placed below the interface specifying it.   For attribute names, the AUTOSAR-conform attribute values shall be used. If for this attribute value a code number exist, this code number shall be placed in the "initial” value entry of a type's detailed properties form in EA.
Rationale:	All types have to be defined in the same way, so that there are no inconsistencies within the model.

Use Case:	The example shown in the description represents the following Std_Types enumeration:
	`typedef enum FlsIf_JobResultType`
	`{`
	`  FLSIF_JOB_OK,`
	`  FLSIF_JOB_PENDING,`
	`  …`
	`};`
	
	Need to represent DCM's Neg Resp Codes (NRCs), for which an enum type is defined in SWS DCM v1.1.6, section 8.1.2.8. Place the NRC "DEM_E_xxx" in [attribute]"name" and the 0x value in "initial” value.

Dependencies:	Definition of simple types TR_BSWUML_00028
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.15 [TR_BSWUML_00028] Definition of simple types

ID:	TR_BSWUML_00028
Initiator:	WP Architecture
Date:	27.04.2007
Short Description:	Definition of simple types
Type:	
Importance:	high
Description:	Each type definition shall be modeled as a separate class with stereotype ‘type’. If the type has a hardware and configuration independent type (e.g.

	'unit8'), the tagged value 'range' has to specify the range as text.
Rationale:	All types have to be defined in the same way, so that there are no inconsistencies within the model.
Use Case:	--
Dependencies:	Definition of structures [TR_BSWUML_00027], Definition of enumerations TR_BSWUML_00026
Conflicts:	--
Supporting Material:	
Contributes to:	--

4.2.16 [TR_BSWUML_00059] Definition of typedefs

ID:	TR_BSWUML_00059
Initiator:	Technical Office
Date:	27.04.2007
Short Description:	Definition of typedefs
Type:	
Importance:	high
Description:	Each type definition shall be modeled as a separate class with stereotype 'typedef'. If the typedef is independent from the configuration, the typedef must be a specialization of the type it is referring to. If the typedef can refer to different types depending on the configuration, the typedef must be a specialization of those types.
Rationale:	The documentation generator has extract information regarding the typedefs from the UML model.
Use Case:	--
Dependencies:	Definition of structures TR_BSWUML_00028, Definition of enumerations TR_BSWUML_00026
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.17 [TR_BSWUML_00066] Definition of ranges for typedefs

ID:	TR_BSWUML_00066
Initiator:	Technical Office
Date:	23.07.2007
Short Description:	Definition of ranges for typedefs
Type:	
Importance:	high
Description:	If a typedef (class with stereotype <<typedef>>) has a restricted set of ranges, an attribute with stereotype <<range>> has to be created for each such range. The name of the attribute specifies the range label and the notes field describes the range.
Rationale:	The documentation generator has to extract information regarding the range of typedefs from the UML model.
Use Case:	See «typedef» Fim_FunctionIdType.
Dependencies:	Definition of structures TR_BSWUML_00028
Conflicts:	--

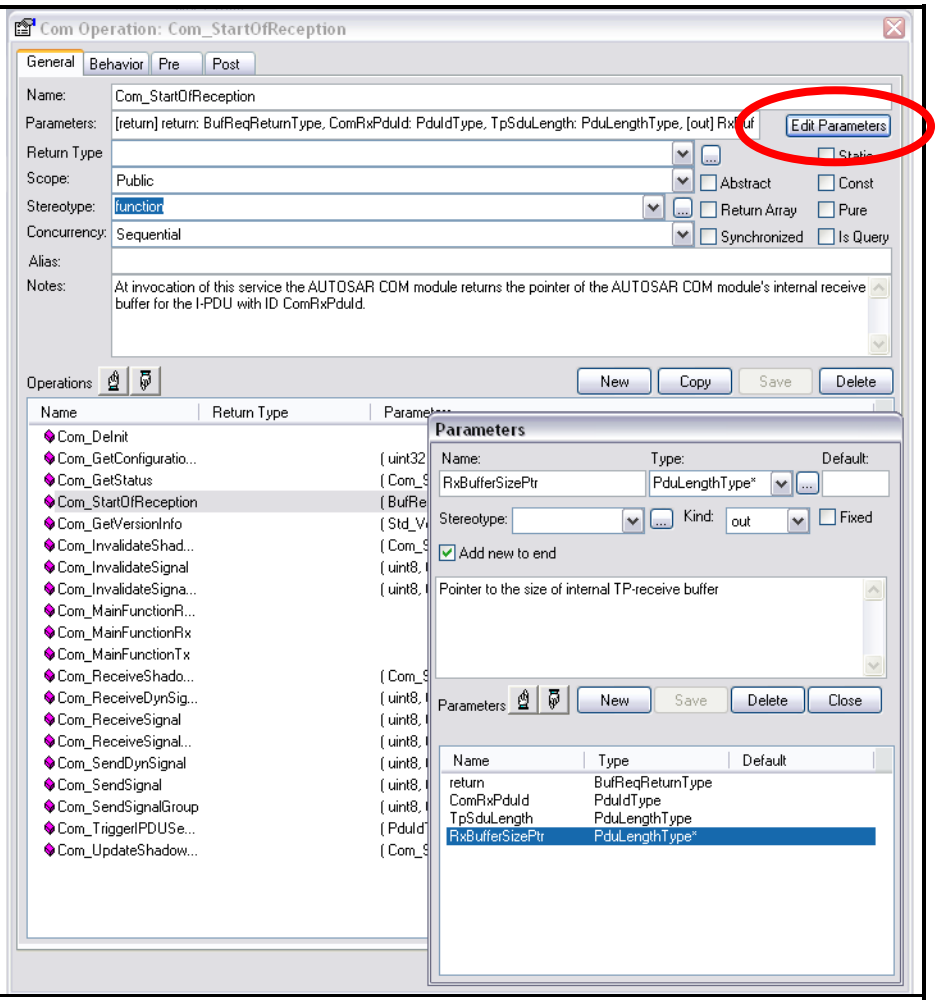
Supporting Material:	--
Contributes to:	--

4.2.18 [TR_BSWUML_00062] Definition of functions and callbacks

ID:	TR_BSWUML_00062
Initiator:	Technical Office
Date:	27.04.2007
Short Description:	Definition of functions
Type:	
Importance:	high
Description:	Each BSW function must be represented by an operation with stereotype 'function'. Each BSW callback must be represented by an operation with stereotype 'callback'. The following tagged values must be specified: • ServiceID: numeric id of the function • Synchronous: must be set to 'true' if this function is synchronous, must be set to 'false' otherwise • Reentrancy: description of the reentrancy for this function. Should be set to "Reentrant" for reentrant functions. Should be set to "Non-Reentrant" for non-reentrant functions.
Rationale:	The documentation generator needs this information to generate the function tables.
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

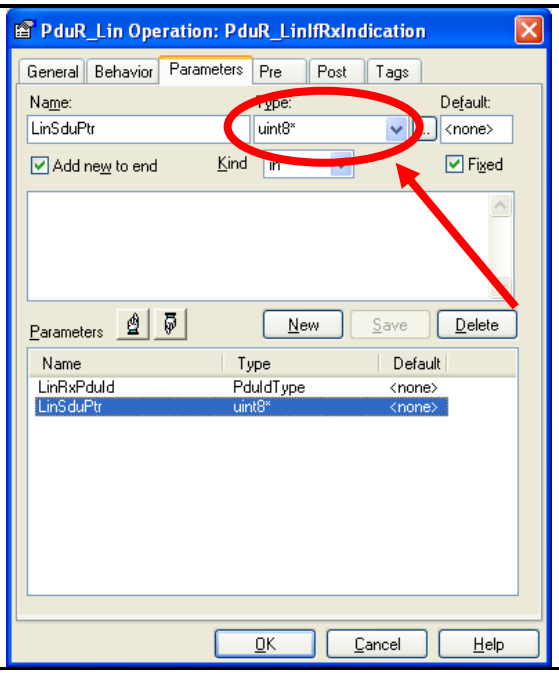
4.2.19 [TR_BSWUML_00068] Definition of parameters

ID:	TR_BSWUML_00068
Initiator:	WP Virtual Functional Bus
Date:	09.07.2009
Short Description:	Definition of parameters
Type:	New
Importance:	High
Description:	Parameters of functions are defined, by going to the "Edit Parameters" dialog and adding the parameters with the "New" button. All parameters must have a name and a type. Type names in braces (e.g. "<type>") are considered to be generic. A C ellipse can be used by typing a blank as name and "…" as type. It is as well considered a generic type. Parameters shall not have stereotypes. All parameters must have a kind indicating the direction of the information flow. The order of the parameters in the list is relevant.
Rationale:	Harmonization of modeling techniques.

Use Case:	
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.20 [TR_BSWUML_00037] Definition of pointer types

ID:	TR_BSWUML_00037
Initiator:	WP Architecture
Date:	13.01.2005
Short Description:	Definition of pointer types
Type:	new
Importance:	high
Description:	If a parameter or a return value of a module interface represents a pointer the asterix(es) shall be placed directly after the original type.
Rationale:	Readability of the module (specific views will otherwise filter out that information). Harmonization of modeling techniques.

Use Case:	
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.21 [TR_BSWUML_00055] Use of parameter kind

ID:	TR_BSWUML_00055
Initiator:	Technical Office
Date:	27.04.2007
Short Description:	Use of parameter kind
Type:	New
Importance:	High
Description:	The drop down list for the 'kind' of function parameters should be set to the appropriate value (in, out, in/out, return). In the case that EA adds a "*" to the parameter type (for 'out') although it is already a pointer (by a typedef), this should be annotated in the field 'notes' of the respective function. Note that all out and inout parameters must be pointer types.
Rationale:	Use the in/out feature and work around the EA bug.
Use Case:	Modeling of the com stack types
Dependencies:	[TR_BSWUML_00037] Definition of pointer types
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.22 [TR_BSWUML_00061] Definition of return type

ID:	TR_BSWUML_00061
Initiator:	Technical Office
Date:	27.04.2007

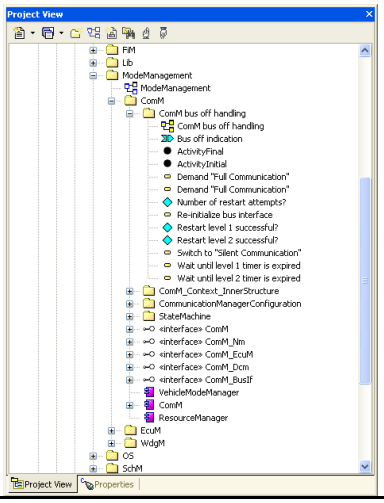
Short Description:	Definition of return type
Type:	New
Importance:	High
Description:	The return type of a function must not be specified. Instead a parameter with kind 'return' must be used.
Rationale:	Return parameters must be documented. This is not possible when just the return type is specified.
Use Case:	
Dependencies:	
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.23 [TR_BSWUML_00063] Definition of scheduled functions

ID:	TR_BSWUML_00063
Initiator:	Technical Office
Date:	27.04.2007
Short Description:	Definition of functions
Type:	
Importance:	High
Description:	Each BSW scheduled function must be represented by an operation with stereotype 'scheduled function'. In addition to the tagged values for functions, the following tagged values must be specified: • schedule: Must be set to one of the following values ○ FIXED_CYCLIC ○ ON_PRE_CONDITION ○ VARIABLE_CYCLIC ○ VARIABLE_CYCLIC_OR_ON_PRE_CONDITION
Rationale:	The documentation generator needs this information to generate the function tables.
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.2.24 [TR_BSWUML_00035] Sub elements of BSW modules

ID:	TR_BSWUML_00035
Initiator:	WP Architecture
Date:	13.01.2005
Short Description:	Sub elements of BSW modules
Type:	Changed
Importance:	high
Description:	The internal behaviour of BSW modules may be modeled in two ways: (1) A package may be added to the package representing the BSW module or (2) elements can be placed below the BSW module component. In case of optional functionality or scaled functionality the respective

	dependency in the respective diagram shall be commented by selecting 'Attach Note or Constraint'.
Rationale:	The Sub elements of a component could be of type: - separation of concerns / grouping of functionality - optionally / scalability
Use Case:	Refinement of ComM. 
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3 Behavioral Design

4.3.1 General

4.3.1.1 [TR_BSWUML_00030] Usage of Sequence Diagrams

ID:	TR_BSWUML_00030
Initiator:	WP Architecture
Date:	13.01.2005
Short Description:	Usage of Sequence Diagrams
Type:	new
Importance:	high
Description:	Only sequence diagrams shall be used for modeling interactions of different modules.
Rationale:	Restriction of different modeling techniques.
Use Case:	Modeling of the sequences of API calls during a LIN frame transmission.
Dependencies:	BSW_UMLGuide_00007
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.1.2 [TR_BSWUML_00031] Usage of State Machine Diagrams

ID:	TR_BSWUML_00031
Initiator:	WP Architecture
Date:	13.01.2005
Short Description:	Usage of State Machine Diagrams
Type:	new
Importance:	high
Description:	Only state machine diagrams shall be used for modeling state dependencies within and in between elements.
Rationale:	Restriction of different modeling techniques.
Use Case:	Modeling of ECU Manager state changes.
Dependencies:	BSW_UMLGuide_00007
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.2 Sequence Diagrams

4.3.2.1 [TR_BSWUML_00012] Location of Sequence Diagrams

ID:	TR_BSWUML_00012
Initiator:	WP Architecture
Date:	13.01.2005
Short Description:	Location of Sequence Diagrams
Type:	Renamed
Importance:	High
Description:	All sequence diagrams have to be placed within the “Interaction View Package”
Rationale:	Definition of similar model structures
Use Case:	Modeling of the AUTOSAR COM stack
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.2.2 [TR_BSWUML_00020] Packages to contain sequence diagrams

ID:	TR_BSWUML_00020
Initiator:	WP Architecture
Date:	25.01.2005
Short Description:	Packages to contain sequence diagrams
Type:	Changed
Importance:	High
Description:	A new sequence diagram shall be put into an appropriate package. If no such package is available, it shall be requested from the technical office: technical.office@autosar.org.
Rationale:	Guarantee of readability and correct placement of the sequence tree.
Use Case:	--
Dependencies:	--

Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.2.3 [TR_BSWUML_00021] Commenting of Sequence Diagrams

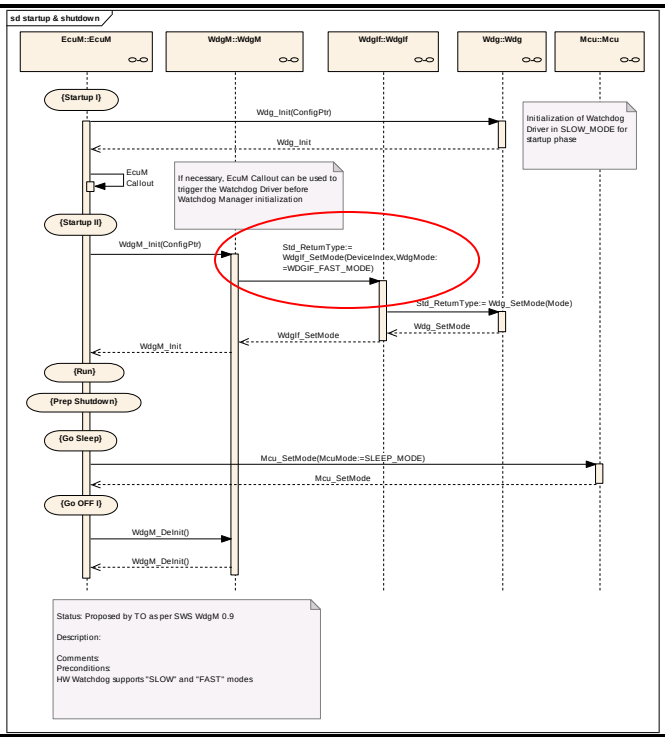
ID:	TR_BSWUML_00021
Initiator:	WP Architecture
Date:	19.10.2004
Short Description:	Commenting of Sequence Diagrams
Type:	New
Importance:	High
Description:	Each Sequence diagram shall have a comment placed as 'note' within the diagram that contains the following items: • Status (open – proposed – approved – conflict – rejected) • Description • Comment If a sequence diagram is rejected or on conflict, the reason shall be described within the comment.
Rationale:	Give other people the chance to understand. Traceability

Use Case:	`Status: approved`
	
	`Description: A CAN frame is received and indicated to the upper layer in interrupt context.`
	
	`Comment: -none-`

Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

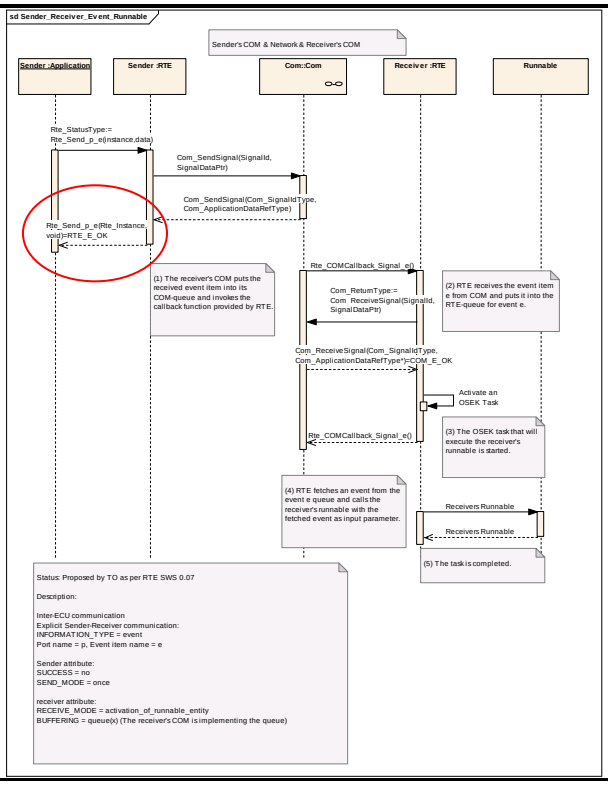
4.3.3 [TR_BSWUML_00057] Parameter values in sequence diagrams

ID:	TR_BSWUML_00057
Initiator:	Technical Office
Date:	31.07.2006
Short Description:	Parameter values in sequence diagrams
Type:	New
Importance:	High
Description:	If a function is called with a fixed value for one or more of its parameters in a sequence diagram, then this should be modeled by writing 'ParName:=value' in the field 'Parameters' of the respective message.
Rationale:	Unified message modeling.

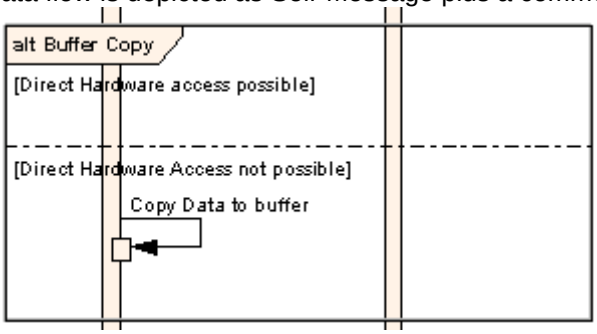
Use Case:	
Dependencies:	[TR_BSWUML_00019] Labeling returns
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.3.1 [TR_BSWUML_00058] Return values in sequence diagrams

ID:	TR_BSWUML_00058
Initiator:	Technical Office
Date:	31.07.2006
Short Description:	Return values in sequence diagrams
Type:	New
Importance:	High
Description:	If the return of a function should be shown to give a specific value, then this should be modeled by writing 'FuncName=value' in the field 'Message' of the respective return-message.
Rationale:	Unified message modeling.

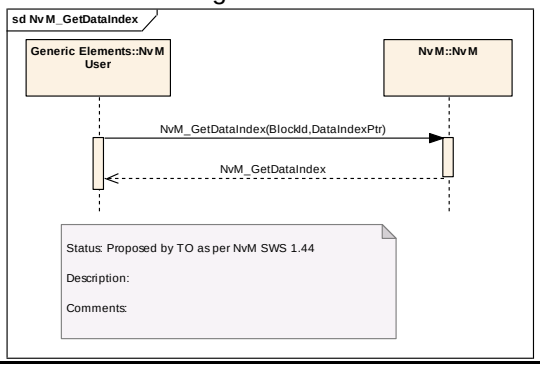
Use Case:	
Dependencies:	[TR_BSWUML_00019] Labeling returns
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.3.2 [TR_BSWUML_00018] Modeling of data copying

ID:	TR_BSWUML_00018
Initiator:	WP Architecture
Date:	18.10.2004
Short Description:	Modeling of data copying
Type:	new
Importance:	high
Description:	Within sequence diagrams, the following scheme shall be used for modeling data copied/stored/…: Data flow is depicted as Self-Message plus a comment field  In the message text is documented: • What data is copied

	• From source • To target
Rationale:	Definition of uniform data exchange modeling
Use Case:	Modeling of data exchange between buffers of different layers
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.3.3 [TR_BSWUML_00019] Labeling returns

ID:	TR_BSWUML_00019
Initiator:	WP Architecture
Date:	07.10.2004
Short Description:	Labeling returns
Type:	Changed
Importance:	High
Description:	Returns shall be labeled. The label shall be the name of the function it belongs to without parameter names or -types. Returns shall be marked as “Is Return”. It is announced that in future return labels can be automatically be selected within the Enterprise architect. If this is possible no hand-made adaptations shall be done after selection.
Rationale:	Allow easy identification to which function a return belongs
Use Case:	A UML message has the name “Transmit CAN PDU”. The return message has the same name. 
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.3.4 [TR_BSWUML_00036] Linking sequence diagrams

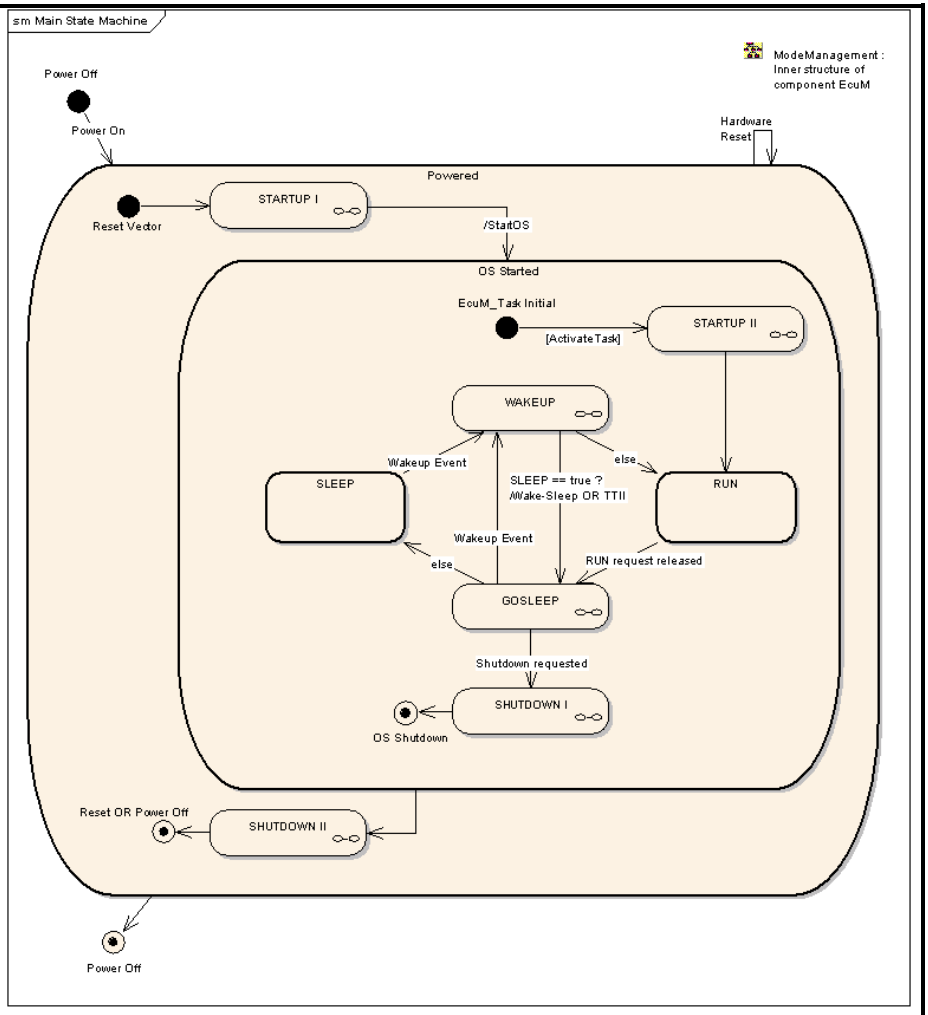
ID:	TR_BSWUML_00036
Initiator:	WP Architecture
Date:	13.01.2005
Short Description:	Linking sequence diagrams
Type:	new
Importance:	high

Description:	Each package within the 'Interaction Views' package shall contain dedicated diagrams containing descriptions and links to sub diagrams. These diagrams will be generated by the model owner. The author of a sequence diagram shall therefore provide a short description of contents of generated packages and diagrams to the model owner.
Rationale:	Readability of overall module
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.4 State Machine Diagrams

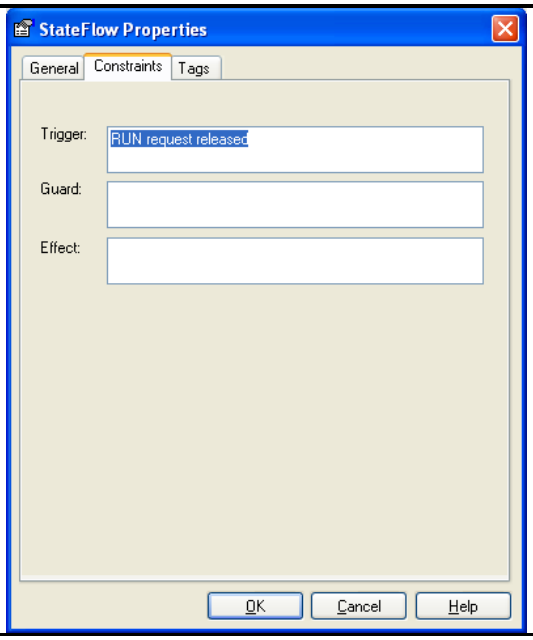
4.3.4.1 [TR_BSWUML_00041] States shall have thick lines

ID:	TR_BSWUML_00041
Initiator:	WP Mode Management
Date:	14.02.2005
Short Description:	States shall have thick lines
Type:	new
Importance:	high
Description:	The state boxes shall have an outline of 2 points
Rationale:	Allow easier distinction between states and activities

Use Case:	 (to see what is meant please zoom to 200%)
Dependencies:	TR_BSWUML_00048
Conflicts:	--
Supporting Material:	--
Contributes to:	--

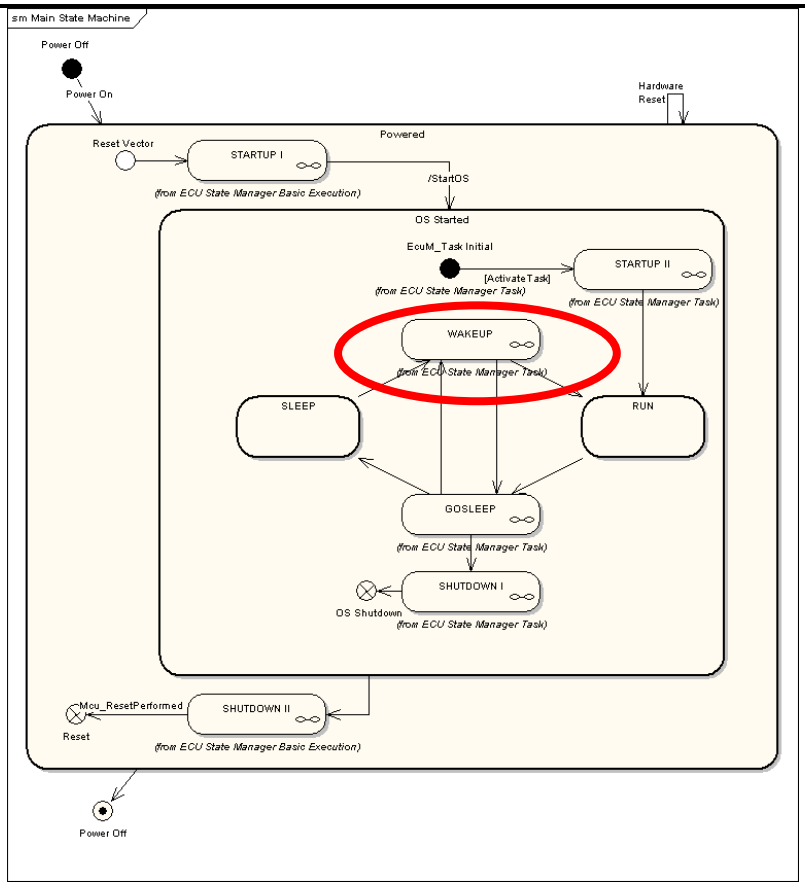
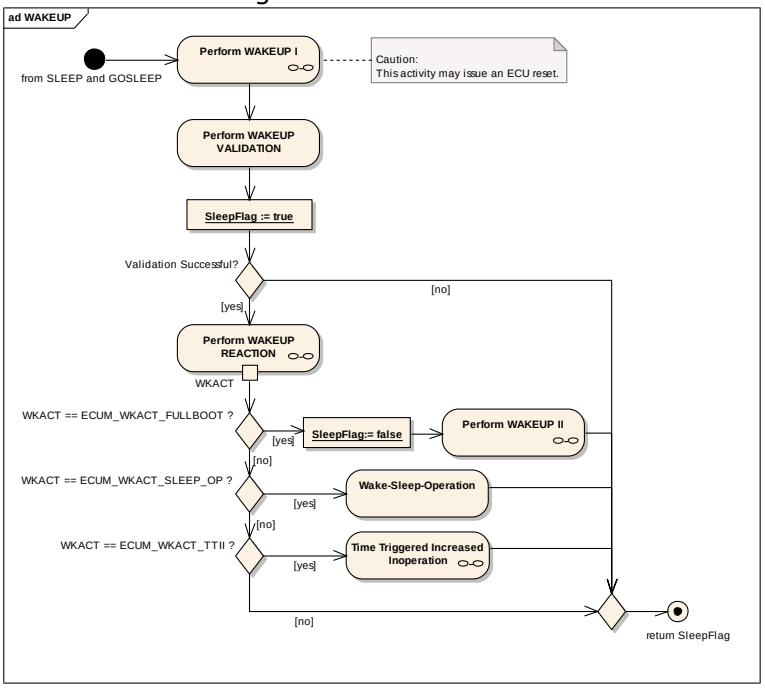
4.3.4.2 [TR_BSWUML_00042] A trigger condition shall be defined for each transition

ID:	TR_BSWUML_00042
Initiator:	WP Mode Management
Date:	14.02.2005
Short Description:	A trigger condition shall be defined for each transition
Type:	Changed
Importance:	High
Description:	In each transition between two states the trigger of the transition (the condition to make a transition) shall be defined in the ‘Trigger’ field of the ‘State Flow Properties’.
Rationale:	Necessary for complete behavioral description

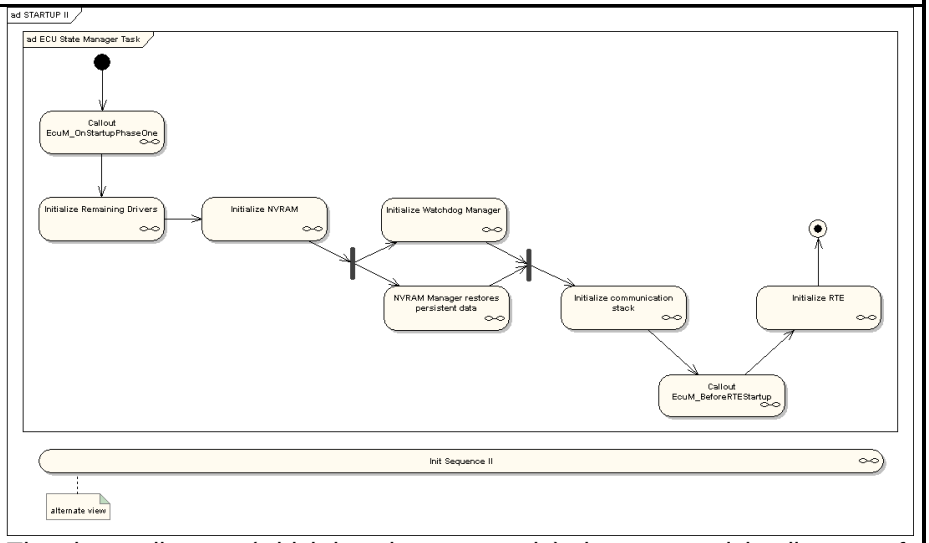
Use Case:	
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.4.3 [TR_BSWUML_00043] Transitions may be modeled with sub-activities

ID:	TR_BSWUML_00043
Initiator:	WP Mode Management
Date:	14.02.2005
Short Description:	Transitions may be modeled with sub-activities
Type:	Changed
Importance:	High
Description:	To reduce complexity of diagrams Activities may be modeled in a hierarchical way by using sub-activities.
Rationale:	In some cases complex activities could trigger a transition. In these cases the diagrams become rather complex. These sub-activities may be visualized as sub activities to reduce complexity in one diagram.

Use Case:	 Overview State diagram.  Refined activity 'WAKEUP'.
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.4.4 [TR_BSWUML_00046] Links to parent diagrams shall be drawn as hyperlink diagram references

ID:	TR_BSWUML_00046
Initiator:	WP Mode Management
Date:	14.02.2005
Short Description:	Links to parent diagrams shall be drawn as diagram references
Type:	Changed
Importance:	medium
Description:	 The shown diagram (which is only an example) shows an activity diagram of a sub-activity of a larger system. The frame around the diagram indicates the link to the parent diagram. Applies to state and activity diagrams similarly.
Rationale:	Simple forward/backward navigation
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	Diagram references do not work in the HTML-Report!
Contributes to:	--

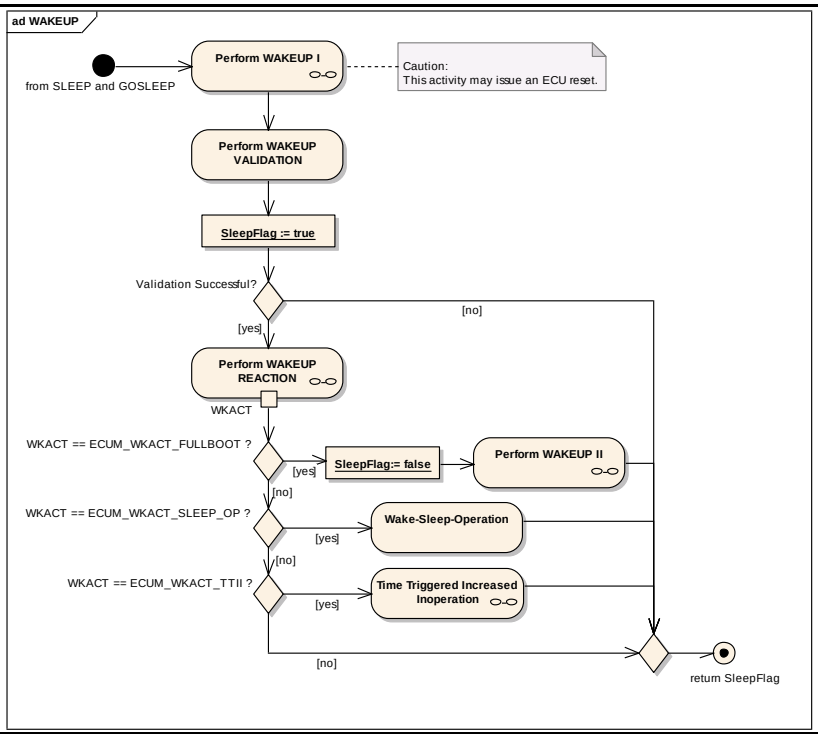
4.3.5 Activity Diagrams

4.3.5.1 [TR_BSWUML_00048] Activities shall have thin lines

ID:	TR_BSWUML_00048
Initiator:	WP Mode Management
Date:	14.02.2005
Short Description:	Activities shall have thin lines
Type:	new
Importance:	high
Description:	The activity boxes shall have an outline of 1 point
Rationale:	Allow easier distinction between states and activities

Use Case:	--
Dependencies:	TR_BSWUML_00041
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.3.5.2 [TR_BSWUML_00049] Conditions to be defined for each branch

ID:	TR_BSWUML_00049
Initiator:	WP Mode Management
Date:	14.02.2005
Short Description:	Conditions to be defined for each branch
Type:	Changed
Importance:	High
Description:	If a flow branches because of a condition, the 'Decision' element shall be used. All outgoing control flows must have set a 'Guard' constraint in 'Control Flow Properties'. If different flows shall be merged, also the "Decision" element shall be used.
Rationale:	--
Use Case:	
Dependencies:	--
Conflicts:	--
Supporting Material:	Similar rules apply for forks/joins. The idea is to have the control flow clearly defined. Object flow follows slightly different rules. Such as strict rules make UML clumsy for use with object flow elements.
Contributes to:	--

4.3.5.3 [TR_BSWUML_00050] Activities to be re-used in sequence diagrams should also be drawn as sequence diagrams

ID:	TR_BSWUML_00050
Initiator:	WP Mode Management
Date:	14.02.2005
Short Description:	Activities to be re-used in sequence diagrams must also be drawn as sequence diagrams
Type:	new
Importance:	medium
Description:	If an activity is to be referenced within a sequence diagram the drawing messages will not look nice. Therefore this type of activities should also be modeled as sequence diagrams.
Rationale:	Nice modeling.
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.4 Model synchronization

All guidelines related to the design master are not intended for ‘normal’ users, because the master of the BSW UML model will not be distributed. This chapter will be refined as soon as the process of collaborative work on the BSW UML model has been agreed.

4.4.1 [TR_BSWUML_00013] Creating a Design Master

ID:	TR_BSWUML_00013
Initiator:	WP Architecture
Date:	14.10.2004
Short Description:	Creating a Design Master
Type:	Changed
Importance:	High
Description:	Convert the base project to a Design Master using the Make Design Master option in the Tools (Manage .EAP File submenu.
Rationale:	--
Use Case:	This shall be done once for the project by AUTOSAR Technical Office only (already done – no more actions required).
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.4.2 [TR_BSWUML_00023] Design Master naming convention

ID:	TR_BSWUML_00023
Initiator:	WP Architecture
Date:	14.10.2004
Short Description:	Design Master naming convention
Type:	New
Importance:	High
Description:	The file name of the Design Master shall have the following naming: Master_AR_BasicSWArchitecture.eap and to be managed by a version management tool.
Rationale:	--
Use Case:	Master_AR_BasicSWArchitecture.eap
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.4.3 [TR_BSWUML_00014] Creating replicas from the Design Master

ID:	TR_BSWUML_00014
Initiator:	WP Architecture
Date:	14.10.2004
Short Description:	Creating replicas from the Design Master
Type:	new
Importance:	high
Description:	Create replicas from the design master using the Create New Replica option in the Tools (Manage .EAP File submenu. Further work must be done on the replica.
Rationale:	--
Use Case:	To create your own local working model. This has to be done only once.
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

4.4.4 [TR_BSWUML_00022] Replica naming convention

ID:	TR_BSWUML_00022
Initiator:	WP Architecture
Date:	14.10.2004
Short Description:	Replica naming convention
Type:	new
Importance:	high
Description:	Replicas of the design master shall have the following naming convention: `Replica_AR_BasicSWArchitecture_<Version number>_<Author short name>.eap`
Rationale:	--

Use Case:	Replica_AR_BasicSWArchitecture_V24.1_CMA.eap
Dependencies:	--
Conflicts:	--
Supporting Material:	--
Contributes to:	--

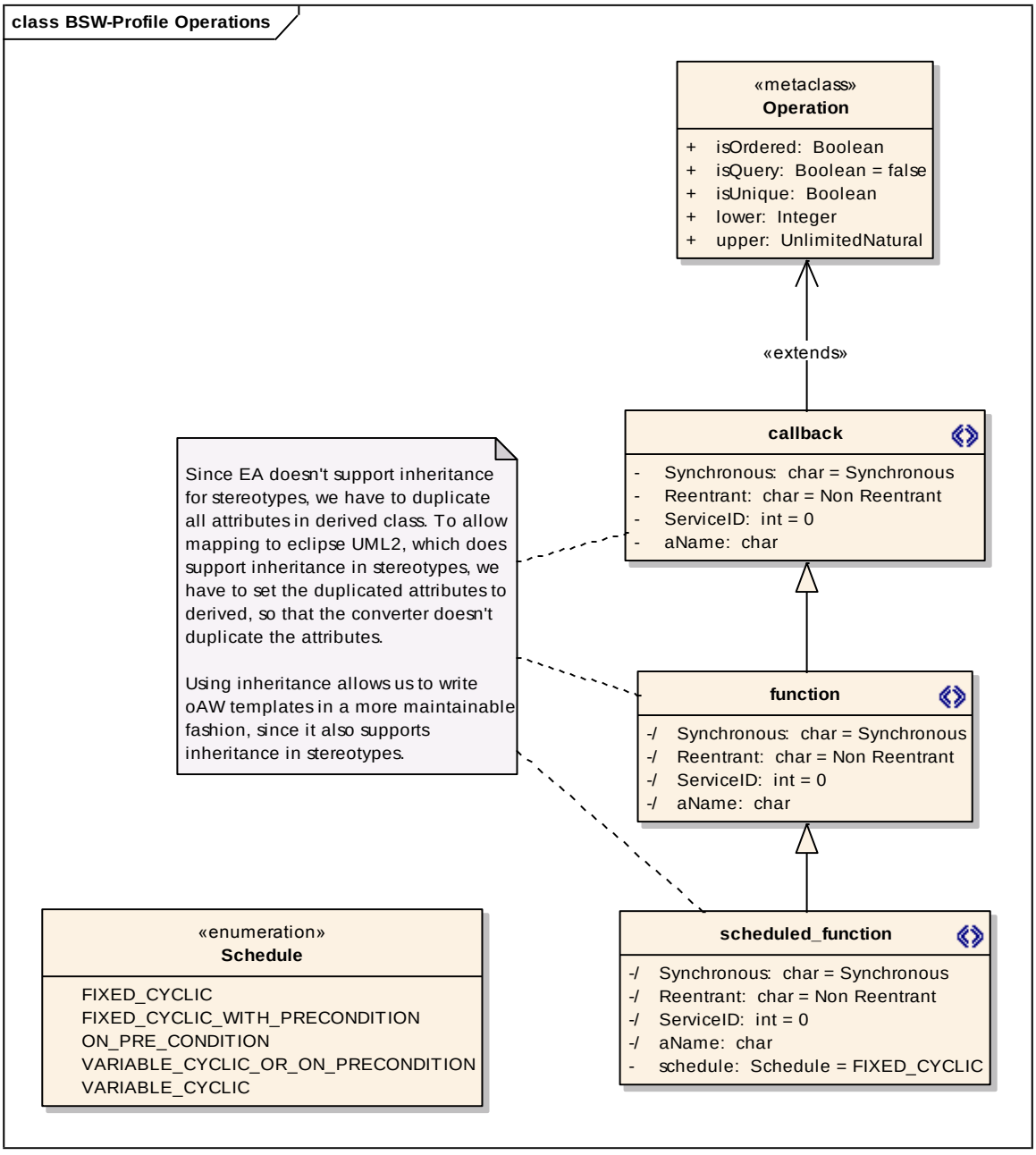
4.5 Documentation generation

4.5.1 [TR_BSWUML_00067] Providing an alternative name for generated tables

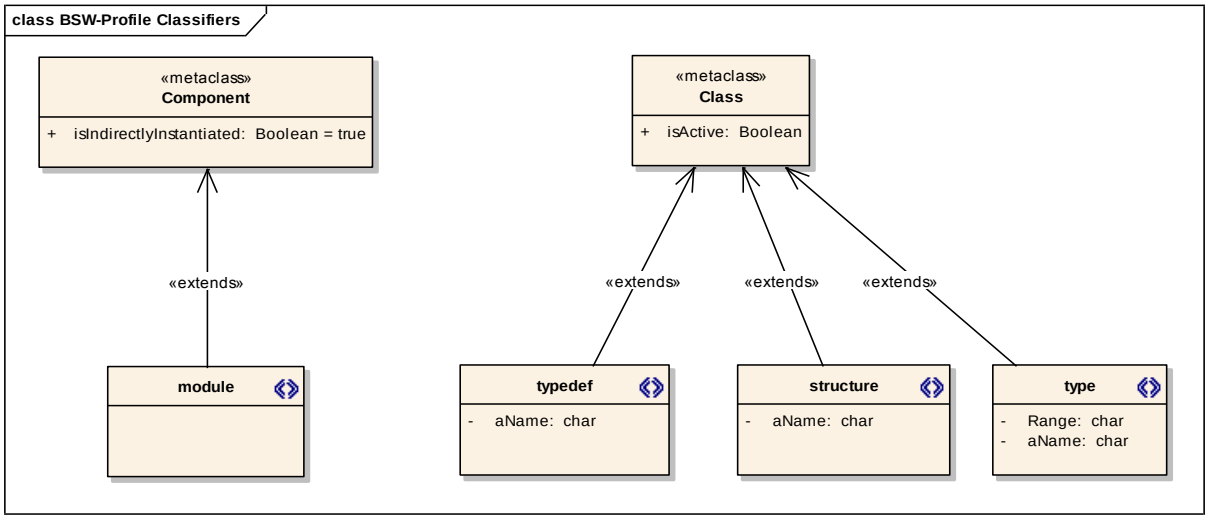
ID:	TR_BSWUML_00067
Initiator:	TO
Date:	05.09.2007
Short Description:	Providing an alternative name for generated tables
Type:	new
Importance:	high
Description:	The documentation generator for the API tables uses the element name as table name for the inclusion in the SWS Word document. This name has a limited length in Word, which some elements in the BSW UML model exceed. An alternative shorter name can be added by editing the tagged value “aName”.
Rationale:	Limitation on the length of anchors in Word.
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	AUTOSAR_SWS_DEM.doc
Contributes to:	--

5 BSW UML Profile

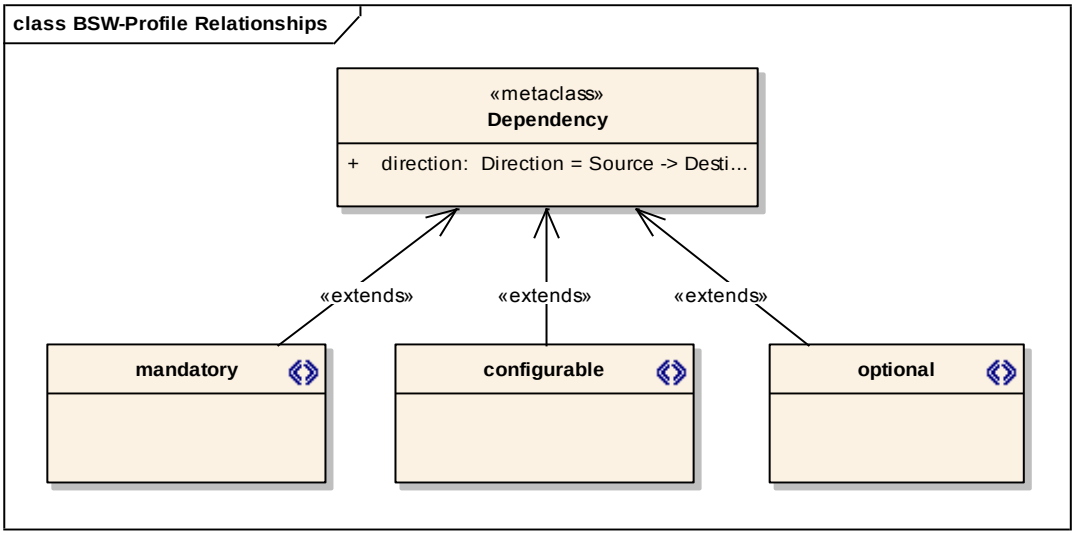
5.1.1 Stereotypes callback, function and scheduled function



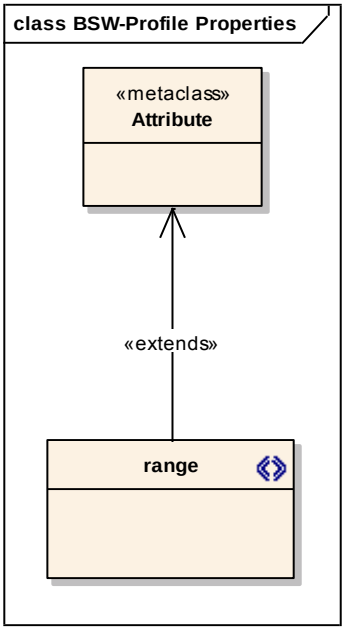
5.1.2 Stereotypes module, type, typedef and structure



5.1.3 Stereotypes mandatory, configurable and optional



5.1.4 Stereotype range


class BSW-Profile Properties
«metaclass»
Attribute
«extends»
range

6 Administrative Info

Last used Requirements ID is [TR_BSWUML_00068]