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01.04.2006	2.0.0	AUTOSAR Administration	Requirements for TRANSMISSION MODES changed, nearly all requirements slightly changed
09.05.2005	1.0.0	AUTOSAR Administration	Initial release

Disclaimer

Advice for users

AUTOSAR Specification Documents may contain exemplary items (exemplary reference models, "use cases", and/or references to exemplary technical solutions, devices, processes or software).

Any such exemplary items are contained in the Specification Documents for illustration purposes only, and they themselves are not part of the AUTOSAR Standard. Neither their presence in such Specification Documents, nor any later documentation of AUTOSAR conformance of products actually implementing such exemplary items, imply that intellectual property rights covering such exemplary items are licensed under the same rules as applicable to the AUTOSAR Standard.

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1 Scope of this Document, Goals

The following specification is to define the functional and non-functional requirements on the AUTOSAR Communication Layer (AUTOSAR COM) for AUTOSAR Release 2.

This Software Requirement Specification (SRS) of AUTOSAR COM is based on the OSEK[1] COM 3.0.3 specification [10] and only defines add-ons to this OSEK specification or different behavior.

The location of the AUTOSAR COM Layer within the whole AUTOSAR ECU SW Architecture is defined in [1].

The focus of this document is to specify:

- the behavior of the AUTOSAR COM Layer
- the interfaces of the AUTOSAR COM Layer
- the input of the generator and its configuration input
- the rules to check the consistency of the configuration input

The focus is NOT to specify:

- the editor and the rule checker for the input of the AUTSAR COM Layer module implementation (however the rule checker must use the rules for the configuration in/out defined by the [9].

Requirements Guidelines

Existing specifications shall be referenced (in form of a single requirement). Differences to these specifications are specified as additional requirements.

All Requirements shall have the following properties:

- Redundancy
  Requirements shall not be repeated within one requirement or in other requirements
- Clearness
  All requirements shall allow one possibility of interpretation only. Only technical terms of the glossary may be used.
- Atomicity
  Each Requirement shall only contain one requirement. A Requirement is atomic if it cannot be split up in further requirements.
- Testability
  Requirements shall be testable by analysis, review or test.

[1] OSEK is a registered trademark of Siemens AG.

- Traceability
  The source and status of a requirement shall be visible at all times.

Constraints

First scope for specification of requirements on basic software modules is systems which are not safety relevant. For this reason safety requirements are assigned to medium priority.

2 Related Documentation

2.1 Deliverables of AUTOSAR

[1] AUTOSAR Layered Architecture
AUTOSAR_LayeredSoftwareArchitecture.pdf

[2] Specification of Communication Stack Types
AUTOSAR_SWS_ComStackTypes

[3] Specification of the Virtual Functional Bus
AUTOSAR_VirtualFunctionBus.pdf

[4] Specification of ECU Configuration
AUTOSAR_ECU_Configuration.pdf

[5] Specification of RTE Software
AUTOSAR_SWS_RTE.pdf

[6] Specification of Communication
AUTOSAR_SWS_COM.pdf

[7] Glossary
AUTOSAR_Glossary.pdf

[8] Software Component Template
AUTOSAR_SoftwareComponentTemplate

[9] Specification of Communication
AUTOSAR_SWS_COM.pd

2.2 Related standards and norms

2.2.1 OSEK

[10] Glossary OSEK/VDX Communication Version 3.0.3 July 20, 2004

[11] OSEK/VDX Communication Version 3.0.3 July 20, 2004

2.2.2 ISO

No references at the moment

2.2.3 HIS

[12] Requirements for Protected Applications under OSEK, Version 1, 25.09.2002

3 Glossary

AUTOSAR data type	See [8], section 6.4
I-PDU	Interaction Layer Protocol Data Unit (assembled and disassembled in AUTOSAR COM), consists of one or more signals (see below and [1]).
I-PDU group	An I-PDU Group is a collection of I-PDUs in COM with the following properties: 1) An I-PDU group consists of zero or more I-PDUs or zero or more I-PDU groups, not a mixture of I-PDUs and I-PDU groups. 2) Every I-PDU must belong to exactly 1 I-PDU group. 3) An I-PDU group that is part of another I-PDU group can not contain another I-PDU group. 4) An I-PDU group can only be included in one other I-PDU group. 5) An I-PDU group must not contain itself. 6) An I-PDU group shall consist entirely of received I-PDUs or sent I-PDUs, a mixture is not allowed. For more information and a figure see[9].
LOM	Listen Only Mode
L-PDU	Data Link Layer Protocol Data Unit (assembled and disassembled in AUTOSAR Hardware Abstraction layer, see [1]).
Signal	A signal in the AUTOSAR COM context is equal to a message in OSEK COM. An AUTOSAR signal is carried by one or more signals in COM. The transformation from an AUTOSAR signal to a signal in COM is carried out by the RTE. Typically the transformation preserves the syntax of the data. However, in the case of complex data types the transformation may change the syntax of the signal. Therefore a signal in AUTOSAR COM is not always the same as an AUTOSAR signal.
Signal group	A signal group refers to a set of signals that must always be kept together in a common I-PDU. A Signal group is used to guarantee the atomic transfer of AUTOSAR composite data types. A signal group has the following properties: • A signal can belong to at most one signal group • A signal group can not belong to more than exactly one I-PDU • Signal groups do not overlap each other within an I-PDU • Signal groups are a contiguous set of signals which belong to this group, however it is possible to have unused bits (“holes”) within a group. • Signal groups may contain no signals (“may be empty”). The grouping of signals to signal groups is assumed to be provided as an input for the COM generation process.

4 How-To read this document

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

Each module specific chapter contains a short functional description of the Basic Software Module. Requirements of the same kind within each chapter are grouped under the following headlines (where applicable):

Functional Requirements:
- Configuration (which elements of the module need to be configurable)
- Initialization
- Normal Operation
- Shutdown Operation
- Fault Operation
- ...

Non-Functional Requirements:
- Timing Requirements
- Resource Usage
- Usability
- Output for other WPs (e.g. Description Templates, Tooling,...)
- ...

5 Requirement Specification AUTOSAR COM

5.1 Functional Overview

The AUTOSAR COM Layer is the layer between RTE and the PDU Router.

Main-Features of AUTOSAR COM are:

- Provision of signal oriented data interface for the RTE
- Communication transmission control (start/stop of I-PDU groups)
- Sending of signals according to transmission type as specified in the VFB specification.
- Guarantee of minimum distances between transmission requests
- Monitoring of receive signals (signals timeout)
- Filter mechanisms for incoming signals
- Different notification mechanisms
- Provision of Init-Values and Update-Indications
- Endianness conversion + sign extension
- Packing and unpacking of AUTOSAR signals to I-PDUs to be transmitted

5.2 Functional Requirements

5.2.1 General requirements

5.2.1.1 [BSW02037] AUTOSAR COM shall be based on the functionality and APIs of OSEK COM 3.0.3

Initiator:	WP 4.2.2.1.2
Date:	07.02.2005
Short Description:	AUTOSAR COM shall be based on the functionality and APIs of OSEK COM 3.0.3
Type:	new
Importance:	High
Description:	**SRS99** AUTOSAR COM shall be based on the functionality and APIs specified in OSEK COM 3.0.3. Specifications not done there, resp. specifications of functionality different from that specified in the above mentioned document shall be defined in the AUTOSAR COM SRS and SWS specifications. Features of OSEK COM 3.0.3 which are not provided by AUTOSAR COM: - shall be defined in the SWS
Rationale:	This SRS is only an add-on to OSEK COM 3.0.3 as an existing standard.
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	Specification of OSEK COM 3.0.3, 2004-07-20, [10]

5.2.1.2 [BSW02078] Support of endianness conversion

Initiator:	WP 4.2.2.1.2
Date:	03.03.2005
Short Description:	Support of endianness conversion
Type:	new
Importance:	High
Description:	**SRS101** AUTOSAR COM shall support endianness conversion for the following data types defined in the RTE SWS specification ([5] Tabular 5.3 “Base type”): • Uint16 • Uint32 • Sint16 • Sint32 • Char16.
Rationale:	ensure end to end data consistency
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	Software Component Template AUTOSAR_SoftwareComponentTemplate [8] AUTOSAR SWS RTE [5]

5.2.1.3 [BSW02086] Support of Sign-Extension for received signals

Initiator:	WP 4.2.2.1.2
Date:	03.03.2005
Short Description:	Support of Sign-Extension for received signals
Type:	new
Importance:	High
Description:	Sign-Extension means, to map negative values of signed signals correctly, if the bit-size of the signal in an I-PDU received and the bit-size of the signal used in the interface of the receiving software component differ from each other. In this case, the size of the signal received shall be extended to the size of the receiver interface. AUTOSAR COM shall support Sign-Extension for the following data types defined in the RTE SWS specification ([5] Tabular 5.3 “Base type”): • Sint8 • Sint16 • Sint32
Rationale:	Ensure end to end data consistency
Use Case:	--
Dependencies:	--
Conflicts:	--
Supporting Material:	Software Component Template AUTOSAR_SoftwareComponentTemplate [8] AUTOSAR SWS RTE [5]

5.2.2 Initialization

[BSW02042] Initialization of not used areas of an I-PDU

Initiator:	BMW
Date:	01.02.2005
Short Description:	Initialization of unused areas/bits of an I-PDU
Type:	New
Importance:	High
Description:	AUTOSAR COM shall fill unused areas/bits within an I-PDU with a configurable value (e.g. 0xFF). This value shall be configurable per I-PDU.
Rationale:	Limit impact of a wrong configuration, if a not used area of an I-PDU is wrongly assigned to a signal this can be detected by the application SW component.
Use Case:	For error detection purposes, all data values must be filled with a defined value.
Dependencies:	--
Conflicts:	--
Supporting Material:	--

5.2.3 Configuration

The chapter Configuration deals with the configurable parameters/functionalities of the AUTOSAR COM Layer.
This chapter deals only with general configuration requirements, the requirements for configuration of a single feature are defined within the requirement of the feature itself.

5.2.3.1 [BSW02040] AUTOSAR COM configuration language

Initiator:	BMW
Date:	17.02.2005
Short Description:	AUTOSAR COM Configuration Language shall be XML
Type:	Changed
Importance:	High
Description:	**SRS102** AUTOSAR COM shall be configured by using XML as configuration language as defined by ECU Configuration Template. It is up to the SWS to define the configuration parameters themselves.
Rationale:	Having a unique configuration language within AUTOSAR.
Use Case:	Configuration of AUTOSAR COM
Dependencies:	--
Conflicts:	--
Supporting Material:	[4]

5.2.3.2 [BSW177] Configuration of communication parameters

Initiator:	BMW
Date:	27.02.2004
Short Description:	Configuration of communication parameters

Type:	New
Importance:	High
Description:	**SRS177** The AUTOSAR COM Layer shall allow the configuration of communication at the following different stages: • Pre-Compile-Time • Link Time • Post-build-Time o Load-able Configuration o Multiple configuration sets The configuration parameters must be organized in a way to be able to be changed in all the different stages, e.g. one OEM might select to configure pre-compile time while another will configure post-build time. Which parameters exactly are configurable in which state shall be defined in [9]
Rationale:	Guarantee flexibility of using the AUTOSAR COM Layer.
Use Case:	It must be possible to configure the handled bus frames after compile- or build-time, particularly for future concepts running at BMW (reuse an ECU within another vehicle product line with different and incompatible communication layouts).
Dependencies:	The configuration of all communication parameters must be consistent with the parameters in the PDU-router, interfaces and drivers for CAN, LIN and FlexRay.
Conflicts:	--
Supporting Material:	--

5.2.3.3 [BSW02067] Rules for checking the consistency of configuration input

Initiator:	LD
Date:	03.03.2005
Short Description:	Rules for checking of the consistency of configuration input
Type:	New
Importance:	High
Description:	**SRS111** A set of rules needs to be specified that enable the Configuration Editor to reject inconsistent configurations or configurations that can not be implemented. These rules shall be defined in the SWS and shall be implemented by the Configuration Editor.
Rationale:	Needed to make sure that the generator only works with correct configuration files.
Use Case:	The configuration must not contain overlapping signals within one I-PDU. The period of I-PDUs must not be negative.
Dependencies:	--
Conflicts:	--
Supporting Material:	--

5.2.3.4 [BSW02046] Configuration of signal notification

Initiator:	WP 4.2.2.1.2
Date:	15.02.2005
Short Description:	Configuration of signal notification
Type:	New
Importance:	High

Description:	It shall be configurable whether the signal based notification (done by callback or flag) to the RTE is done either immediately within the I-PDU RxIndication/TxConfirmation (made by the PduRouter) or is deferred to the COM main function context
Rationale:	To allow unpacking of signals in interrupt and polled modes.
Use Case:	Unpacking of signals out of an I-PDU.
Dependencies:	--
Conflicts:	--
Supporting Material:	UML diagram: - Polling Mode only in Com (R3b-R1a-R1a) and - Interrupt mode (R1b-R1a-R1a) (For decryption of the codes in brackets refer to UML Model)

5.2.3.5 [BSW02089] Timeout indication mechanism on receiver-side

Initiator:	DC
Date:	11.11.2005
Short Description:	Timeout indication mechanism on receiver-side
Type:	New
Importance:	High
Description:	Receiver-side COM layer shall provide two (configurable) options if a signal timeout is detected • Indication to the RTE → AUTOSAR Software Component can use “spare values” • No indication to the RTE
Rationale:	The RTE shall have the opportunity to notify its environment about timeouts or the application shall be provided with a default value to avoid using outdated values
Use Case:	See rationale
Dependencies:	--
Conflicts:	--
Supporting Material:	--

5.2.3.6 [BSW02088] Value substitution in case of a signal timeout

Initiator:	DC
Date:	11.11.2005
Short Description:	Substitution of the last received value by configurable data value in case of a signal timeout
Type:	New
Importance:	High
Description:	In case a signal timeout is configured in that way, that no indication is given to the upper layer, AUTOSAR COM shall substitute the last received value by the init value. Whether this substitution takes place shall be configurable.
Rationale:	It shall be possible to provide the application with a configurable value in case of a signal timeout and no indication is given up to the upper layer.
Use Case:	See rationale
Dependencies:	--
Conflicts:	--
Supporting Material:	--

5.2.4 Normal Operation

5.2.4.1 Communication Modes

5.2.4.1.1 Transmission

This chapter deals with the add-ons to the OSEK COM specification related to signal and I-PDU transmission.

5.2.4.1.1.1[BSW02083] TRANSMISSION MODES

Initiator:	BMW
Date:	09.08.2005
Short Description:	TRANSMISSION MODES
Type:	New
Importance:	High
Description:	AUTOSAR COM shall provide the TRANSMISSION MODES given in the following tabular for each I-PDU. It shows the TRANSMISSION MODES available and a short description of those TRANSMISSION MODES.

TRANSMISSION MODES	***Description***
Periodic	Transmissions occur indefinitely with a fixed period between them.
Direct / n-times	Event driven transmission with n-1 repetitions
Mixed	Periodic transmission with direct/n-times transmissions in between
None	No transmission

Rationale:	These modes are commonly used by all existing automotive bus systems.
Use Case:	--
Dependencies:	BSW02082, BSW02084, BSW02080
Conflicts:	--
Supporting Material:	TRANSMISSION MODES “periodic”, “mixed” are the same as already defined in the OSEK COM 3.0.3 Specification [6] see also Use Cases in [10].

5.2.4.1.1.2[BSW02082] Two different TRANSMISSION MODES

Initiator:	BMW
Date:	09.08.2005
Short Description:	Two different TRANSMISSION MODES
Type:	New
Importance:	High
Description:	AUTOSAR COM shall provide the possibility to define two different TRANSMISSION MODES for each I-PDU. This shall also include the situation where only the parameters of a transmission mode are changed, e.g. different cycle times. It shall be possible to switch between both TRANSMISSION MODES during runtime.
Rationale:	This is commonly used by many existing automotive bus systems.
Use Case:	--

Dependencies:	BSW02083, BSW02084, BSW02080
Conflicts:	--
Supporting Material:	--

5.2.4.1.1.3 [BSW02084] TRANSMISSION MODE selection

Initiator:	BMW
Date:	09.08.2005
Short Description:	TRANSMISSION MODE selection
Type:	New
Importance:	High
Description:	To select one of the two TRANSMISSION MODES, AUTOSAR COM shall provide the possibility to attach a condition to each signal within an I-PDU separately. The possibilities to define those conditions shall be the same as defined in OSEK COM 3.0.3 reception filter algorithms (s. [10], Section 2.2.2). If all conditions defined for signals within one specific I-PDU evaluate to TRUE, one TRANSMISSION MODE shall be used for this I-PDU. In all other cases, the other TRANSMISSION MODE shall be used. The conditions shall be evaluated immediately every time a related signal or signal group is sent by RTE and the new transmission request shall be sent using the new TRANSMISSION MODE already
Rationale:	These modes are commonly used by many existing automotive bus systems.
Use Case:	--
Dependencies:	BSW02082, BSW02083, BSW02080
Conflicts:	--
Supporting Material:	--

5.2.4.1.1.4 [BSW02080] Re-Triggering of repetitions of I-PDUs

Initiator:	WP 4.2.2.1.2
Date:	09.03.2005
Short Description:	Re-Triggering of repetitions of I-PDUs
Type:	New
Importance:	High
Description:	**SRS106** A new send request called while existing repetitions are in progress shall cancel those outstanding repetitions and the transmission shall be started with the new signal/signal group.
Rationale:	These modes are commonly used by many existing automotive bus systems.
Use Case:	--
Dependencies:	BSW02082, BSW02083, BSW02084
Conflicts:	--
Supporting Material:	--

Hints:

- AUTOSAR COM shall provide the same Transfer Properties as OSEK COM.

- The rules for combining Send Modes of Signals and TRANSMISSION MODES of I-PDUs shall be the same as in OSEK COM.

5.2.4.1.2 Signal invalidation

5.2.4.1.2.1 [BSW02077] Signal invalidation mechanism on sender-side

Initiator:	WP4.2.2.1.2
Date:	10.03.2005
Short Description:	Signal invalidation mechanism on sender side
Type:	Changed 05.04.2005 during meeting
Importance:	High
Description:	**SRS108** It shall be possible for the sender side RTE to indicate that it is not able to provide a valid value (e.g. sensor is faulty). This shall be done by writing a per signal configurable invalid value (outside of the range of the valid values) into the I-PDU which is handled like a valid value in the further processing. Therefore a special API shall be provided on the sender side COM layer.
Rationale:	The AUTOSAR Software Component shall have (via the RTE) the opportunity to notify its environment about reduced functionality (e.g. sensor is faulty)
Use Case:	See rationale, Starting a fail safe routine if a sensor is broken.
Dependencies:	[BSW02079]
Conflicts:	--
Supporting Material:	--

5.2.4.1.2.2 [BSW02079] Signal invalidation mechanism on receiver-side

Initiator:	WP4.2.2.1.2
Date:	04.04.2005
Short Description:	Signal invalidation mechanism on receiver-side
Type:	New
Importance:	High
Description:	**SRS179** Receiver-side COM layer shall provide two (configurable) options if a sender indicates that it is not able to provide a valid value • Indication to the RTE → AUTOSAR Software Component can use "spare values" • No indication to the RTE
Rationale:	The RTE shall have the opportunity to notify its environment about reduced functionality (e.g. sensor is faulty)
Use Case:	See rationale, Starting a fail safe routine if a sensor is broken.
Dependencies:	[BSW02077], [BSW02087]
Conflicts:	--
Supporting Material:	--

5.2.4.1.2.3 [BSW02087] Substitution of invalid value by configurable data value

Initiator:	WP4.2.2.1.2
Date:	09.09.2005

Short Description:	Substitution of invalid value by configurable data value
Type:	New
Importance:	High
Description:	In case a signal is invalidated on sender-side and the receiver-side is configured in that way, that no indication is given to the upper layer, AUTOSAR COM shall substitute the invalid value by the init value. Whether this substitution takes place shall be configurable.
Rationale:	It shall be possible to provide the application with a configurable value in case the signal value received is invalid and no indication is given up to the upper layer.
Use Case:	See rationale
Dependencies:	[BSW02077], [BSW02079]
Conflicts:	--
Supporting Material:	--

5.2.4.1.3 Mode Changes

This chapter collects the requirements for starting/stopping of I-PDUs groups and the handling of the Listen Only Mode.

5.2.4.1.3.1 [BSW218] Separate Start/Stop COM for separate groups of I-PDUs

Initiator:	PSA
Date:	09.04.2004
Short Description:	Start/stop communication services for an offline configurable group of I-PDUs.
Type:	New
Importance:	Medium
Description:	**SRS109** The AUTOSAR COM Layer shall be able to start and to stop sending and receiving for a configurable group of I-PDUs during runtime. The minimum delay time and deadline monitoring shall be respected for started groups of I-PDUs and shall be reset after a restart of an I-PDU group. After a reset of the COM Layer (normally reset of the ECU) all I-PDUs are stopped per default.
Rationale:	OSEK COM can only start/stop communication (StartCOM and StopCOM services) as a whole. Such a limitation is too restrictive.
Use Case:	Such configurable groups of I-PDUs provide for example the possibility to disable the transmission of all I-PDUs on a single channel, and enable only their reception (Silent Mode). Such configurable groups of I-PDUs provide for example the possibility to start/stop communication per logical channel of a single channel (e.g. FlexRay/MOST applications). Start sending and receiving on the body domain (e.g. use of the radio and multi-function screen), while powertrain is not still powered on. Stop the transmission of I-PDUs but not the reception when bus load is too high. Bus off handling
Dependencies:	[BSW192]
Conflicts:	--
Supporting Material:	For definition of I-PDU group see [7]

5.2.4.1.3.2 [BSW192] Disable reception deadline monitoring

Initiator:	BMW
Date:	21.05.2004
Short Description:	Disable reception deadline monitoring
Type	Changed
Importance:	High
Description:	**SRS110** The AUTOSAR COM Layer shall provide the functionality to disable reception deadline monitoring for configurable I-PDU group. After a reset of the COM Layer (normally reset of the ECU), the configured state (enabled/disabled) shall be active. Further information: The ECU State Manager is responsible for enabling and disabling the Listen Only Mode and selecting an appropriate ECU mode (e.g. 'diagnostic mode') for informing the application.
Rationale:	This is needed to suppress wrong error handling in Listen Only Mode (see use case). It is assumed that at least a second ECU on the same channel is also in LOM and does not provide the expected signals to the first one.
Use Case:	For the Listen Only Mode (LOM) the transmission of all I-PDU groups is switched off, reception (maybe of only one I-PDU group) is still active but without supervision of the reception timeouts (reception deadline monitoring). -> For example all ECUs on one channel (e.g. on CAN network) are in listen only mode, so there are no more periodic send signals on this channel, but the ECU has to be able to receive changes of the ECU state management.
Dependencies:	[BSW218]
Conflicts:	--
Supporting Material:	--

5.2.4.1.3.3 [BSW02081] Re-enable reception deadline monitoring

Initiator:	BMW
Date:	21.05.2004
Short Description:	Enable reception deadline monitoring
Type	Changed
Importance:	High
Description:	The AUTOSAR COM Layer shall provide the functionality to re-enable reception deadline monitoring for an I-PDU group where reception deadline monitoring has been previously disabled. After a reset of the COM Layer (normally reset of the ECU), the configured state (enabled/disabled) shall be active.
Rationale:	See BSW192
Use Case:	See BSW192
Dependencies:	BSW192
Conflicts:	--
Supporting Material:	--

5.2.4.2 Packing signals into I-PDUs

5.2.4.2.1 [BSW02041] Atomic transfer of complex data types

Initiator:	Vector
Date:	01.02.2005

Short Description:	Atomic transfer of all data elements of a complex AUTOSAR data type by network signals in an I-PDU shall be supported.
Type:	new
Importance:	high
Description:	SRS112 It is required by AUTOSAR to handle complex data types as a consistent set of data. Therefore it is necessary to pass the data elements from the RTE to the AUTOSAR COM layer atomically.
Rationale:	AUTOSAR provides complex data types; those have to be sent and received atomically via RTE, COM, etc.
Use Case:	Complex AUTOSAR data types, data consistency of signal groups.
Dependencies:	--
Conflicts:	--
Supporting Material:	For guarantee data consistency of complex AUTOSAR data types, signal groups are introduced. For definition of signal group see [7].

5.2.4.3 Interface between COM and the lower layer (PDU-Router)

OSEK COM leaves the interface between COM and the lower layers undefined. In AUTOSAR the only lower layer that COM interfaces to is the PDU Router. The interfaces refer to the definitions in [2]. The requirements are derived from [2] .

5.2.4.3.1 [BSW02043] Indication service Com_RxIndication

Initiator:	BMS/BMW
Date:	07.02.2005
Short Description:	AUTOSAR COM shall provide a callback function called Com_RxIndication
Type:	New
Importance:	High
Description:	**SRS113** AUTOSAR COM module shall provide a function that is called by the lower layer (PDU-Router) after an I-PDU has been received. The name of the function has to be Com_RxIndication. Parameter values of the function are the ID of the I-PDU and a pointer to the PduInfoType. The function has no return value. The AUTOSAR COM module shall allow unpacking of signals of partially received I-PDUs.
Rationale:	Basic functionality of a communication layer
Use Case:	Receiving a PDU by the lower layer
Dependencies:	--
Conflicts:	--
Supporting Material:	[2]

5.2.4.3.2 [BSW02044] Confirmation service Com_TxConfirmation

Initiator:	BMS/BMW
Date:	07.02.2005
Short Description:	AUTOSAR COM shall provide a callback function called Com_TxConfirmation
Type:	New
Importance:	High
Description:	**SRS114** AUTOSAR COM shall provide a function that is called by the lower layer (PDU-Router) after an I-PDU has been transmitted on the network.

	The name of the function has to be Com_TxConfirmation. The parameter value of the function is the ID of the transmitted I-PDU. It is selectable via configuration whether the TxConfirmation for a I-PDU is active or not. The function has no return value.
Rationale:	Basic functionality of a communication layer
Use Case:	Transmitting a PDU on the network.
Dependencies:	--
Conflicts:	--
Supporting Material:	[2]

5.2.4.3.3 [BSW02045] Function Com_TriggerTransmit

Initiator:	BMS/BMW
Date:	07.02.2005
Short Description:	AUTOSAR COM shall provide a function called Com_TriggerTransmit
Type:	New
Importance:	High
Description:	**SRS115** AUTOSAR COM shall provide a function that is called by the lower layer (PDU-Router) when an I-PDU shall be transmitted. Within this function, AUTOSAR COM shall copy the contents of its I-PDU transmit buffer to the L-PDU buffer given by the calling layer. The name of the function has to be Com_TriggerTransmit. The parameter values of the function are the ID I-PDU that is requested to be transmitted by COM and a pointer to the transmit buffer of the L-PDU. The function has no return value.
Rationale:	Basic functionality of a communication layer
UseCase:	This function is used e.g. by the LIN Master for sending out a LIN frame. In this case, the trigger transmit can be initiated by the Master schedule table it self or a received LIN header. This function is also used by the FlexRay Interface for requesting PDUs to be sent in the static part (synchronous to the FlexRay global time).
Dependencies:	--
Conflicts:	--
SupportingMaterial:	[2]

5.2.4.4 Signalstatusinformation

5.2.4.4.1 [BSW02030] Identify if a signal/signal group is updated by the sender

Initiator:	WP4.2.2.1.2
Date:	02.12.2004
ShortDescription:	It shall be possible to identify at receiver side if a signal/ signal group has been up dated by the sender.
Type:	New
Importance:	High
Description:	**SRS116** It shall be possible for the receiver to identify and indicate to the upper layer if a signal/ signal group has been up dated by the sender. Whether this feature is provided shall be configurable per signal.
Rationale:	When multiple signals /signal group are placed in the same I-PDU, and that I-PDU is sent more frequently than a signal/ signal group is update, the update bit provides a mechanism to detect only those signals/ signal groups that have changed values.
UseCase:	--

Dependencies:	[BSW02058]
Conflicts:	--
SupportingMaterial:	Implementation proposal: An update bit is optionally attached to a signal/ signal group and can only be attached at configuration time. When COM is started all up date bits in all I-PDUs are cleared. In the sending ECU, when a signal/ signal group is sent by the application, the update bit is set automatically by COM as part of the Send Message() call. In the sending ECU, once the call to the lower layers to transmit the ECU has completed, all update bits in the recently sent I-PDU are cleared. In the receiving ECU, when an I-PDU is received, a signal/signal group with an associated update bit is only processed by COM if its update bit is set. Therefore filtering and informing the RTE etc. will only take place if the update bit is set. In the receiving ECU, for a signal/signal group with an update bit, the reception deadline monitor for that signal/signal group (if configured) is only reset if the update bit is set. Update bits do not have to reside in the I-PDU in a fixed relationship to the signal/signal group with which they are associated. The update bits could reside anywhere in the I-PDU subject to the same restrictions as any other signal/signal group.

5.2.4.4.2 [BSW02058] Deadline monitoring of receiving updated signals/signal groups

Initiator:	WP4.2.2.1.2
Date:	21.02.2005
Short Description:	Deadline monitoring of receiving updated signals/signal groups
Type:	New
Importance:	High
Description:	The AUTOSAR COM layer shall monitor on receiver-side, if an updated value for a specific signal/signal group has been received within a configurable, signal/signal group specific deadline, i.e. the AUTOSAR COM layer shall check, whether the sender-side upper layers have explicitly sent the signal/signal group. If a deadline violation of a specific signal/signal group is detected, AUTOSAR COM shall notify the upper receiving layers (the SWC via the RTE) about that fact. This information given to the upper receiving layers shall be signal/signal group specific. AUTOSAR COM shall not do any substitution of signal/signal group values. If upper layers read signals/signal groups that have violated their deadline AUTOSAR COM shall return the last value received.
Rationale:	Due to latency times of communication systems or interrupts data might be not received in a pre-defined time (e.g. jitter of period to big, older than max age).
Use Case:	Detect delays in communication system to make sure the application works on up-to-date data.
Dependencies:	[BSW02030]
Conflicts:	--
Supporting Material:	If no update bits are used, AUTOSAR COM provides the deadline monitoring defined in OSEK COM 3.0.3 [9] (Section 2.5.1). Here, deadline monitoring is done on the reception of I-PDUs but deadline violations are notified per signal to the upper layer.

5.2.4.5 Requirements for COM under a protected OS

AUTOSAR Release 2 does not include protection features. Therefore, there are currently no requirements to support protection in this specification.

5.3 Non-Functional Requirements(Qualities)

none

6 References

AUTOSAR Layered Architecture
AUTOSAR_LayeredSoftwareArchitecture.pdf

Specification of Communication Stack Types
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Specification of the Virtual Functional Bus
AUTOSAR_VirtualFunctionBus.pdf

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