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2011-12-22	4.0.3	AUTOSAR Administration	• Added requirement [RS_SYST_00042]
2009-12-18	4.0.1	AUTOSAR Administration	• Added requirements [RS_SYST_00027], [RS_SYST_00028], [RS_SYST_00029], [RS_SYST_00030], [RS_SYST_00031], [RS_SYST_00037], [RS_SYST_00038], [RS_SYST_00039], [RS_SYST_00041] • Refined requirement SYSCT0004 with SYSCT32, SYSCT33, SYSCT34, SYSCT35, SYSCT36 • Refined requirement SYSCT0005 with [RS_SYST_00037] and [RS_SYST_00040] • Refined requirement [RS_SYST_00007], [RS_SYST_00001], [RS_SYST_00035] • Legal disclaimer revised

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2006-11-28	2.1	AUTOSAR Administration	Release as a separate Document. The Specification of System Template V1.0.0 has been split into independent documents for Release 2.1 • Legal disclaimer revised • Release Notes added • "Advice for users" revised • "Revision Information" added
2005-05-31	1.0	AUTOSAR Administration	Initial release as part of the Specification of System Template V1.0.0

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Contents

References

[1] System Template
AUTOSAR_TPS_SystemTemplate

[2] Standardization Template
AUTOSAR_TPS_StandardizationTemplate

[3] Main Requirements
AUTOSAR_RS_Main

1 Scope of this document

This document collects the requirements on the System Template (SYS-T). The main goal of the System Template is the definition of a relationship between the pure Software View on the System and a Physical System Architecture with networked ECUs.

The System Template covers the following areas:

- System topology: In the system topology the logical layout of the system is described. This means it is documented which ECU is connected to which cluster or channel.
- Communication properties: The central purpose of a communication system is the exchange of frames with certain properties.
- Mapping: The mapping covers the distribution of software components to ECUs as well as the mapping of data elements that are to be exchanged between software components onto signals and frames.

The requirements collected in this document will be satisfied by the System Template specification [1]. This document implements most of the requirements stated here.

1.1 Document Conventions

The representation of requirements in AUTOSAR documents follows the table specified in [TPS_STDT_00078], see Standardization Template, chapter Support for Traceability ([2]).

The verbal forms for the expression of obligation specified in [TPS_STDT_00053] shall be used to indicate requirements, see Standardization Template, chapter Support for Traceability ([2]).

1.2 Requirements Tracing

The following table references the requirements specified in [3] and links to the fulfillment of these.

Requirement	Description	Satisfied by
[RS_Main_00010]	Safety Mechanisms	[RS_SYST_00028] [RS_SYST_00056]
[RS_Main_00026]	AUTOSAR shall support high speed and high bandwidth communication between executed SW	[RS_SYST_00048] [RS_SYST_00049] [RS_SYST_00050] [RS_SYST_00055]
[RS_Main_00030]	Safety Related Process Support	[RS_SYST_00003] [RS_SYST_00008] [RS_SYST_00009] [RS_SYST_00016] [RS_SYST_00017] [RS_SYST_00018] [RS_SYST_00019] [RS_SYST_00020]
[RS_Main_00060]	Standardized Application Communication Interface	[RS_SYST_00031] [RS_SYST_00057]
[RS_Main_00100]	AUTOSAR shall provide standardized Basic Software	[RS_SYST_00002] [RS_SYST_00025]
[RS_Main_00150]	AUTOSAR shall support the deployment and reallocation of AUTOSAR Application Software	[RS_SYST_00002] [RS_SYST_00007] [RS_SYST_00008] [RS_SYST_00009] [RS_SYST_00016] [RS_SYST_00017] [RS_SYST_00018] [RS_SYST_00019] [RS_SYST_00020]
[RS_Main_00180]	Intellectual Property Protection	[RS_SYST_00027]
[RS_Main_00190]	Non-AUTOSAR Software Integration	[RS_SYST_00001]
[RS_Main_00230]	Network Technology Support	[RS_SYST_00013] [RS_SYST_00014] [RS_SYST_00044] [RS_SYST_00052]
[RS_Main_00280]	Standardized Automotive Communication Protocols	[RS_SYST_00058]
[RS_Main_00300]	AUTOSAR shall provide data exchange formats to support work-share in large inter and intra company development groups	[RS_SYST_00006] [RS_SYST_00027]
[RS_Main_00320]	AUTOSAR shall provide formats to specify system development	[RS_SYST_00007] [RS_SYST_00013] [RS_SYST_00045] [RS_SYST_00047]
[RS_Main_00340]	AUTOSAR shall support the continuous timing requirement analysis	[RS_SYST_00037] [RS_SYST_00040]
[RS_Main_00360]	Variant Management Support	[RS_SYST_00032] [RS_SYST_00033] [RS_SYST_00034] [RS_SYST_00035] [RS_SYST_00036] [RS_SYST_00041]
[RS_Main_00400]	AUTOSAR shall provide a layered software architecture	[RS_SYST_00043]
[RS_Main_00420]	AUTOSAR shall use established software standards and consolidate de-facto standards for basic software functionality	[RS_SYST_00026]
[RS_Main_00430]	AUTOSAR shall support established automotive communication standards	[RS_SYST_00015] [RS_SYST_00021] [RS_SYST_00022] [RS_SYST_00023] [RS_SYST_00024] [RS_SYST_00025] [RS_SYST_00029] [RS_SYST_00030] [RS_SYST_00038] [RS_SYST_00039] [RS_SYST_00052]
[RS_Main_00460]	AUTOSAR shall standardize methods to organize mode management on Application, ECU and System level	[RS_SYST_00042]

△

Requirement	Description	Satisfied by
[RS_Main_00500]	AUTOSAR shall provide naming conventions	[RS_SYST_00053]
[RS_Main_00510]	Secure Onboard Communication	[RS_SYST_00054]
[RS_Main_01002]	AUTOSAR shall support service-oriented communication	[RS_SYST_00059]
[RS_Main_01003]	AUTOSAR shall support data-oriented communication	[RS_SYST_00051] [RS_SYST_00059]

Table 1.1: RequirementsTracing

2 Requirements

2.1 Category: Main Requirements

2.1.1 Compatibility between the AUTOSAR Templates

[RS_SYST_00006] Compatibility between the AUTOSAR Templates ⌈

Description:	The compatibility between the AUTOSAR Templates must be guaranteed. In this context, compatibility means that each AUTOSAR template can have references to elements of another AUTOSAR template.
Rationale:	Ensuring coherence and interoperability between AUTOSAR templates.
Dependencies:	None identified.
Use Case:	Development of an in-vehicle electronic architecture (software modelling, hardware modelling and mapping constraint modelling) using the same tool chain.
Supporting Material:	–

⌋*(RS_Main_00300)*

2.2 Category: System Template Requirements

2.2.1 Legacy systems

[RS_SYST_00001] Mixed Systems (AUTOSAR/NON-AUTOSAR) ⌈

Description:	System constraints, which arise through usage of mixed systems, must be treated by System Template.
Rationale:	The transition between non-AUTOSAR systems to full-AUTOSAR systems can only be achieved gradually. Furthermore, interoperability with legacy solutions must be ensured. Thus, it must be possible to have AUTOSAR and non-AUTOSAR ECUs together on the same system ("mixed" systems).
Dependencies:	None identified.
Use Case:	Gradual AUTOSAR introduction into an existing architecture e.g. it shall be possible to handle signals not originating from AUTOSAR software components.
Supporting Material:	–

⌋*(RS_Main_00190)*

2.2.2 Basic Software and RTE Resources

[RS_SYST_00002] Basic Software Resources and RTE Resources ⌈

Description:	The System Template has to cover resource requests of the basic SW and the RTE.
Rationale:	Resources of an ECU are, by their own definition, limited (RAM, ROM, CPU time, etc.). Such limitations act as constraints during the mapping process.
Dependencies:	None identified.
Use Case:	Taking into account memory limitations when allocating AUTOSAR services and features on a small ECU.
Supporting Material:	–

⌋*(RS_Main_00150, RS_Main_00100)*

2.2.3 Iterative Development

[RS_SYST_00003] Iterative Development ⌈

Description:	The System Template has to support an iterative system development.
Rationale:	During the development of an AUTOSAR system, solutions found in former steps of the system design process are themselves system constraints for the next system generation steps.
Dependencies:	None identified.
Use Case:	If new functionalities are added to a vehicle project in a late development phase, the current mapping become itself a constraint for the mapping of the new SW components associated with such new functionalities.
Supporting Material:	–

⌋*(RS_Main_00030)*

2.2.4 Mapping of Software Components to ECUs

[RS_SYST_00007] Mapping of Software Components to ECUs ⌈

Description:	The System Template has to describe the mapping of software components to ECUs. An optional mapping of software components to individual processing units residing in one ECU shall also be possible.
Rationale:	–
Dependencies:	None identified.

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Use Case:	For safety reasons (or simply due to the experience) some specific Software Components can run only on some specific ECUs. Such "pre-mapping" is a constraint for the real mapping process.
Supporting Material:	–

⌋(*RS_Main_00320*, *RS_Main_00150*)

2.2.5 Mapping of Software Components to ECUs: Clustering

[RS_SYST_00008] SWC Cluster ⌈

Description:	The System Constraint Description has to cover the clustering of SW Components. SW Component Clustering means that two SW Components cannot be divided and must be mapped to the same ECU.
Rationale:	Due to performance requirements, to safe communication requirements or simply to experience, some communication paths must be prevented to be mapped onto an external bus. Involved SW Components shall then be mapped together onto the same ECU.
Dependencies:	None identified.
Use Case:	Safe communication, which may not be carried out over a communication bus, or very strict timing requirements.
Supporting Material:	–

⌋(*RS_Main_00030*, *RS_Main_00150*)

2.2.6 Mapping of Software Components to ECUs: Separation

[RS_SYST_00009] SWC Separation ⌈

Description:	The System Constraint Description has to cover the separation of SW Components. SW Component Separation means that two SW Components cannot be on the same ECU.
Rationale:	To enhance the independence of redundant SWC.
Dependencies:	None identified.
Use Case:	Two redundant Software Components, implementing safety critical functions, will not be mapped together on the same ECU because of safety requirements (of course, redundancy does not always imply SWC separation).
Supporting Material:	–

⌋(*RS_Main_00030*, *RS_Main_00150*)

2.2.7 Topology Description

[RS_SYST_00013] Topology ⌈

Description:	The System Template has to describe the topology of an EE System.
Rationale:	The available communication paths limit the possible distributions of SW Components to some ECUs.
Dependencies:	None identified.
Use Case:	Mapping of SW Components being tightly linked from a functional point of view: the topology must then be known in order to avoid too long data paths.
Supporting Material:	–

⌋*(RS_Main_00320, RS_Main_00230)*

2.2.8 Data Segmentation

[RS_SYST_00014] Data Segmentation ⌈

Description:	The System Template must provide information, which can be used for the segmenting of (application) data to more than 1 frame.
Rationale:	Data length limitations of the underlying bus technology.
Dependencies:	None identified.
Use Case:	Transmission of diagnostic data, often longer than bus specific maximum frame size.
Supporting Material:	–

⌋*(RS_Main_00230)*

2.2.9 Bus bandwidth

[RS_SYST_00015] Bus bandwidth ⌈

Description:	The System Template shall support bandwidth calculation as a constraint for the definition of the Communication Matrix.
Rationale:	Bandwidth is a limited resource, acting as a constraint during the definition of the Communication Matrix.
Dependencies:	None identified.
Use Case:	When defining the Communication Matrix for mixed systems (AUTOSAR and non-AUTOSAR ECUs), only one part of the Communication Matrix is freely configurable using the AUTOSAR process. That means that the available bandwidth for the AUTOSAR system generator is limited by the non-AUTOSAR part of the Communication Matrix.

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Supporting Material:	–

⌋(*RS_Main_00430*)

2.2.10 Dedicated physical connections

[RS_SYST_00016] Dedicated physical connections ⌈

Description:	The System Constraint Description shall be able to describe that a signal has to be sent over a dedicated wire, which is only used by two SW-Components (sender and receiver).
Rationale:	This technique is commonly used in current safety concepts.
Dependencies:	None identified.
Use Case:	Communication with the airbag module.
Supporting Material:	–

⌋(*RS_Main_00150*, *RS_Main_00030*)

2.2.11 Mapping of signals to the same physical line

[RS_SYST_00017] Mapping of signals to the same physical line ⌈

Description:	The System Constraint Description shall be able to describe that a group of signals has to be sent via the same physical line.
Rationale:	–
Dependencies:	None identified.
Use Case:	–
Supporting Material:	–

⌋(*RS_Main_00150*, *RS_Main_00030*)

2.2.12 Mapping of signals to different physical lines

[RS_SYST_00018] Mapping of signals to different physical lines ⌈

Description:	The System Constraint Description shall be able to describe, if needed, that signals between ECUs are sent via different physical lines.
Rationale:	To support hardware and information redundancy (as a mean to support fault detection and fault handling).
Dependencies:	None identified.
Use Case:	A mean to guarantee the transmission of very safety critical data, is to force the sending of redundant copies onto different physical lines.
Supporting Material:	–

⌋*(RS_Main_00150, RS_Main_00030)*

2.2.13 Mapping of signals to a specific physical line

[RS_SYST_00019] Mapping of signals to a specific physical line ⌈

Description:	The System Constraint Description shall be able to describe that signals have to be mapped to a specific physical line.
Rationale:	Some signals have to be mapped to specific physical lines due to e.g. special performance and/or safety needs.
Dependencies:	None identified.
Use Case:	Powertrain signals have to be mapped to a high-speed bus, due to their timing requirements.
Supporting Material:	–

⌋*(RS_Main_00150, RS_Main_00030)*

2.2.14 Exclusion of signals from a specific physical line

[RS_SYST_00020] Exclusion of signals from a specific physical line ⌈

Description:	The System Constraint Description shall be able to describe that signals have not to be mapped to a specific physical line.
Rationale:	Some physical lines can result unsuitable (too slow, unsafe communication protocol, etc.) for the transmission of some specific signals.
Dependencies:	None identified.
Use Case:	Most of power train signals cannot be mapped to a low speed CAN bus, due to their timing requirements.

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Supporting Material:	–

⌋(*RS_Main_00150*, *RS_Main_00030*)

2.2.15 ECU Communication via CAN

[RS_SYST_00021] ECU Communication via CAN ⌈

Description:	The System Template has to cover the system communication via CAN Bus.
Rationale:	CAN is widely used in the automotive systems.
Dependencies:	None identified.
Use Case:	Development of a complete, multi-networked, in-vehicle electronic architecture.
Supporting Material:	–

⌋(*RS_Main_00430*)

2.2.16 ECU Communication via LIN

[RS_SYST_00022] ECU Communication via LIN ⌈

Description:	The System Template has to cover the system communication via LIN.
Rationale:	LIN is widely used in the automotive systems.
Dependencies:	None identified.
Use Case:	Development of a complete, multi-networked, in-vehicle electronic architecture.
Supporting Material:	–

⌋(*RS_Main_00430*)

2.2.17 ECU Communication via MOST

[RS_SYST_00023] ECU Communication via MOST ⌈

Description:	The System Template has to cover the system communication via MOST.
Rationale:	MOST is going to become a standard communication protocol in the automotive industry.
Dependencies:	None identified.
Use Case:	Development of a complete, multi-networked, in-vehicle electronic architecture.

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Supporting Material:	–

⌋(*RS_Main_00430*)

2.2.18 ECU Communication via FlexRay

[RS_SYST_00024] ECU Communication via FlexRay ⌈

Description:	The System Template has to cover the system communication via FlexRay.
Rationale:	FlexRay is going to become a standard communication protocol in the automotive industry.
Dependencies:	None identified.
Use Case:	Development of a complete, multi-networked, in-vehicle electronic architecture.
Supporting Material:	–

⌋(*RS_Main_00430*)

2.2.19 Derivation of COM Stack Configuration Parameters from the System Template

[RS_SYST_00025] Derivation of COM Stack Configuration Parameters from the System Template ⌈

Description:	The System Template shall enable the configuration of the Com Stack of the ECU. It handles those parameters that are necessary to describe the inter-ECU communication. Configuration parameters local to an ECU are not in the scope of the System Template.
Rationale:	All ECUs connected in one communication cluster needs to be configured consistently.
Dependencies:	None identified.
Use Case:	Generate Base ECU Configuration from ECU Extract
Supporting Material:	–

⌋(*RS_Main_00430*, *RS_Main_00100*)

2.2.20 ASAM FIBEX compatibility

[RS_SYST_00026] Fibex compatibility ⌈

Description:	Whenever there is a considerable overlap between the System Template and the ASAM FIBEX Standard, the System Template shall adopt the structures of the ASAM FIBEX Standard.
Rationale:	The System Template will benefit from FIBEX as an established proven standard.
Dependencies:	None identified.
Use Case:	Facilitate the adoption of the System Template into existing tools which deal with the FIBEX Standard.
Supporting Material:	ASAM FIBEX

⌋*(RS_Main_00420)*

2.2.21 ECU Extract generation rules

[RS_SYST_00027] ECU Extract generation rules ⌈

Description:	The ECU Extract is derived from a System Description. The specification for generating the ECU Extract shall be detailed enough to enable semantically unambiguous generation of this artifact.
Rationale:	Tool interoperability requires unambiguous description of the ECU Extract.
Dependencies:	None identified.
Use Case:	Generate Base ECU Configuration from ECU Extract
Supporting Material:	–

⌋*(RS_Main_00180, RS_Main_00300)*

2.2.22 IPdu End-to-End Communication Protection support

[RS_SYST_00028] IPdu End-to-End Communication Protection support ⌈

Description:	The System Template shall enable to select E2E protection settings for IPdus.
Rationale:	Protect communication between COM modules.
Dependencies:	None identified.
Use Case:	Transmission of safety-related data on a single channel without redundancy.
Supporting Material:	–

⌋*(RS_Main_00010)*

2.2.23 Dynamic length signals

[RS_SYST_00029] Dynamic length signals ⌈

Description:	The System Template shall support a definition of dynamic length signals. A Signal shall have either a static length or its length should vary up to some statically defined maximum. Signals with a maximum length are called dynamic length signals.
Rationale:	Dynamic length signals can change size during run time.
Dependencies:	None identified.
Use Case:	–
Supporting Material:	OSEK COM

⌋(*RS_Main_00430*)

2.2.24 Dynamic length IPdus

[RS_SYST_00030] Dynamic length IPdus ⌈

Description:	The System Template shall support a definition of IPdus that contain dynamic length signals.
Rationale:	Dynamic length IPdus can change size during run time.
Dependencies:	[RS_SYST_00029]
Use Case:	The Network Layer and the Data Link Layer are capable of transmitting and receiving both fixed and dynamic-length I-Pdus as determined by the Interaction Layer.
Supporting Material:	OSEK COM

⌋(*RS_Main_00430*)

2.2.25 Distribution of Application and Vehicle Mode Requests

[RS_SYST_00031] Distribution of Application and Vehicle Mode Requests ⌈

Description:	The System Template shall support the distribution of application and vehicle mode requests to all affected ECUs.
Rationale:	A Mode Requester is an entity that requests modes from a Mode Manager by sending some data via a port with a Mode Request interface. The Mode Manager receives the incoming information, arbitrates the requests and decides upon a resulting mode.
Dependencies:	None identified.

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Use Case:	Depending on Vehicle and Application Modes, the BSW modes may change, e.g. the communication needs of an Application may cause a change in the BSW Mode of a communication network.
Supporting Material:	–

⌋(*RS_Main_00060*)

2.2.26 Topology variants

[RS_SYST_00032] Topology variants ⌈

Description:	The System Template shall provide the means to describe topology variants with optional/alternative ECUs and communication clusters.
Rationale:	In a product line approach different product variants can be realized by a common core topology with only a few varying topology nodes.
Dependencies:	None identified.
Use Case:	In a product line two different product variants HIGH and LOW use the same common core topology with the difference, that the product variant HIGH requires an additional ECU.
Supporting Material:	–

⌋(*RS_Main_00360*)

2.2.27 Software-to-ECU mapping variants

[RS_SYST_00033] Software-to-ECU mapping variants ⌈

Description:	The System Template shall provide the means to describe alternative mappings of software components to ECUs.
Rationale:	In order to reach different specific characteristics of the overall system for products within a product line a different mapping of software components is used.
Dependencies:	[RS_SYST_00007],[RS_SYST_00008],[RS_SYST_00009],[RS_SYST_00013]
Use Case:	In a product line two different product variants HIGH and LOW use the same common software architecture but define a different mapping to the network topology.
Supporting Material:	–

⌋(*RS_Main_00360*)

2.2.28 Timing Variants

[RS_SYST_00034] Timing Variants ⌈

Description:	The System Template shall provide the means to describe alternative timing properties (e.g. trigger type, period, priority) and timing constraints (e.g. latency, age).
Rationale:	Due to a different software-to-ECU mapping the timing properties and constraints for the transmission of signals can vary.
Dependencies:	None identified.
Use Case:	A PDU is transmitted cyclically for two different product variants HIGH and LOW with a period of 10ms for the variant HIGH and 20ms for the variant LOW.
Supporting Material:	–

⌋*(RS_Main_00360)*

2.2.29 Data mapping variants

[RS_SYST_00035] Data mapping variants ⌈

Description:	The System Template shall provide the means to describe data mapping Variants.
Rationale:	Variants in the Software Component Description have an impact on the data mapping which is described in the System Template.
Dependencies:	None identified.
Use Case:	A DataElement exists only in one product variant HIGH.
Supporting Material:	–

⌋*(RS_Main_00360)*

2.2.30 Communication variants

[RS_SYST_00036] Communication variants ⌈

Description:	The System Template shall provide the means to describe communication variants, such as alternative signal-to-PDU mappings, alternative communication paths, and alternative signal and PDU properties (e.g. data type, data length).
Rationale:	To optimize the communication matrix for different product variants which use the same network topology the description of communication variants in the System Template is an essential prerequisite.
Dependencies:	[RS_SYST_00032],[RS_SYST_00035]

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Use Case:	A signal is transmitted for two different product variants HIGH and LOW with the byte order LittleEndian for the variant HIGH and the byte order BidEndian for the variant LOW.
Supporting Material:	–

⌋(*RS_Main_00360*)

2.2.31 Timing properties

[RS_SYST_00037] Timing properties ⌈

Description:	The System Template shall provide the means to describe the timing properties of a system's dynamics, which are determined by the consumption of computation, communication, and other hardware resources.
Rationale:	The description of timing properties in the System Template is an essential prerequisite for the analysis and validation of a system's timing behavior or its prediction early in the process.
Dependencies:	None identified.
Use Case:	Analysis and validation of timing behavior, early prediction of modification impacts, support for hardware dimensioning, system configuration optimization
Supporting Material:	–

⌋(*RS_Main_00340*)

2.2.32 Support of SAE J1939 Protocol Features

[RS_SYST_00038] Support of SAE J1939 Protocol Features ⌈

Description:	The System Template has to cover the system communication via SAE J1939.
Rationale:	SAE J1939 protocol is an industry standard that is used in automotive systems.
Dependencies:	None identified.
Use Case:	Development of a complete, multi-networked, in-vehicle electronic architecture.
Supporting Material:	–

⌋(*RS_Main_00430*)

2.2.33 ECU Communication via Ethernet

[RS_SYST_00039] ECU Communication via Ethernet ⌈

Description:	The System Template has to cover the system communication via Ethernet.
Rationale:	Ethernet is going to become a standard communication protocol in the automotive industry.
Dependencies:	None identified.
Use Case:	Development of a complete, multi-networked, in-vehicle electronic architecture.
Supporting Material:	–

⌋*(RS_Main_00430)*

[RS_SYST_00052] Ethernet Switch Configuration ⌈

Description:	Ethernet Switch Configuration shall provide standardized artifacts to describe the structure of egress ports, port scheduling mechanisms as well as the forwarding process within the switch. Common parameters which can be written to a switch, e.g. during the initialization phase, need to be integrated in the system description.
Rationale:	The timing behavior of messages within the switch depends on the configuration of switches. Therefore, the switch behavior needs to be described.
Dependencies:	–
Use Case:	Provide the description of an Ethernet topology including the model for switches and their behavior.
Supporting Material:	–

⌋*(RS_Main_00430, RS_Main_00230)*

2.2.34 Timing constraints

[RS_SYST_00040] Timing constraints ⌈

Description:	The System Template shall provide the means to describe the timing constraints of a system's dynamics, which are determined by the consumption of computation, communication, and other hardware resources.
Rationale:	The description of timing constraints in the System Template is an essential prerequisite for the analysis and validation of a system's timing behavior or its prediction early in the process.
Dependencies:	None identified.
Use Case:	Analysis and validation of timing behavior, early prediction of modification impacts, support for hardware dimensioning, system configuration optimization

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Supporting Material:	–

⌋(*RS_Main_00340*)

2.2.35 Variants in ECU Extract

[RS_SYST_00041] Variants in ECU Extract ⌈

Description:	The ECU Extract shall support variability of elements taken over or derived during the transformation from the System Description.
Rationale:	Data mapping and communication variants (see [RS_SYST_00035], [RS_SYST_00036]) may have to be preserved in artifacts, which are generated out of a System Description (e.g. ECU-Extract), if the binding time is at a later point in the process.
Dependencies:	None identified.
Use Case:	Pdu Layout is postbuild configurable during the ECU Configuration, variability needs to be visible at build time.
Supporting Material:	–

⌋(*RS_Main_00360*)

2.2.36 Support for Partial Networking

[RS_SYST_00042] Support for Partial Networking ⌈

Description:	System Template shall support the definition of partial network clusters, the mapping of virtual function clusters to partial network clusters and the wakeup information of individual ECUs. The System Template shall define constraints regarding the design of Partial Network topologies. Supported and unsupported Partial Network topologies shall be clearly defined to ensure a proper PNC handling.
Rationale:	System Template shall contain all system relevant parameters required for the configuration of a partial network.
Dependencies:	None identified.
Use Case:	Describe the size and location of the system wide partial network cluster vector. Model the existence of multiple top-level PNC coordinators. Model the coordination of PNCs on selected channels.
Supporting Material:	–

⌋(*RS_Main_00460*)

2.2.37 Communication via Complex Drivers

[RS_SYST_00043] Communication via Complex Drivers ⌈

Description:	System Template shall support the Pdu-based communication via Complex Drivers.
Rationale:	It shall be possible to describe the Complex Driver Pdus that are transmitted over the network.
Dependencies:	None identified.
Use Case:	A new BSW module is used above the PduR, e.g a Diagnostic Service.
Supporting Material:	–

⌋*(RS_Main_00400)*

2.2.38 Description of custom bus systems

[RS_SYST_00044] Description of custom bus systems ⌈

Description:	System Template shall support the integration of custom bus systems on the topology level.
Rationale:	It shall be possible to describe the complete network topology of a vehicle with a System Description.
Dependencies:	None identified.
Use Case:	Alternative communication technologies (e.g. I2C, USB, serial line) are integrated as Complex Drivers
Supporting Material:	–

⌋*(RS_Main_00230)*

2.2.39 Co-existing System artifacts in the same model

[RS_SYST_00045] Co-existing System artifacts in the same model ⌈

Description:	The System Template shall provide means to describe different System Extracts, which can co exist with the complete system description and each other in the same model.
Rationale:	–
Dependencies:	None identified.

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Use Case:	The OEM hands a system extract over to the supplier, as a formal "requirement" specification. The supplier extends and refactors this system extract. In the next development cycle the OEM hands over an updated system extract to the supplier. The supplier updates his system extract according to the update of the OEM.
Supporting Material:	[RS_METH_00077]

⌋(*RS_Main_00320*)

2.2.40 Different views on the system's SWC-structure

[RS_SYST_00046] Different views on the system's SWC-structure ⌈

Description:	The System Template shall provide means to describe the different views on the SWC-structure and the mapping between their elements.
Rationale:	–
Dependencies:	None identified.
Use Case:	Different views on the SWC-structure at an OEM: Functional view (independent of ECUs) and ECU-topological view
Supporting Material:	[RS_METH_00078], [RS_METH_00079]

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2.2.41 Network and physical representation on signal level

[RS_SYST_00047] Network and physical representation on signal level ⌈

Description:	The System Template shall provide means to describe the physical representation and the network representation of signals.
Rationale:	–
Dependencies:	None identified.
Use Case:	–
Supporting Material:	–

⌋(*RS_Main_00320*)

2.2.42 CAN with Flexible Data-Rate

[RS_SYST_00048] CAN with Flexible Data-Rate ⌈

Description:	The System Template shall support the CAN FD protocol.
Rationale:	CAN FD increases the bandwidth of a CAN network and allows payload larger than 8 byte.
Dependencies:	None identified.
Use Case:	Development of a complete, multi-networked, in-vehicle electronic architecture
Supporting Material:	–

⌋(*RS_Main_00026*)

2.2.43 Support of Efficient COM for large data configuration

[RS_SYST_00049] Support of Efficient COM for large data configuration ⌈

Description:	The System Template shall support the configuration of communication over Efficient COM for large data.
Rationale:	Efficient COM for large data provides a lean mechanism how the interaction of RTE with the Communication Stack is handled. There are however some prerequisites which need to be fulfilled if this interaction shall be done via Efficient COM for large data. The System Template shall define these prerequisites.
Dependencies:	–
Use Case:	IPdus which only contain one signal and have no special transmission mode defined can be processed by Efficient COM for large data.
Supporting Material:	–

⌋(*RS_Main_00026*)

2.2.44 Data transformation of inter-ECU communication

[RS_SYST_00050] Data transformation of inter-ECU communication ⌈

Description:	The System Template shall provide the means to describe data transformation for inter-ECU communication.
Rationale:	If data of an inter-ECU communication shall be transformed, this has to be configured within the System to enable sending and receiving ECUs to execute the data transformation.
Dependencies:	None identified.

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Use Case:	Large composite data shall be mapped in one go to bus communication to avoid the mapping of each atomic element of the composite data.
Supporting Material:	–

⌋(*RS_Main_00026*)

2.2.45 Support of COM Based Data Transformation

[RS_SYST_00051] Support of COM Based Data Transformation ⌈

Description:	The System Template shall provide the means to define the usage of the uint8-array API to pass the serialized representation of a composite data to COM module.
Rationale:	The AUTOSAR transformer chain provides means to serialize composite data into a uint8-array representation. This serialized uint8-array shall be passed as one entity to COM.
Dependencies:	–
Use Case:	Usage of transformer with COM based serialization and Com Interaction to enable the communication with ECUs running AUTOSAR R4.1 versions and earlier.
Supporting Material:	–

⌋(*RS_Main_01003*)

2.2.46 Translation between signal-based and service-oriented communication

[RS_SYST_00059] The System Template shall support the translation between signal-based and service-oriented communication. ⌈

Description:	The System Template shall support the translation between signal-based and service-oriented communication.
Rationale:	Adaptive Platform restricts communication to Service-oriented communication, the rest of the vehicle however still uses Signal-based communication means - therefore a translation of these two approaches has to be performed.
Use Case:	Data which is produced on a Can ECU is needed at an Adaptive machine in a safe and secure manner. The translation may be implemented on a Classic platform gateway Ecu.
Dependencies:	As an alternative the translation may be implemented on the Adaptive platform.
Supporting Material:	–

⌋(*RS_Main_01002*, *RS_Main_01003*)

2.2.47 Naming conventions

[RS_SYST_00053] The System Template shall provide the ability to define naming conventions for public symbols ⌈

Description:	The System Template shall provide the ability to define naming conventions for public symbols. This especially includes requirement ids, module abbreviations, meta data and configuration symbols used in the document of a release
Rationale:	Avoid ambiguities and name clashes inside the specification. Provide a consistent uniform presentation of meta data to the reader of the specification. Allow automatic processing of specification elements
Use Case:	
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00500*)

Please note that the System Template does not define specific naming conventions.

2.2.48 Support of Secured Pdus

[RS_SYST_00054] Support of Secured Pdus ⌈

Description:	The System Template shall support the definition of Secured Pdus.
Rationale:	It shall be possible to define a Pdu that is supplemented with additional Authentication Information.
Dependencies:	–
Use Case:	Protection of Pdus against unauthorized manipulation and replay attacks.
Supporting Material:	–

⌋(*RS_Main_00510*)

2.2.49 Support of Container Pdus

[RS_SYST_00055] Support of Container Pdus ⌈

Description:	The System Template shall support the definition of Container Pdus.
Rationale:	It shall be possible to define that one Container Pdu shall transport several contained Pdus.
Dependencies:	–
Use Case:	Routing of Pdus from a network onto a network with higher payload possibility (e.g. CAN onto CanFD or Ethernet).

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Supporting Material:	–

⌋(*RS_Main_00026*)

2.2.50 E2E-protected communication

[RS_SYST_00056] E2E-protected communication ⌈

Description:	The System Template has to cover the protection of communication via E2E.
Rationale:	Enables safety-related communication over non-safety-related communication buses.
Dependencies:	–
Use Case:	Development of a complete, multi-networked, in-vehicle electronic architecture.
Supporting Material:	–

⌋(*RS_Main_00010*)

2.2.51 Assigning communication graphs to particular RTE Implementation Plug-Ins

[RS_SYST_00057] Assigning communication graphs to particular RTE Implementation Plug-Ins ⌈

Description:	The System Template shall support to assign communication graphs of software components to particular RTE Implementation Plug-Ins.
Rationale:	The RTE of an ECU is build modularized with RTE Implementation Plug-Ins. Each communication graph is handled by a specific RTE Implementation Plug-In.
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋(*RS_Main_00060*)

2.2.52 Optional Elements

[RS_SYST_00058] The System Template shall support the usage of the TLV encoding in SOME/IP messages ⌈

Description:	The System Template shall provide means to configure a SOME/IP transformer to consider TLV encoding according to the system model
Rationale:	The existence of optional elements in composite data structures is semantically different from the receiver simply taking an initial value if the received information does not contain a respective sub-element of a composite data structure. The receiver is supposed to actively acknowledge the fact that certain information is missing and still be able to deal with this fact in a meaningful way.
Use Case:	A composite data structure that qualifies for TLV encoding is defined and used for communication on the VFB. The SOME/IP transformer configured for this composite data structure needs to take the specification of the tLV encoding into account
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280)*

2.2.53 Software Cluster

[RS_SYST_00060]{DRAFT} **The System Template shall support the modeling of Software Clusters** ⌈

Description:	The System Template shall provide means to define software clusters composing of AUTOSAR software components and Basic Software Modules
Rationale:	Complex ECUs can be structurally decomposed into Software Clusters. Each Software Cluster is developed, integrated and build independent of the surrounding host system of the enclosing ECU.
Use Case:	Different development partners are responsible for specific software clusters. Each development partner is able to deploy its Software Cluster onto the ECU independently and to keep the rest of the software on the respective ECU unchanged.
Dependencies:	–
Supporting Material:	–

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2.2.54 Interaction of a Software Cluster with the environment

[RS_SYST_00061]{DRAFT} **The System Template shall provide means to describe the interface of the Software Clusters binary object** ⌈

Description:	The System Template shall provide means to describe the interface of the Software Clusters binary object
Rationale:	The necessary information to access a resource defined inside of a Software Cluster shall be defined in the interface description
Use Case:	Establishment of connections between Software Clusters
Dependencies:	–
Supporting Material:	–

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2.2.55 Software Cluster Resource

[RS_SYST_00062]{DRAFT} **The System Template shall support the modeling of Software Cluster Resources** ⌈

Description:	The System Template shall support the modeling of Software Cluster Resources
Rationale:	A Software Cluster is able to provide resources that can be accessed by other software clusters and to use resources of other Software Clusters
Use Case:	
Dependencies:	–
Supporting Material:	–

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3 Change History

3.1 Change History for AUTOSAR 4.0.1 against 3.1.5

3.1.1 Removed SRS Items

Number	Heading
[RS_SYST_00004]	Variant Handling
[RS_SYST_00005]	Timing Requirements

Table 3.1: Removed Specification Items in 4.0.1

3.1.2 Changed SRS Items

Number	Heading
[RS_SYST_00001]	Mixed Systems (AUTOSAR/NON-AUTOSAR)
[RS_SYST_00007]	Mapping of Software Components to ECUs

Table 3.2: Changed Specification Items in 4.0.1

3.1.3 Added SRS Items

Number	Heading
[RS_SYST_00027]	ECU Extract generation rules
[RS_SYST_00028]	IPdu End-to-End Communication Protection support
[RS_SYST_00029]	Dynamic length signals
[RS_SYST_00030]	Dynamic length IPdus
[RS_SYST_00031]	Distribution of Application and Vehicle Mode Requests
[RS_SYST_00032]	Topology variants
[RS_SYST_00033]	Software-to-ECU mapping variants
[RS_SYST_00034]	Timing variants
[RS_SYST_00035]	Data mapping variants
[RS_SYST_00036]	Communication variants
[RS_SYST_00037]	Timing properties
[RS_SYST_00038]	Support of SAE J1939 Protocol Features
[RS_SYST_00039]	ECU Communication via Ethernet
[RS_SYST_00040]	Timing constraints
[RS_SYST_00041]	Variants in ECU Extract

Table 3.3: Added Specification Items in 4.0.1

3.2 Change History for AUTOSAR 4.0.2 against 4.0.1

3.2.1 Removed SRS Items

N/A

3.2.2 Changed SRS Items

N/A

3.2.3 Added SRS Items

N/A

3.3 Change History for AUTOSAR 4.0.3 against 4.0.2

3.3.1 Removed SRS Items

N/A

3.3.2 Changed SRS Items

N/A

3.3.3 Added SRS Items

Number	Heading
[RS_SYST_00042]	Support for Partial Networking

Table 3.4: Added Specification Items in 4.0.3

3.4 Change History for AUTOSAR 4.1.1 against 4.0.3

3.4.1 Removed SRS Items

N/A

3.4.2 Changed SRS Items

N/A

3.4.3 Added SRS Items

Number	Heading
[RS_SYST_00043]	Communication via Complex Device Drivers
[RS_SYST_00044]	Description of custom bus systems
[RS_SYST_00045]	Co-existing System artifacts in the same model
[RS_SYST_00046]	Different views on the system's SWC-structure
[RS_SYST_00047]	Network and physical representation on signal level
[RS_SYST_00048]	CAN with Flexible Data-Rate

Table 3.5: Added Specification Items in 4.1.1

3.5 Change History for AUTOSAR 4.1.1 against 4.1.2

3.5.1 Removed SRS Items

N/A

3.5.2 Changed SRS Items

N/A

3.5.3 Added SRS Items

N/A

3.6 Change History for AUTOSAR 4.1.2 against 4.2.1

3.6.1 Removed SRS Items

N/A

3.6.2 Changed SRS Items

Number	Heading
[RS_SYST_00014]	Data Segmentation

Table 3.6: Changed Specification Items in 4.2.1

3.6.3 Added SRS Items

Number	Heading
[RS_SYST_00049]	Support of Efficient COM for large data configuration
[RS_SYST_00050]	Data transformation of inter-ECU communication
[RS_SYST_00051]	Support of COM Based Data Transformation
[RS_SYST_00052]	Ethernet Switch Configuration
[RS_SYST_00053]	Naming conventions
[RS_SYST_00054]	Support of Secured Pdus
[RS_SYST_00055]	Support of Container Pdus
[RS_SYST_00056]	E2E-protected communication

Table 3.7: Added Specification Items in 4.2.1

3.7 Change History for AUTOSAR 4.2.1 against 4.2.2

3.7.1 Removed SRS Items

N/A

3.7.2 Changed SRS Items

N/A

3.7.3 Added SRS Items

N/A

3.8 Change History for AUTOSAR 4.2.2 against 4.3.0

3.8.1 Added Traceables in 4.3.0

none

3.8.2 Changed Traceables in 4.3.0

none

3.8.3 Deleted Traceables in 4.3.0

Id	Heading
[RS_SYST_00010]	Exclusive Mapping of SWCs
[RS_SYST_00011]	Dedicated Mapping of SWCs

Table 3.8: Deleted Traceables in 4.3.0

3.9 Change History for AUTOSAR 4.3.0 against 4.3.1

3.9.1 Added Traceables in 4.3.1

none

3.9.2 Changed Traceables in 4.3.1

none

3.9.3 Deleted Traceables in 4.3.1

none

3.10 Change History for AUTOSAR 4.3.1 against 4.4.0

3.10.1 Added Traceables in 4.4.0

Number	Heading
[RS_SYST_00057]	Assigning communication graphs to particular RTE Implementation Plug-Ins
[RS_SYST_00058]	The System Template shall support the usage of the TLV encoding in SOME/IP messages

Table 3.9: Added Traceables in 4.4.0

3.10.2 Changed Traceables in 4.4.0

none

3.10.3 Deleted Traceables in 4.4.0

none

3.11 Change History for AUTOSAR 4.4.0 against 19-11

3.11.1 Added Traceables in 19-11

Number	Heading
[RS_SYST_00059]	The System Template shall support the translation between signal-based and service-oriented communication.

Table 3.10: Added Traceables in 19-11

3.11.2 Changed Traceables in 19-11

none

3.11.3 Deleted Traceables in 19-11

none

3.12 Change History for AUTOSAR R19-11 against R20-11

3.12.1 Added Traceables in R20-11

Number	Heading
[RS_SYST_00060]	The System Template shall support the modeling of Software Clusters
[RS_SYST_00061]	The System Template shall provide means to describe the interface of the Software Clusters binary object
[RS_SYST_00062]	The System Template shall support the modeling of Software Cluster Resources

Table 3.11: Added Traceables in R20-11

3.12.2 Changed Traceables in R20-11

none

3.12.3 Deleted Traceables in R20-11

none

3.13 Change History for AUTOSAR R20-11 against R21-11

3.13.1 Added Traceables in R21-11

none

3.13.2 Changed Traceables in R21-11

none

3.13.3 Deleted Traceables in R21-11

none

3.14 Change History for AUTOSAR R21-11 against R22-11

3.14.1 Added Traceables in R22-11

none

3.14.2 Changed Traceables in R22-11

Number	Heading
[RS_SYST_00042]	Support for Partial Networking

Table 3.12: Changed Traceables in R22-11

3.14.3 Deleted Traceables in R22-11

none