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2006-05-16	2.0	AUTOSAR Administration	• Signal router added • FIFO for PduRouter added
2005-05-31	1.0	AUTOSAR Administration	• Initial release

Disclaimer

Table of Contents

1 Scope of Document

Scope of this document is the definition of the functional and non-functional requirements for the AUTOSAR PDU Router module and the AUTOSAR Signal Gateway which is integral part of COM.

Other modules relevant for data communication in the AUTOSAR architecture, such as COM, DCM, driver and interface layers for CAN, LIN and FlexRay, and other modules irrelevant for data communication, are not in the scope of this document.

2 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!

2.1 Conventions used

- The representation of requirements in AUTOSAR documents follows the table specified in [TPS_STDT_00078].
- In requirements, the following specific semantics are used.

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted . Note that the requirement level of the document in which they are used modifies the force of these words.

- SHALL: This word means that the definition is an absolute requirement of the specification.
- SHALL NOT: This phrase means that the definition is an absolute prohibition of the specification.
- MUST: This word, or the terms “REQUIRED” or “SHALL”, mean that the definition is an absolute requirement of the specification.
- MUST NOT: This phrase, or the phrase “SHALL NOT”, means that the definition is an absolute prohibition of the specification.
- SHOULD: This word, or the adjective “RECOMMENDED”, mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
- SHOULD NOT: This phrase, or the phrase “NOT RECOMMENDED” mean that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
- MAY: This word, or the adjective “OPTIONAL”, means that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation, which does not include a particular option, MUST be prepared to interoperate with another implementation, which does include the option, though perhaps with reduced functionality. In the same vein an implementation, which does include a particular option,

MUST be prepared to interoperate with another implementation, which does not include the option (except, of course, for the feature the option provides.)

All requirements tables comply with the template TPS_StdT_00077.

2.2 Requirements structure

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, ...
- ...

3 Acronyms and abbreviations

The following glossary defines acronyms and terms that are not defined by the AUTOSAR glossary.

Abbreviation/Acronym	Description
Routing Configuration	Configuration data that controls the operation of the PDU Router and Signal Gateway. The configuration data defines the destination for each PDU of the PDU Router and each Signal of the signal gateway. The routing configuration should be encapsulated in a way that allows an update.
Gw	Abbreviation of signal based gateway.
Gatewaying-on-the-fly	PDU Gateway capability; routing between two TP modules where forwarding of data is started (when a specified threshold is reached) before all data have been received.

4 Functional overview

The AUTOSAR Gateway functionality consists of two parts:

- Gateway functionality on PDU level (pdu-based gateway), provided by the PDU Router module
- Gateway functionality on signal level (signal-based gateway), provided by the Signal Gateway, which is integral part of COM.

In addition to the gateway functionality on PDU level, the PDU Router also provides routing of PDUs up and down the communication stack, (e.g. between COM and communication interface modules (CAN, LIN, FlexRay), and similarly between DCM and transport protocol modules (CAN, LIN, FlexRay)) in addition connection to I-PDU multiplexer.

Figure 4.1 shows an overview of the AUTOSAR communication architecture and the interaction of PDU Router and Signal Gateway with other components of the AUTOSAR architecture.

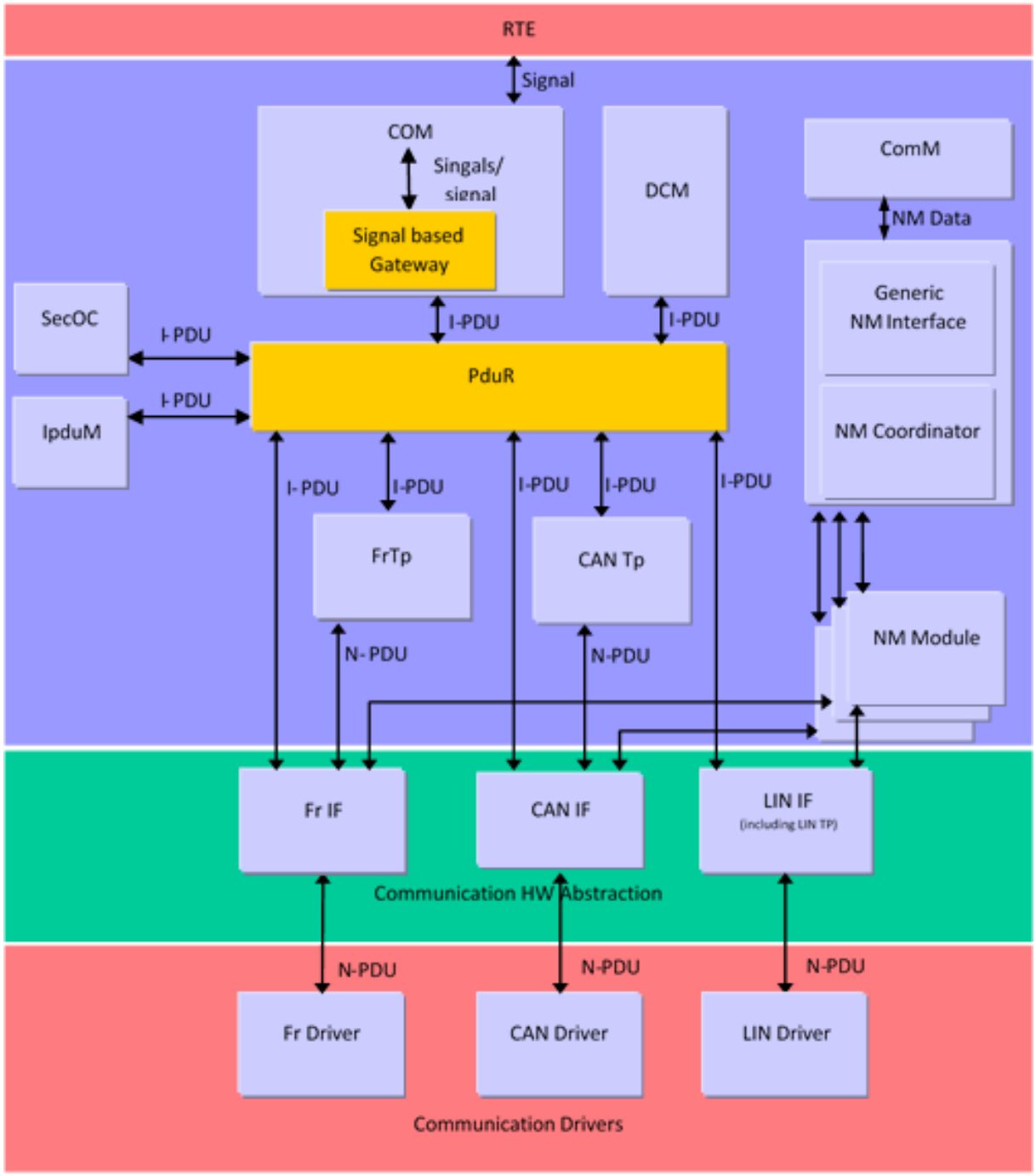

Figure 4.1: Interaction of gateway components with other modules of the AUTOSAR communication structure. Signal gateway is integral part of COM (only present if required).

4.1 PDU Router

- Provides transport of PDUs between
  - communication interface layers, upper service layers and IPDUM;
  - TP modules and upper service layers;
  - different communication interface layers;
  - different TP modules

  initiated by a PDU routing trigger.
- PDU routing trigger may be generated by the CAN, LIN, or FlexRay interfaces, the corresponding TP modules, the service layers COM and DCM or IPDUM.
- The size of the Routing Configuration is ECU specific, and statically configurable (down to zero size if e.g. no PDU level gateway functionality is needed).
- Provides TP routing on-the-fly. This means that transfer of TP data is started before full TP data is buffered. The gateway therefore provides a buffer to the receiving TP module which is smaller than the overall data length. When this buffer is filled, the gateway starts transmitting these data on the destination bus. In parallel, the receiving TP module get another buffer. Then data are received on the receiving TP module and in parallel transmitted by the transmitting TP module.

4.2 Signal Gateway

- Provides mapping of signals or groups of signals (Complex Data Types), initiated by a signal routing trigger.
- Signal routing trigger is generated by COM core functionality.
- Signal Gateway uses packing/unpacking mechanisms and timeout handling mechanisms of COM.

5 Requirements Tracing

Feature	Description	Satisfied by
[RS_BRF_01088]	AUTOSAR shall offer interfaces which allow to express high level application communication needs	[SRS_GTW_06123]
[RS_BRF_01136]	AUTOSAR shall support variants of configured BSW data resolved after system start-up	[SRS_GTW_06120]
[RS_BRF_01152]	AUTOSAR shall support limited dynamic reconfiguration	[SRS_GTW_06002] [SRS_GTW_06097]

[RS_BRF_01576]	AUTOSAR communication shall support a signal gateway	[SRS_GTW_06001] [SRS_GTW_06003] [SRS_GTW_06004] [SRS_GTW_06055] [SRS_GTW_06056] [SRS_GTW_06061] [SRS_GTW_06064] [SRS_GTW_06077] [SRS_GTW_06089] [SRS_GTW_06098] [SRS_GTW_06099]
[RS_BRF_01584]	AUTOSAR communication shall support an IPDU gateway	[SRS_GTW_06001] [SRS_GTW_06003] [SRS_GTW_06004] [SRS_GTW_06012] [SRS_GTW_06020] [SRS_GTW_06026] [SRS_GTW_06029] [SRS_GTW_06030] [SRS_GTW_06032] [SRS_GTW_06049] [SRS_GTW_06103] [SRS_GTW_06104] [SRS_GTW_06105] [SRS_GTW_06106] [SRS_GTW_06114] [SRS_GTW_06115] [SRS_GTW_06116] [SRS_GTW_06117] [SRS_GTW_06119] [SRS_GTW_06120] [SRS_GTW_06121] [SRS_GTW_06122] [SRS_GTW_06123] [SRS_GTW_06124] [SRS_GTW_06125] [SRS_GTW_06126] [SRS_GTW_06127]
[RS_BRF_01632]	AUTOSAR communication shall support data consistency of groups of signals	[SRS_GTW_06049] [SRS_GTW_06056]
[RS_BRF_01728]	AUTOSAR communication shall support J1939 transport protocol	[SRS_GTW_06121]

6 Requirements Specification

6.1 Functional Requirements

6.1.1 General Gateway

[SRS_GTW_06001] Gateway shall be only be reconfigured while the configuration table to be reconfigured is not in use ⌈

Description:	Gateway can only be reconfigured while the configuration table to be reconfigured is not in use (e.g. during programming mode). Reconfiguration during normal operation (application running and configuration table is in use) shall not be possible.
Rationale:	Changes during normal operation are regarded as safety risk.
Use Case:	–
Dependencies:	[SRS_GTW_06002]
Supporting Material:	–

⌋*(RS_BRF_01576, RS_BRF_01584)*

[SRS_GTW_06002] The Routing Configuration shall be updateable at post-build time ⌈

Description:	The goal is to avoid re-compiling and re-loading of huge application binaries in case of minimal routing changes.
Rationale:	Changes during normal operation are regarded as safety risk.
Use Case:	A PDU has to be routed to an additional path.
Dependencies:	[SRS_GTW_06001]
Supporting Material:	–

⌋*(RS_BRF_01152)*

[SRS_GTW_06097] A Routing Configuration shall be identified by an unique ID number ⌈

Description:	A Routing Configuration shall be identified by an unique ID number. This number shall be accessible.
Rationale:	Diagnostic device shall read the present configuration.
Use Case:	–
Dependencies:	[SRS_GTW_06002]
Supporting Material:	–

⌋*(RS_BRF_01152)*

[SRS_GTW_06003] Static Routing Configuration shall be defined for gateways ⌈

Description:	The gateway does not support dynamic Routing Configuration. All routing paths are statically defined, and do not depend on the content of a PDU or signal.
Rationale:	Reduction of complexity, realization of deterministic gateways.
Use Case:	–
Dependencies:	–
Supporting Material:	–

⌋*(RS_BRF_01576, RS_BRF_01584)*

[SRS_GTW_06004] The chronological order of different instances shall be preserved ⌈

Description:	The chronological order of different instances of the same PDU or of different instances of the same signal has to be preserved. The loss of some instances of a PDU or signal does not break this rule. The Gateway does not have to preserve the order of different PDUs or different signals on the same bus, or of equal PDUs or equal signals sent on different buses.
Rationale:	No reordering of PDU instances and signal instances shall take place.
Use Case:	• The sequence of PDUs and signals may reflect the sequence of user actions. • The sequence of PDUs and signals reflects a sequence of commands to execute by an ECU.
Dependencies:	–
Supporting Material:	–

⌋*(RS_BRF_01576, RS_BRF_01584)*

6.1.2 Signal Gateway

This chapter contains the requirements of the signal gateway. The signal gateway is an integral part of COM and not a separate module. The APIs are specified in the COM SWS document.

[SRS_GTW_06055] The signal gateway shall provide a mechanism to route individual signals between I-PDUs in a 1:n fashion ⌈

Description:	The signal gateway shall provide a mechanism to route individual signals between I-PDUs in a 1:n fashion.
Rationale:	Routing of AUTOSAR signals.

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Use Case:	• A received signal can be forwarded to different buses. • A received signal can be forwarded to one bus and to RTE. • A TX signal from RTE can be forwarded to different buses. • Combine signals of ECUs (e.g. error signals or display signals) to reduce the amount of received I-PDUs of an ECU (e.g. instrument panel cluster). • Reduce the number of gateway sending I-PDUs (e.g. in case of multiple source I-PDUs with few transmission signals). • Adaptation of different payload length of the connected buses.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01576*)

[SRS_GTW_06056] Signal Groups shall be routed ⌈

Description:	The gateway shall provide a mechanism to route signal groups. The routing has to be atomic to keep the data consistent.
Rationale:	Routing of AUTOSAR signal groups. Individual signal information of a signal group needs to be kept consistent within the group during routing the signal group.
Use Case:	• Allow distribution of signal groups between buses. • Combine signal groups of ECUs (e.g. error signals or display signals) to reduce the amount of received PDUs of an ECU (e.g. instrument panel cluster). • Reduce the number of sending-PDUs sent by gateway (e.g. in case of multiple source PDUs with few transmission signal groups). • Adaptation of different payload length of the connected buses.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01632*, *RS_BRF_01576*)

[SRS_GTW_06061] Routers shall map only signals ⌈

Description:	The functionality of the router is mapping of signals — not changing the contents or types of signals.
Rationale:	The signal gateway shall router only.
Use Case:	Examples: No shift from an 8 bit signal to a 6 bit signal; no merging of two signals into one signal. Such changes belongs to application SW.

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Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01576*)

[SRS_GTW_06098] Signal Gateway Error shall be handled with signal routing ⌈

Description:	The Signal Gateway shall provide the following error handling for *Single signal*: 1. Receive signal request returns with “unknown signal ID” (configuration error) Handling: Report to DET. 2. Send signal request reports “unknown signal ID” (configuration error) Handling: Report to DET. Development errors have to be reported to DET. A configuration error is e.g. a signal ID which is out of range.
Rationale:	Signal gateway can only detect some configuration errors but no runtime errors.
Use Case:	It is impossible to forward a signal to be routed because of a configuration error.
Dependencies:	[2, SRS BSW General]
Supporting Material:	–

⌋(*RS_BRF_01576*)

[SRS_GTW_06099] Signal Gateway Error shall be handled with signal group routing ⌈

Description:	The Signal Gateway shall provide the following error handling for *Single Group*: 1. One of the receive signal requests returns with “unknown signal ID” (configuration error) Handling: Report to DET. 2. One of the send signal requests returns with “unknown signal ID” (configuration error) Handling: Report to DET. Development errors have to be reported to DET. A configuration error is e.g. a signal ID which is out of range.
Rationale:	Signal gateway can only detect some configuration errors but no runtime errors.
Use Case:	It is impossible to forward a signal to be routed because of a configuration error.
Dependencies:	–
Supporting Material:	[2, SRS BSW General]

⌋(*RS_BRF_01576*)

[SRS_GTW_06077] Multiple signals of the same PDU shall be routed ⌈

Description:	The transmission of the target PDU(s) has to be triggered if and only if all signals of the related source PDU have been copied. Example: Two signals A and B are received by COM in the same source PDU. Both signals shall be routed to the same target bus using the Signal gateway. Both signals are configured to be transmitted on the target bus in the same PDU. Then it shall be avoided that each signal triggers the transmission of one instance of the same target PDU. It shall be ensured, that for both signals together only one instance of the target PDU is produced.
Rationale:	To keep bandwidth usage small, it is necessary to put different signals (with the same periodicity) into one PDU. It is not reasonable to define a signal group for signals of different source applications, even if these applications are located at the same ECU.
Use Case:	Some signals of one received PDU have to be copied into one transmit PDU by the gateway ECU.
Dependencies:	–
Supporting Material:	There are two approaches to fulfill this requirement: 1. Treat this requirement as an implementation requirement for COM. The consequence would be that access from RTE to COM would be done using the blocking mechanism — even if not required! 2. Treat this requirement as a requirement for the configuration tool. The configuration tool can define a “local” signal group for the router. The COM of the gateway ECU will then use the mechanism which are used for signal groups. Keep in mind that according to actual COM SRS (see COM SRS glossary) a signal group must be continuous and cannot be separated by other signals between.

⌋(*RS_BRF_01576*)

6.1.3 PDU Router

[SRS_GTW_06012] PDU router shall route non-TP PDUs with transparency between layers ⌈

Description:	PDU router shall route PDUs without any payload or rate modifications between local communication interface layers and local upper software layers. • If the communication bus is able to handle PDU’s which are bigger or smaller then statically configured, the PDU shall be routed with the actual received length. • If the communication bus or routing software is not able to handle a greater length, the PDU shall be cut. • If the bus is not able to handle smaller length the PDU shall not be routed. • A local receiver of the PDU (e.g. COM) shall always be able to handle a PDU with a smaller or bigger length.

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Rationale:	This layer allows the construction of a PDU based router and handles the distribution of PDUs between the communication interface layers and COM. The payload is not modified in any way.
Use Case:	• Direct routing of PDUs without modification from any bus to COM and vice versa. • Direct routing of PDUs without modification from one communication interface bus to another communication interface bus. • Use an old ECU (which send a smaller DLC) in a new network cluster. • Use 2 new ECU's (have a larger DLC) with an old gateway.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06026] Data buffers for TP shall be provided on request ⌈

Description:	• **In the gateway case**: The PDU router provides data buffers for forwarding TP data on request. • **In the non-gateway case**: DCM provides data buffers for transmitting and receiving TP data on request. Furthermore the PDU Router manages the on-the-fly gatewaying of these data buffers.
Rationale:	Save buffer memory and reduce latency of forwarding TP data.
Use Case:	• Diagnostic tester communicates with an ECU connected to a different bus. • Diagnostic tester communicates with the (this PDU Router) hosting ECU itself.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06029] The PDU Router shall be able to support routing of TP PDUs independent from the source to more than one destinations ⌈

Description:	The PDU Router shall be able to support routing of TP PDUs independent from the source (bus interface or DCM) to more than one destinations, e.g.CanTp, FrTp, and it's own DCM.
Rationale:	Gateway ECU should support multicast.
Use Case:	TesterPresent to maintain diagnostic on all ECUs.
Dependencies:	–

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Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06030] Routing of non-TP PDUs to more than one destination independent from the source shall be supported by the PDU Router ⌈

Description:	Routing of non-TP PDUs to more than one destination (e.g. multiple communication buses, local COM) independent from the source (bus interface or COM) shall be supported by the PDU Router.
Rationale:	Sending or routing of multicast non-TP PDUs.
Use Case:	Broadcast, e.g. keyPosition: send out key information to all ECUs.
Dependencies:	[SRS_GTW_06012]
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06125] Multicast implementation in PduR shall behave such that the source module does not need to know that there is more than one destination module configured ⌈

Description:	Multicast implementation in PduR shall behave such that the source module does not need to know that there is more than one destination module configured. It suffices that a transmission is successful on one of the destinations for the whole operation to be successful. Cancellation, however, is only successful if nothing has been sent, which is the case when the cancellation is successful on all destinations.
Rationale:	The PduR should implement the multicast transparently and robustly. If the source module needs individual feedback from all destination modules, it shall use separate I-PDUs.
Use Case:	Multicast transmissions.
Dependencies:	[SRS_GTW_06029], [SRS_GTW_06030], [SRS_GTW_06119]
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06126] Routing of non-TP PDUs from more than one source to one destination using a FIFO shall be supported by the PDU Router ⌈

Description:	Routing of non-TP PDUs from more than one source to one destination using a FIFO shall be supported by the PDU Router. Incoming data from more than one source shall be buffered in a FIFO. The PduR shall forward the received data according to the chronological order. If the source modules need a feedback from the destination module, it shall use separate I-PDUs.
Rationale:	–
Use Case:	Fan-in of PDUs.
Dependencies:	[SRS_GTW_06030], [SRS_GTW_06119]
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06127] Routing of TP PDUs from more than one source to one destination using a FIFO shall be supported by the PDU Router ⌈

Description:	Routing of TP PDUs from more than one source to one destination using a FIFO shall be supported by the PDU Router. Incoming data from more than one source shall be buffered in a FIFO. The PduR shall forward the received data according to the chronological order. If the source modules need a feedback from the destination module, it shall use separate I-PDUs.
Rationale:	–
Use Case:	Fan-in of PDUs.
Dependencies:	[SRS_GTW_06030], [SRS_GTW_06119]
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06032] The non-TP transmit buffering strategy shall be configured for each PDU to be routed by the PDU Router ⌈

Description:	PDU buffering strategy elements: • **Buffer size**: number of buffers for each PDU can vary from 1 to n, if n > 1 Buffer is a FIFO; • **Buffer Overwrite**: If buffer is full, the buffer shall be flushed and the new value shall be forwarded to interface; • **TriggerTransmit in case of empty buffe**: If interface requests a value but PDU Router Buffer is empty the most recent value shall be provided, if there has been no transmission before, the most recent value shall be the default value. The strategy shall be configured for each PDU to be routed by the PDU Router. Only teh youngest PDUs are transmitted (buffer size equals 1) or up to n received PDUs are to be processed and routed without any data leakage. A PDU can also be configured to have no buffer. If the received PDU is bigger than the configured PDU length, the PDU Router shall cut the message and only the part of the message can be stored in the buffer.

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Rationale:	It can be necessary to handle a sequence of instances of the same PDU in a way, that no instance is lost and their order has to be preserved.
Use Case:	• Usage of cycle counter information in normal PDUs. • Usage of other transport protocols (e.g. MCNet).
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06124] The TP transmit buffering strategy shall be configured for each PDU to be routed by the PDU Router ⌈

Description:	TP PDUs shall be buffered depending on their size. Single frame PDUs shall be stored in dedicated buffers, while multi frame PDUs can be stored in buffers which are dynamically allocated from a buffer pool.
Rationale:	Single frame PDUs, especially functional diagnostic requests and OBD requests, have a higher priority than multi frame PDUs. While a delay caused by dynamic buffer allocation is acceptable for large PDUs, it is not for OBD requests.
Use Case:	OBD requests must adhere to strict timing constraints, which are easily broken by dynamic buffer allocation.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06049] PDU buffer content shall be consistent during the time needed to read this data ⌈

Description:	In case the PDU Router stores PDUs in PDU buffers it shall be guaranteed that the stored data is kept consistent during the time needed to read this data.
Rationale:	Data consistency.
Use Case:	Avoidance of inconsistent data. Guarantee that during writing e.g. a 16-byte-long variable, another task may not read the data.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01632*, *RS_BRF_01584*)

[SRS_GTW_06103] PDU Router error shall be provided for unknown PDU-ID ⌈

Description:	The PDU Router shall provide the following error handling: In case a PDU Router is called with an unknown PDU-ID (out of range), the PDU Router shall ignore the error and report to DET.
Rationale:	Handle development and runtime errors.
Use Case:	Handle development and runtime errors.
Dependencies:	–
Supporting Material:	[2, SRS BSW General]

⌋(*RS_BRF_01584*)

[SRS_GTW_06104] PDU Router error shall be provided for local reception or transmission ⌈

Description:	The PDU Router shall provide the following error handling for local reception or transmission: 1. Transmission request to interface module returns with error Handling: Return error to upper layer (COM). In case all transmit requests returned with error, then multicast error is returned to COM. 2. Receiving TP module reports an error Handling: Return error to upper layer (DCM). 3. Receiving interface module reports an error Handling: Return error to upper layer (COM). 4. Transmission request to TP module returns with error Handling: Return error to upper layer (DCM). In case all transmit requests returned with error, then multicast of a single-frame TP error is returned to DCM. 5. Transmitting TP module reports an error Handling: Forward error indication to upper layer (DCM). In case of multicast transmission, an indication with error is forwarded to DCM if at least one error indication is received from a TP module.
Rationale:	Handle development and runtime errors.
Use Case:	Handle development and runtime errors.
Dependencies:	–
Supporting Material:	[2, SRS BSW General]

⌋(*RS_BRF_01584*)

[SRS_GTW_06105] PDU Router error shall be provided in gateway case ⌈

Description:	The PDU Router shall provide the following error handling in gateway case: 1. Transmission request to interface module returns with error (when using the function call to lower layer) Handling: Ignore that error in the non-FIFO case, send next element in the FIFO case. 2. Transmitting interface reports an error (in case of notification “asynchronous call” by lower layer) Handling: Ignore that error. 3. Receiving TP module reports an error Handling: Release TP buffer. Do not continue TP transmission. 4. Transmission request to TP module returns with error Handling: Do not continue TP reception. 5. Transmitting TP module reports an error Handling: Release TP buffer. Do not continue TP reception.
Rationale:	Handle development and runtime errors.
Use Case:	Handle development and runtime errors.
Dependencies:	–
Supporting Material:	[2, SRS BSW General]

⌋(*RS_BRF_01584*)

[SRS_GTW_06106] PDU Router error shall be provided for FIFO handling ⌈

Description:	The PDU Router shall provide the following error handling for FIFO handling: PDU Router shall report a loss of a PDU instance to DEM if and only if it is configured to store this PDU instances in a FIFO (of size 2 or more) within the PDU Router.
Rationale:	Handle development and runtime errors.
Use Case:	Handle development and runtime errors.
Dependencies:	–
Supporting Material:	[2, SRS BSW General]

⌋(*RS_BRF_01584*)

[SRS_GTW_06119] Confirmation in case of multicast ⌈

Description:	In case of communication interface multicast transmission, the PDU Router shall forward the first transmit confirmation received from a lower layer. Forwarding can be disabled by configuration.
Rationale:	Transparent behavior of PDU Router in view of the upper layer. Since the upper layer local module is not aware if it is a multicast or not, it may become a problem if they are expecting transmit confirmation.

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Use Case:	Multicast communication interface transmission.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06120] A predefined set of PDUs shall be enabled and disabled if required ⌈

Description:	It shall be possible to configure the PDU Gateway in such a way, that PDU-routing of a predefined set of PDUs can be enabled and disabled.
Rationale:	–
Use Case:	According to ISO 14229-1(Service $28) it shall be possible to disable normal communication and at the same time keep a predefined set of PDUs active, including diagnostic communication. In that case a PDU Gateway is only allowed to transmit a predefined set of PDUs.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01136*, *RS_BRF_01584*)

6.2 Non-Functional Requirements

6.2.1 Signal Gateway

[SRS_GTW_06064] The signal gateway shall be scalable to zero size and zero resource usage when signal routing is not required ⌈

Description:	The signal gateway shall be scalable to zero size and zero resource usage when signal routing is not required.
Rationale:	This layer is important for some ECU structures, but in other ECUs, no additional overhead shall be introduced. To achieve this without any software implementation changing, the software (the signal gateway) shall be scalable.
Use Case:	It is required for ECUs with no gateway functionality (but the same software).
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01576*)

[SRS_GTW_06089] The timeout of a deadline monitored signal shall be ignored by the Signal Gateway ⌈

Description:	The timeout of a signal, which is deadline monitored and to be routed, shall be ignored by the Signal Gateway. Only the related transmit signals, which are to be deadline monitored, and which are not of types n-times or direct, shall be configured to have update bits. (Behaviour of COM: After transmission of a signal equipped with an update bit, the update bit will be cleared by COM automatically.)
Rationale:	Timeout indication of the source signal for receiver.
Use Case:	In case of general signal routing, the ECU behind the gateway must be able to detect that a timeout occurred.
Dependencies:	–
Supporting Material:	Timeout indication informs a receiver that the signals are not up-to-date because of a missing message (or a cleared update bit) on the source bus of the gateway. If the update bit is not handled during a timeout, it will remain cleared and the receiving node will inform the application with the help of deadline monitoring.

⌋(*RS_BRF_01576*)

6.2.2 PDU Router

If the PDU Router is used to route PDUs between two communication interface modules, without incorporation of COM, the minimum send interval for transmission on a CAN target bus can not be guaranteed.

[SRS_GTW_06020] The PDU Router resource usage shall be scalable to zero in case no PDU gateway ⌈

Description:	The PDU Router resource usage (memory and runtime) shall be scalable to zero in case no PDU gateway, no I-PDUM and no multicast functionality is needed.
Rationale:	This layer is necessary for some ECU structures, but in ECUs with no gateway functionality no additional overhead shall be introduced.
Use Case:	It is required for ECUs with no gateway functionality.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06114] The PDU Router provides an interface (API) for usage by COM, to use the PDU Router functionality ⌈

Description:	The PDU Router provides an interface for usage by COM, to use the PDU Router functionality. This API provides an interface for sending of non-TP PDUs.
Rationale:	An API is required, to use the functionality of the PDU Router.
Use Case:	COM sends a non TP-PDU to be forwarded to an bus interface.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06115] The PDU Router provides an interface (API) for usage by DCM, to use the PDU Router functionality ⌈

Description:	The PDU Router provides an interface for usage by DCM, to use the PDU Router functionality. This API provides an interface for sending of TP PDUs.
Rationale:	An API is required, to use the functionality of the PDU Router.
Use Case:	DCM sends a TP-PDU to be forwarded to a bus TP module.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06116] The PDU Router provides an interface (API) for usage by IpduM, to use the PDU Router functionality ⌈

Description:	The PDU Router provides an interface for usage by IpduM, to use the PDU Router functionality. This API provides an interface for: • Sending of non-TP PDUs • Reception Indication of non-TP PDUs • Transmit Confirmation for non-TP PDUs • TriggerTransmit call for non-TP PDUs
Rationale:	An API is required, to use the functionality of the PDU Router.
Use Case:	• IpduM sends a non-TP PDU to be forwarded to a bus interface. • IpduM notifies the reception of a received non-TP PDU.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06117] The PDU Router provides an interface (API) for usage by bus interfaces, to use the PDU Router functionality ⌈

Description:	The PDU Router provides an interface for usage by bus interfaces, to use the PDU Router functionality. This API provides an interface for: • Reception Indication of non-TP or TP PDUs • Transmit Confirmation for non-TP or TP PDUs • TriggerTransmit call for non-TP PDUs • Request a TP receive buffer or TP transmit buffer The PDU Router provided bus interfaces are: • CAN • FlexRay • LIN
Rationale:	An API is required, to use the functionality of the PDU Router.
Use Case:	• CAN-Interface notifies the reception of a received non-TP PDU.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06121] J1939 TP as an alternative to CAN TP (ISO 15765-2) shall be supported ⌈

Description:	By configuration the PDU Router shall support J1939 TP or CAN TP (ISO 15765-2) for the handling of long I-PDUs over CAN.
Rationale:	Support of SAE 1939.
Use Case:	–
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01728*, *RS_BRF_01584*)

[SRS_GTW_06122] The PDU Router shall provide a method that enables COM layer to request cancellation of I-PDU transmission ⌈

Description:	The PDU Router shall provide a method that enables COM layer to request cancellation of I-PDU transmission.
Rationale:	Needed to free buffers in the FlexRay interface.
Use Case:	Cancellation of an outdated I-PDU.

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Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01584*)

[SRS_GTW_06123] The PDU Router shall provide an interface (API) for usage by bus network management, to use the PDU Router functionality for partial networking ⌈

Description:	The PDU Router provides an interface for usage by bus network management, to use the PDU Router functionality for partial networking. This API provides an interface for: • Reception Indication of NM PDUs • Transmit Confirmation for NM PDUs • TriggerTransmit call for NM PDUs The PDU Router provided bus interfaces are: • CAN • FlexRay • UDP
Rationale:	An API is required, to use the PDU Router for the partial networking functionality in the connected Modules.
Use Case:	• CAN/Flexray/UDP network management notify the change of the Partial Network request information. • CAN/Flexray/UDP network management confirm the successful transmission of a NM PDU. • CAN/Flexray/UDP network management request for NM User Data.
Dependencies:	–
Supporting Material:	–

⌋(*RS_BRF_01088*, *RS_BRF_01584*)

7 References

7.1 Deliverables of AUTOSAR

[1] Standardization Template
AUTOSAR_TPS_StandardizationTemplate

[2] General Requirements on Basic Software Modules
AUTOSAR_SRS_BSWGeneral

7.2 Related standards and norms

ISO transport protocol specification http://www.iso.org