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# 1 Scope of Document

This document specifies requirements on the Bus Mirroring module (Mirror).

## 2 Conventions To Be Used

The representation of requirements in AUTOSAR documents follows the table specified in [TPS\_STDT\_00078], see Standardization Template [1], chapter Support for Traceability.

The verbal forms for the expression of obligation specified in [TPS\_STDT\_00053] shall be used to indicate requirements, see Standardization Template [1], chapter Support for Traceability.

### 3 Acronyms and Abbreviations

Currently, the Bus Mirroring module does not define any acronyms, abbreviations, or terms that are not defined in the [\[2, AUTOSAR glossary\]](#).

## 4 Requirements Specification

This chapter describes all requirements driving the work to define the Bus Mirroring module.

### 4.1 Functional Overview

Many communication buses in a vehicle are not directly accessible by a tester. The aim of the Bus Mirroring is to enable a tester to listen to the traffic on such internal communication buses.

To avoid flooding intermediate communication buses by traffic that needs to be re-routed over an internal bus, a filtering shall be configurable on each node involved in such a mirroring.

Testers connected via CAN shall receive unmodified CAN frames and LIN frames with special CAN IDs.

On intermediate CAN buses, the mirrored CAN and LIN frames shall be transmitted in the same way, possibly with re-mapped CAN IDs.

Testers connected via Ethernet shall receive a stream containing current time, identification, and content of CAN, LIN, and FlexRay frames. Ethernet frames shall be mirrored using the Port Mirroring feature of Ethernet switches.

On intermediate FlexRay, Ethernet, and proprietary buses, the same stream encoding as on external Ethernet connections is used. Proprietary buses are handled by CDDs, and may represent buses that are not controlled directly by AUTOSAR, virtual buses implemented in RAM, or communication buses that are not supported by AUTOSAR like I2C or MOST.

### 4.2 Functional Requirements

#### 4.2.1 Configuration

**[SRS\_Mirror\_00001] The source and destination buses shall be configurable [**

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall support configuration of the source buses and the destination buses used for mirroring. A bus shall not be configurable both as source and destination bus.
<b>Rationale:</b>	Configuration of the buses participating in the mirroring.





<b>Dependencies:</b>	–
<b>Use Case:</b>	Mirroring of CAN/LIN frames to CAN and CAN/LIN/FlexRay frames to FlexRay/Ethernet/CDD.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00002] Frame filters shall be configurable [**

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall support configuration of a set of static frame filters and a number of dynamically assignable frame filters. These filters shall be configurable separately for each source bus. The filters shall be inclusive – if no filter is active, no frames will be mirrored.
<b>Rationale:</b>	Reduce bus traffic on destination bus.
<b>Dependencies:</b>	–
<b>Use Case:</b>	Adaptation to actual use case.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00003] The queue size shall be configurable [**

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall support configuration of the number of transmitted frames that shall be queued on each destination bus.
<b>Rationale:</b>	The number of output frames that need to be stored strongly depends on the use case.
<b>Dependencies:</b>	–
<b>Use Case:</b>	Adaptation to actual use case.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00004] The collection method shall be configurable [**

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall support configuration of the collection method used for each destination bus. Frames are either forwarded and a status frame is created, or frames are collected together with status information.





△

<b>Rationale:</b>	The Bus Mirroring module shall make optimal usage of the frame size on the destination bus.
<b>Dependencies:</b>	–
<b>Use Case:</b>	Adaptation to actual use case.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00016] The re-mapping of CAN IDs and the mapping of LIN PIDs shall be configurable** [

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall support configuration of the rules that are applied to remap CAN IDs and map LIN PIDs to new CAN IDs.
<b>Rationale:</b>	The Bus Mirroring module shall be able to cope with different CAN ID ranges in a CAN destination bus.
<b>Dependencies:</b>	–
<b>Use Case:</b>	Adaptation to actual use case.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00014] Timings shall be configurable** [

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall support configuration of the timings related to status acquisition, status message transmission, and serialization.
<b>Rationale:</b>	The optimal timing depends strongly on the use case.
<b>Dependencies:</b>	–
<b>Use Case:</b>	Adaptation to actual use case.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

#### 4.2.2 Initialization

**[SRS\_Mirror\_00005] The Bus Mirroring module shall provide an interface for module initialization** [

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall provide an interface for initialization of all states and all global variables of the module. Before initialization, the Bus Mirroring module is inactive.
<b>Rationale:</b>	Basic functionality.
<b>Dependencies:</b>	–
<b>Use Case:</b>	ECU initialization.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

]([RS\\_Main\\_00651](#))

### 4.2.3 Normal Operation

**[SRS\_Mirror\_00006] The Bus Mirroring module shall collect incoming frames** [

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall provide interfaces for the collection of incoming CAN, LIN, and FlexRay frames.
<b>Rationale:</b>	Access to frames from different bus types.
<b>Dependencies:</b>	Configuration of source buses, see [ <a href="#">SRS_Mirror_00001</a> ].
<b>Use Case:</b>	Collect input frames.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

]([RS\\_Main\\_00651](#))

**[SRS\_Mirror\_00007] The Bus Mirroring module shall filter incoming frames** [

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall select incoming frames based on filters. If no filter is active, no source frames shall be mirrored. If filters are active, source frames that match at least one filter shall be mirrored.
<b>Rationale:</b>	Reduce bus traffic on destination bus.
<b>Dependencies:</b>	Configuration of filters, see [ <a href="#">SRS_Mirror_00002</a> ], and modification of filters, see [ <a href="#">SRS_Mirror_00011</a> ].
<b>Use Case:</b>	Monitor timeout of the response to a transmitted request message.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

]([RS\\_Main\\_00651](#))

**[SRS\_Mirror\_00008] The Bus Mirroring module shall serialize incoming frames and bus states** [

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall serialize incoming frames using a defined mirroring protocol. The protocol shall have a uniquely identifiable layout, and shall contain the time stamp, identification, and content of collected frames together with related bus status information.
<b>Rationale:</b>	Optimal use of bandwidth on buses with large frames.
<b>Dependencies:</b>	Configuration of collection method, see [SRS_Mirror_00004].
<b>Use Case:</b>	Mirroring from CAN/LIN/FlexRay to FlexRay/Ethernet/CDD.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00009] The Bus Mirroring module shall create a status frame [**

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall create a status frame containing information about irregular states of the source buses.
<b>Rationale:</b>	Status information is also interesting in CAN-CAN and LIN-CAN mirroring.
<b>Dependencies:</b>	Configuration of collection method, see [SRS_Mirror_00004].
<b>Use Case:</b>	Mirroring from CAN/LIN to CAN.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00013] The Bus Mirroring module shall queue output frames [**

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall queue all outgoing frames (direct CAN frames or serialized frames).
<b>Rationale:</b>	The destination bus cannot always cope with the speed messages are acquired from the source buses. Queueing can solve this problem if it is only temporal.
<b>Dependencies:</b>	Configuration of collection method, see [SRS_Mirror_00003].
<b>Use Case:</b>	Compensation of message bursts on one or more source buses.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00010] The Bus Mirroring module shall provide an interface to control the mirroring state [**

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall provide an interface for setting the destination bus, for activation and deactivation of source buses, and for disabling the mirroring completely.
<b>Rationale:</b>	Mirroring is only required in certain circumstances and shall be disabled otherwise.
<b>Dependencies:</b>	–
<b>Use Case:</b>	Runtime control of mirroring.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00011] The Bus Mirroring module shall provide an interface to control the active filters** [

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall provide an interface for the activation and deactivation of preconfigured filters and for adding new filters and removing them again.
<b>Rationale:</b>	To reduce bus load, only the interesting part of the traffic shall be mirrored.
<b>Dependencies:</b>	Configuration of filters, see [SRS_Mirror_00002]
<b>Use Case:</b>	Runtime control of frame filtering.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

**[SRS\_Mirror\_00012] The Bus Mirroring module shall provide an interface for module shutdown** [

<b>Type:</b>	valid
<b>Description:</b>	The Bus Mirroring module shall provide an interface for de-initialization of the module.
<b>Rationale:</b>	Basic functionality.
<b>Dependencies:</b>	–
<b>Use Case:</b>	ECU shutdown, ECU degradation.
<b>Supporting Material:</b>	Concept 634 “Bus Mirroring”

](RS\_Main\_00651)

## 5 Requirements Tracing

The following table references the requirements specified in [3] and links to the fulfillment of these. Please note that if column “Satisfied by” is empty for a specific requirement this means that this requirement is not fulfilled by this document.

Requirement	Description	Satisfied by
[RS_Main_00651]	AUTOSAR shall support mirroring of CAN, LIN, and FlexRay to CAN, FlexRay, Ethernet, or proprietary networks	<a href="#">[SRS_Mirror_00001]</a> <a href="#">[SRS_Mirror_00002]</a> <a href="#">[SRS_Mirror_00003]</a> <a href="#">[SRS_Mirror_00004]</a> <a href="#">[SRS_Mirror_00005]</a> <a href="#">[SRS_Mirror_00006]</a> <a href="#">[SRS_Mirror_00007]</a> <a href="#">[SRS_Mirror_00008]</a> <a href="#">[SRS_Mirror_00009]</a> <a href="#">[SRS_Mirror_00010]</a> <a href="#">[SRS_Mirror_00011]</a> <a href="#">[SRS_Mirror_00012]</a> <a href="#">[SRS_Mirror_00013]</a> <a href="#">[SRS_Mirror_00014]</a> <a href="#">[SRS_Mirror_00016]</a>

## 6 References

- [1] Standardization Template  
AUTOSAR\_TPS\_StandardizationTemplate
- [2] Glossary  
AUTOSAR\_TR\_Glossary
- [3] Main Requirements  
AUTOSAR\_RS\_Main