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Known Limitations of the Current Document

Sequence diagrams and other diagrams have not yet been modeled in the BSW UML model, wherefore [chapter 9](#) is still empty.

1 Introduction and Functional Overview

This specification describes the functionality, the API, and the configuration for the AUTOSAR Basic Software module Bus Mirroring.

The purpose of the Bus Mirroring module is the replication of the traffic and the state of internal buses to an external bus, such that a tester connected to that external bus can monitor internal buses for debugging purposes.

The monitored traffic can be configured by the tester using diagnostic commands to the intermediate ECUs (gateways, controllers of sub-buses). Using the diagnostics protocol ensures that mirroring cannot be enabled without passing security checks.

The terms `Bus` and `Network` are used as synonyms within this specification. In most AUTOSAR specifications, the term `Network` is preferred, and therefore it is used when referring to API parameters, to the configuration, or to the protocol layout. On the other hand, the module is called Bus Mirroring, and because of this the term `Bus` is used when the mirroring direction is considered, like in “source bus” or “destination bus”.

2 Acronyms and Abbreviations

Currently, the Bus Mirroring module does not define any acronyms, abbreviations, or terms that are not defined in the [1, AUTOSAR glossary].

3 Related Documentation

3.1 Input Documents & Related Standards and Norms

- [1] Glossary
AUTOSAR_TR_Glossary
- [2] General Specification of Basic Software Modules
AUTOSAR_SWS_BSWGeneral
- [3] Requirements on Bus Mirroring
AUTOSAR_SRS_BusMirroring
- [4] General Requirements on Basic Software Modules
AUTOSAR_SRS_BSWGeneral

3.2 Related Specification

AUTOSAR provides a General Specification on Basic Software modules [2, SWS BSW General], which is also valid for the Bus Mirroring module.

Thus, the specification SWS BSW General shall be considered as additional and required specification for the Bus Mirroring module.

4 Constraints and Assumptions

4.1 Limitations

The Bus Mirroring module cannot be used to influence the traffic on one of the buses configured as a source bus. To ensure this and to avoid loop-back of messages leading to bus overload, the generation tool shall ensure that no bus is connected to the Bus Mirroring module both as source and destination bus (see [SWS_Mirror_00001]).

The Bus Mirroring module is controlled by a diagnostic control application through the dedicated (service) API listed in chapter 8. The control functionality is made accessible to a diagnostic tester by special diagnostic services, which are handled by the DCM and implemented by the diagnostic control application. The DCM provides the necessary security to exclude inadvertent activation of the Bus Mirroring. The Bus Mirroring module does not provide another control interface, and it does not receive control messages on the destination bus.

In general, the Bus Mirroring module does not support source buses that have a larger frame size or more additional information than the destination bus can carry, e.g. CAN-FD to CAN, CAN to LIN, FlexRay to CAN, Ethernet to CAN, or Ethernet to FlexRay. The Bus Mirroring module does not fragment mirrored frames.

The Bus Mirroring module will only mirror traffic that is actually received or transmitted by the bus interface modules. For CAN this means that besides the transmitted frames only those data frames that pass the hardware filter will be mirrored, and that remote frames and error frames will not be mirrored. For LIN, slave-to-slave communication will not be mirrored by a LIN master. And for FlexRay, only transmitted frames and those received frames for which reception buffers are assigned (possibly as a FIFO) will be mirrored.

Another limitation of the mirroring from a FlexRay source bus concerns the reported time stamps and cycles. The `Timestamp` reported for a FlexRay frame contains the time when the corresponding job list entry was executed. The actual transmission time has to be calculated from the slot ID contained in the reported `FrameID`. The cycle contained in the reported `FrameID` is accurate only for received frames and frames transmitted in the static segment. For frames transmitted in the dynamic segment, the reported cycle can be inaccurate because it can happen that a frame cannot be transmitted in the expected cycle, it is then deferred to the next suitable cycle.

A re-serialization of received serialized frames shall not be done by the Bus Mirroring module, because that would require too much resources. Instead, the serialized PDUs shall be routed directly to the destination bus.

The Bus Mirroring module will also not support the forwarding from Ethernet to Ethernet. This use case is already covered by the Port Mirroring feature of the AUTOSAR Ethernet Switch Driver.

4.2 Applicability to Car Domains

The Bus Mirroring module can be used in all kinds of vehicles that feature external CAN and/or Ethernet connectors, e.g. a Diagnostic connector.

5 Dependencies to Other Modules

The Bus Mirroring module has interfaces towards the CAN Interface (CanIf), the LIN Interface (LinIf), the FlexRay Interface (FrIf), the PDU Router (PduR), the Default Error Tracer (DET), and the diagnostic application, which accesses either the service port API via the AUTOSAR Runtime Environment (RTE) or the Complex Drivers (CDD) API of the Bus Mirroring module.

The Bus Mirroring module includes header files of CanIf, LinIf, FrIf, PduR, DET, StbM, and the RTE.

5.1 File Structure

This section explains the file structure of the Bus Mirroring module.

5.1.1 Code File Structure

For details, refer to the section 5.1.6 “Code file structure” in [2, SWS BSW General].

5.1.2 Header File Structure

Besides the files defined in section 5.1.7 “Header file structure” in [2, SWS BSW General], the Bus Mirroring module needs to include the files defined below.

[SWS_Mirror_00142] [The Bus Mirroring module shall include the header file `CanIf.h` if at least one `MirrorSourceNetworkCan` is configured.] (*SRS_Mirror_00001*)

[SWS_Mirror_00143] [The Bus Mirroring module shall include the header file `LinIf.h` if at least one `MirrorSourceNetworkLin` is configured.] (*SRS_Mirror_00001*)

[SWS_Mirror_00144] [The Bus Mirroring module shall include the header file `FrIf.h` if at least one `MirrorSourceNetworkFlexRay` is configured.] (*SRS_Mirror_00001*)

[SWS_Mirror_00147] [The Bus Mirroring module shall include the header file `StbM.h` if at least one `MirrorDestNetworkFlexRay`, `MirrorDestNetworkIp`, or `MirrorDestNetworkCdd` is configured.] (*SRS_Mirror_00001*)

6 Requirements Tracing

The following table references the requirements specified in [3, SRS Bus Mirroring] and [4, SRS BSW General] 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 |
|---------------------|--|--|
| [SRS_BSW_00350] | All AUTOSAR Basic Software Modules shall allow the enabling/disabling of detection and reporting of development errors. | [SWS_Mirror_00004] [SWS_Mirror_00005] |
| [SRS_BSW_00385] | List possible error notifications | [SWS_Mirror_00007] [SWS_Mirror_00008] |
| [SRS_BSW_00406] | A static status variable denoting if a BSW module is initialized shall be initialized with value 0 before any APIs of the BSW module is called | [SWS_Mirror_00002] |
| [SRS_BSW_00450] | A Main function of a un-initialized module shall return immediately | [SWS_Mirror_00004] |
| [SRS_BSW_00459] | It shall be possible to concurrently execute a service offered by a BSW module in different partitions | [SWS_Mirror_00166] [SWS_Mirror_00167] [SWS_Mirror_00168] [SWS_Mirror_00169] |
| [SRS_BSW_00478] | Timing limits of main functions | [SWS_Mirror_00006] |
| [SRS_Mirror_-00001] | The source and destination buses shall be configurable | [SWS_Mirror_00001] [SWS_Mirror_00142] [SWS_Mirror_00143] [SWS_Mirror_00144] [SWS_Mirror_00147] [SWS_Mirror_CONSTR_00001] [SWS_Mirror_CONSTR_00002] [SWS_Mirror_CONSTR_00003] [SWS_Mirror_CONSTR_00004] |
| [SRS_Mirror_-00005] | The Bus Mirroring module shall provide an interface for module initialization | [SWS_Mirror_00002] [SWS_Mirror_00009] [SWS_Mirror_00013] [SWS_Mirror_00016] |
| [SRS_Mirror_-00006] | The Bus Mirroring module shall collect incoming frames | [SWS_Mirror_00021] [SWS_Mirror_00029] [SWS_Mirror_00038] |

| Requirement | Description | Satisfied by |
|---------------------|---|--|
| [SRS_Mirror_-00007] | The Bus Mirroring module shall filter incoming frames | [SWS_Mirror_00017] [SWS_Mirror_00018] [SWS_Mirror_00021] [SWS_Mirror_00022] [SWS_Mirror_00023] [SWS_Mirror_00024] [SWS_Mirror_00025] [SWS_Mirror_00029] [SWS_Mirror_00030] [SWS_Mirror_00031] [SWS_Mirror_00032] [SWS_Mirror_00033] [SWS_Mirror_00038] [SWS_Mirror_00039] [SWS_Mirror_00040] |
| [SRS_Mirror_-00008] | The Bus Mirroring module shall serialize incoming frames and bus states | [SWS_Mirror_00026] [SWS_Mirror_00034] [SWS_Mirror_00035] [SWS_Mirror_00041] [SWS_Mirror_00042] [SWS_Mirror_00043] [SWS_Mirror_00044] [SWS_Mirror_00045] [SWS_Mirror_00046] [SWS_Mirror_00047] [SWS_Mirror_00048] [SWS_Mirror_00049] [SWS_Mirror_00050] [SWS_Mirror_00055] [SWS_Mirror_00056] [SWS_Mirror_00057] [SWS_Mirror_00058] [SWS_Mirror_00059] [SWS_Mirror_00060] [SWS_Mirror_00061] [SWS_Mirror_00062] [SWS_Mirror_00063] [SWS_Mirror_00064] [SWS_Mirror_00065] |

| Requirement | Description | Satisfied by |
|-------------|-------------|--|
| | | [SWS_Mirror_00066] [SWS_Mirror_00067] [SWS_Mirror_00068] [SWS_Mirror_00069] [SWS_Mirror_00070] [SWS_Mirror_00071] [SWS_Mirror_00072] [SWS_Mirror_00073] [SWS_Mirror_00074] [SWS_Mirror_00075] [SWS_Mirror_00076] [SWS_Mirror_00077] [SWS_Mirror_00078] [SWS_Mirror_00079] [SWS_Mirror_00080] [SWS_Mirror_00081] [SWS_Mirror_00082] [SWS_Mirror_00083] [SWS_Mirror_00084] [SWS_Mirror_00085] [SWS_Mirror_00086] [SWS_Mirror_00087] [SWS_Mirror_00088] [SWS_Mirror_00089] [SWS_Mirror_00090] [SWS_Mirror_00091] [SWS_Mirror_00092] [SWS_Mirror_00093] [SWS_Mirror_00094] [SWS_Mirror_00095] [SWS_Mirror_00096] [SWS_Mirror_00097] [SWS_Mirror_00098] [SWS_Mirror_00099] [SWS_Mirror_00100] [SWS_Mirror_00101] [SWS_Mirror_00102] [SWS_Mirror_00103] [SWS_Mirror_00104] [SWS_Mirror_00105] [SWS_Mirror_00106] [SWS_Mirror_00107] [SWS_Mirror_00108] [SWS_Mirror_00109] [SWS_Mirror_00110] [SWS_Mirror_00111] [SWS_Mirror_00112] [SWS_Mirror_00146] [SWS_Mirror_00159] |

| Requirement | Description | Satisfied by |
|---------------------|--|--|
| [SRS_Mirror_-00009] | The Bus Mirroring module shall create a status frame | [SWS_Mirror_00026] [SWS_Mirror_00034] [SWS_Mirror_00035] [SWS_Mirror_00041] [SWS_Mirror_00042] [SWS_Mirror_00123] [SWS_Mirror_00124] [SWS_Mirror_00125] [SWS_Mirror_00126] [SWS_Mirror_00127] [SWS_Mirror_00128] [SWS_Mirror_00129] [SWS_Mirror_00131] [SWS_Mirror_00132] [SWS_Mirror_00133] [SWS_Mirror_00134] [SWS_Mirror_00135] [SWS_Mirror_00136] [SWS_Mirror_00146] [SWS_Mirror_00149] |
| [SRS_Mirror_-00010] | The Bus Mirroring module shall provide an interface to control the mirroring state | [SWS_Mirror_00012] [SWS_Mirror_00014] [SWS_Mirror_00015] [SWS_Mirror_00019] [SWS_Mirror_00020] [SWS_Mirror_00027] [SWS_Mirror_00028] [SWS_Mirror_00036] [SWS_Mirror_00037] [SWS_Mirror_00138] |
| [SRS_Mirror_-00011] | The Bus Mirroring module shall provide an interface to control the active filters | [SWS_Mirror_00138] |
| [SRS_Mirror_-00012] | The Bus Mirroring module shall provide an interface for module shutdown | [SWS_Mirror_00003] |

| Requirement | Description | Satisfied by |
|----------------------------|---|--|
| [SRS_Mirror_-00013] | The Bus Mirroring module shall queue output frames | [SWS_Mirror_00011] [SWS_Mirror_00048] [SWS_Mirror_00049] [SWS_Mirror_00050] [SWS_Mirror_00051] [SWS_Mirror_00052] [SWS_Mirror_00053] [SWS_Mirror_00054] [SWS_Mirror_00113] [SWS_Mirror_00119] [SWS_Mirror_00120] [SWS_Mirror_00121] [SWS_Mirror_00122] [SWS_Mirror_00125] [SWS_Mirror_00126] [SWS_Mirror_00137] [SWS_Mirror_00150] [SWS_Mirror_00151] [SWS_Mirror_00152] [SWS_Mirror_00153] [SWS_Mirror_00154] [SWS_Mirror_00155] [SWS_Mirror_00156] [SWS_Mirror_00157] [SWS_Mirror_00158] [SWS_Mirror_00160] [SWS_Mirror_00161] |
| [SRS_Mirror_-00015] | The Bus Mirroring module shall remap LIN PIDs and CAN IDs | [SWS_Mirror_00114] [SWS_Mirror_00115] [SWS_Mirror_00116] [SWS_Mirror_00117] [SWS_Mirror_00118] |

7 Functional Specification

This chapter defines the behavior of the Bus Mirroring module. The API of the module is defined in chapter 8, while the configuration is defined in chapter 10.

7.1 Overview

The Bus Mirroring module's task is the collection of frames from several source buses, which are then forwarded to a destination bus. The forwarding is strictly unidirectional to avoid message loops and to prevent intrusion scenarios.

[SWS_Mirror_00001] [The generation tool shall ensure that no `ComMChannel` is referenced both from a `MirrorSourceNetwork` and a `MirrorDestNetwork`.] ([SRS_Mirror_00001](#))

The following figure shows how the Bus Mirroring is integrated in the AUTOSAR BSW communication stack:

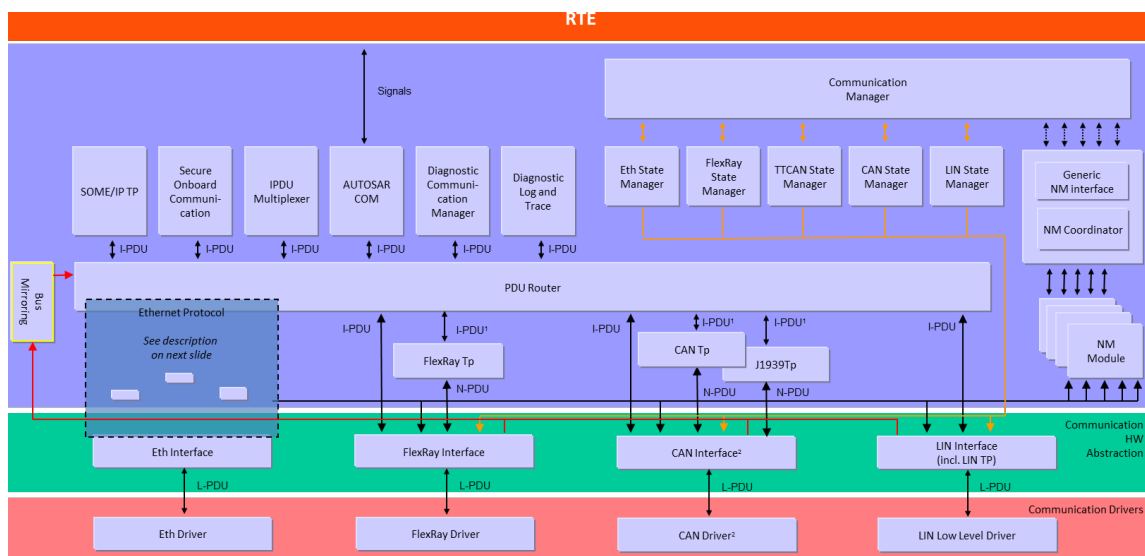


Figure 7.1: AUTOSAR BSW architecture showing the Bus Mirroring module

The following mirroring scenarios are supported by the Bus Mirroring module:

- CAN and LIN \Rightarrow CAN
- CAN, CAN-FD, and LIN \Rightarrow CAN-FD
- CAN, CAN-FD, LIN, and FlexRay \Rightarrow FlexRay
- CAN, CAN-FD, LIN, and FlexRay \Rightarrow IP
- CAN, CAN-FD, LIN, and FlexRay \Rightarrow Proprietary (CDD)

To avoid overloading the destination bus, the messages received on each source bus are filtered. The filters are configured separately for each bus, either by configu-

ration (see [MirrorSourceCanFilter](#), [MirrorSourceLinFilter](#), and [MirrorSourceFlexRayFilter](#)) or at runtime (see chapter 8).

LIN and CAN(-FD) frames mirrored to a CAN(-FD) bus are sent directly with identical data. In case of CAN(-FD), the CAN ID is preserved, but can be remapped to avoid ID conflicts on the destination bus. LIN PIDs, on the other hand, always need to be mapped to appropriate CAN IDs. To avoid ID conflicts, mirrored frames could use ranges of extended CAN IDs.

When frames are mirrored to a FlexRay bus, an IP bus (Ethernet), or a proprietary bus connected as CDD, the source frames are packed into a larger frame using the protocol specified in section 7.4.2. When routing to a FlexRay bus, only those FlexRay frames can be routed that are small enough to fit into the destination FlexRay frame reduced by the protocol overhead.

7.2 Module Handling

This section contains description of auxiliary functionality of the Bus Mirroring module.

7.2.1 Initialization

The Bus Mirroring module is initialized via [Mirror_Init](#), and de-initialized via [Mirror_DeInit](#). Except for [Mirror_GetVersionInfo](#) and [Mirror_Init](#), the API functions of the Bus Mirroring module may only be called after the module has been properly initialized.

[SWS_Mirror_00002] [A call to [Mirror_Init](#) initializes all internal variables and sets the Bus Mirroring module to the initialized state.]([SRS_Mirror_00005](#), [SRS_BSW_00406](#))

[SWS_Mirror_00003] [A call to [Mirror_DeInit](#) sets the Bus Mirroring module back to the uninitialized state.]([SRS_Mirror_00012](#))

[SWS_Mirror_00004] [If development error reporting is enabled via [MirrorDevErrorDetect](#), the Bus Mirroring module shall call `Det_ReportError` with the error code `Mirror.MIRROR_E_UNINIT` when any API other than [Mirror_Init](#) or [Mirror_GetVersionInfo](#) is called in uninitialized state.]([SRS_BSW_00350](#), [SRS_BSW_00450](#))

[SWS_Mirror_00005] [When [Mirror_Init](#) is called in initialized state, the Bus Mirroring module shall not re-initialize its internal variables. It shall instead call `Det_ReportError` with the error code `Mirror.MIRROR_E_REINIT` if development error reporting is enabled (see [MirrorDevErrorDetect](#)).]([SRS_BSW_00350](#))

7.2.2 Timing Related Functionality

To be able to measure times, the Bus Mirroring module is triggered cyclically via the [Mirror_MainFunction](#).

[SWS_Mirror_00006] [The Bus Mirroring module shall use the [Mirror_MainFunction](#) for timing related purposes.]([SRS_BSW_00478](#))

7.2.3 Selection of Active Source Buses

[SWS_Mirror_00013] [Upon initialization, the Bus Mirroring module shall be inactive. No source bus is enabled.]([SRS_Mirror_00005](#))

To start the Bus Mirroring module, one of the configured source buses (see [Mirror_SourceNetwork](#)) has to be activated. This will start collection of frames and status information from this source bus.

[SWS_Mirror_00014] [When a source bus is enabled using [Mirror_Start_SourceNetwork](#), frame and status acquisition from that bus shall be started, and the state of the source bus shall be reset such that it is reported directly after it has been updated for the first time.]([SRS_Mirror_00010](#))

[SWS_Mirror_00015] [When a source bus is disabled using [Mirror_Stop_SourceNetwork](#), frame and status acquisition from that bus shall be stopped. Already collected frames shall still be transmitted to the destination bus.]([SRS_Mirror_00010](#))

To stop the mirroring, the application may call [Mirror_Offline](#) at any time.

[SWS_Mirror_00012] [When [Mirror_Offline](#) is called, all sources buses shall be deactivated, the destination bus shall be reset to the [MirrorInitialDestNetworkRef](#), all statically configured filters shall be disabled, and all other filters shall be removed. Any mirrored frames still waiting for transmission shall be discarded.]([SRS_Mirror_00010](#))

Source buses are also disabled when the destination network is changed (see [\[SWS_Mirror_00011\]](#)).

7.2.4 Switching the Destination Bus

[SWS_Mirror_00009] [Upon initialization, the destination bus ([MirrorDestNetwork](#)) referenced by [MirrorInitialDestNetworkRef](#) is selected.]([SRS_Mirror_00005](#))

Destination frames and status information will not be sent before the mirroring is started (see [\[SWS_Mirror_00014\]](#)).

[SWS_Mirror_00011] [When the destination bus is changed using [Mirror_SwitchDestNetwork](#), all source buses shall be disabled, all statically configured

filters shall be disabled, and all other filters shall be removed. Mirrored frames that are still waiting for transmission shall be discarded.]([SRS_Mirror_00013](#))

This ensures that the selection of information sent to a destination bus has to be chosen specifically for that bus type. Otherwise, switching to a different destination bus could easily overload that bus, especially if it is another internal bus.

The destination bus is reset when the mirroring is stopped (see [[SWS_Mirror_00012](#)]).

7.2.5 Controlling Frame Filters

Frame filters can be configured statically (see [MirrorSourceCanFilter](#), [MirrorSourceLinFilter](#), and [MirrorSourceFlexRayFilter](#)) or added dynamically at run-time separately for each source bus.

[SWS_Mirror_00016] [Upon initialization, all statically configured filters of the Bus Mirroring module are disabled, and no dynamic filters are available.]([SRS_Mirror_00005](#))

Statically configured filters can be explicitly activated and deactivated using [Mirror_SetStaticFilterState](#). Dynamic filters can be added at run-time, using one of the bus specific [Mirror_Add...Filter](#) services (e.g. [Mirror_AddCanMaskFilter](#)), and removed again by calling [Mirror_RemoveFilter](#) with the filter ID returned by the [Mirror_Add...Filter](#) service. Filters are also deactivated/removed when mirroring is stopped (see [[SWS_Mirror_00012](#)]) or when the destination network is changed (see [[SWS_Mirror_00011](#)]).

[SWS_Mirror_00017] [While a filter is active (statically configured and activated by [Mirror_SetStaticFilterState](#) or dynamically added using one of the bus specific [Mirror_Add...Filter](#) services), all frames from the corresponding source bus that match the filter shall be mirrored.]([SRS_Mirror_00007](#))

This means that no frames from a source bus are mirrored as long as no filters are active.

[SWS_Mirror_00018] [When a statically configured filter is deactivated by [Mirror_SetStaticFilterState](#) or a dynamically added filter is removed by [Mirror_RemoveFilter](#), frames that have been accepted before the deactivation/removal shall still be mirrored to the destination bus.]([SRS_Mirror_00007](#))

7.3 Access to Source Buses

The Bus Mirroring module supports CAN, LIN, and FlexRay as source buses. To acquire frames and state information of these buses, the Bus Mirroring module interacts with the corresponding bus interface modules. Reported frames are then filtered before they are mirrored to the destination bus.

[SWS_Mirror_00166] [The Bus Mirroring module shall call interfaces of the CAN, LIN, and FlexRay Interface modules only from within the same partition, to which the `ComMChannel` referenced by `MirrorSourceNetwork` is assigned to.] (*SRS_BSW_00459*)

7.3.1 Access to CAN

The Bus Mirroring module accesses the CAN bus through the CAN Interface module (`CanIf`). After the Bus Mirroring module starts the mirroring of a CAN bus, the CAN Interface module reports received and transmitted CAN frames to the Bus Mirroring module. The CAN bus state is polled cyclically from the `Mirror_MainFunction`.

7.3.1.1 CAN Source Bus Activation

After initialization, the CAN Interface module does not report any frames to the Bus Mirroring module.

[SWS_Mirror_00019] [When `Mirror_StartSourceNetwork` is called to start a CAN source bus, the Bus Mirroring module shall call `CanIf_EnableBusMirroring` with `MirroringActive` set to `TRUE` to start reporting of received and transmitted CAN frames from the corresponding CAN controller.] (*SRS_Mirror_00010*)

`Mirror_StartSourceNetwork` receives a `ComMChannelId` as `network`, while `CanIf_EnableBusMirroring` expects a `CanIfCtrlId` as `ControllerId`. The translation of the one to the other can be determined at generation time by following the references from the `ComMChannelId` to the `CanIfCtrlId` through the ECU configuration.

[SWS_Mirror_00020] [When `Mirror_StopSourceNetwork` is called to stop a CAN source bus, the Bus Mirroring module shall call `CanIf_EnableBusMirroring` with `MirroringActive` set to `FALSE` to stop reporting of received and transmitted CAN frames from the corresponding CAN controller.] (*SRS_Mirror_00010*)

7.3.1.2 CAN Frame Acquisition

The CAN Interface module reports both received and transmitted CAN frames with a call to `Mirror_ReportCanFrame`. Received frames are reported from the reception interrupt or task, while transmitted frames are reported from the transmission confirmation interrupt or task.

[SWS_Mirror_00167] [The Bus Mirroring module shall apply appropriate mechanisms to allow calls of `Mirror_ReportCanFrame` from the partition to which the `ComMChannel` referenced by `MirrorComMNetworkHandleRef` is assigned to, e.g. by providing a satellite in this partition.] (*SRS_BSW_00459*)

For each reported CAN frame, the CAN Interface module provides information about the receiving CAN controller, about the CAN ID, the CAN ID type (extended or standard), and the CAN frame type (CAN-FD or CAN 2.0), and the length and the actual payload of the frame.

[SWS_Mirror_00021] [When `Mirror_ReportCanFrame` is called to report a received or transmitted CAN frame, the Bus Mirroring module shall match the `canId` containing the actual CAN ID, the ID type, and the frame type against all active statically configured and dynamically added filters of the corresponding source bus. If the CAN frame matches at least one filter, it is accepted by the Bus Mirroring module.] (*SRS_Mirror_00006, SRS_Mirror_00007*)

When mirroring to a FlexRay, an IP, or a proprietary destination bus, the source bus is identified by a network ID, but `Mirror_ReportCanFrame` reports the `controllerId`. The translation of the one to the other can be determined at generation time by following the references from the `CanIfCtrlId` to the `MirrorNetworkId` through the ECU configuration via `MirrorComMNetworkHandleRef`.

7.3.1.3 CAN Frame Filters

[SWS_Mirror_00022] [A CAN mask filter statically configured as `MirrorSourceCanFilterMask` matches the reported `canId`, if this `canId` masked by the `MirrorSourceCanFilterCanIdMask` equals the `MirrorSourceCanFilterCanIdCode`.] (*SRS_Mirror_00007*)

[SWS_Mirror_00023] [A CAN mask filter dynamically added by a call to `Mirror_AddCanMaskFilter` matches the reported `canId`, if this `canId` masked by the `mask` equals the `id`.] (*SRS_Mirror_00007*)

[SWS_Mirror_00024] [A CAN range filter statically configured as `MirrorSourceCanFilterRange` matches the reported `canId`, if the value of this `canId` is greater than or equal to the `MirrorSourceCanFilterLower` and smaller than or equal to the `MirrorSourceCanFilterUpper`.] (*SRS_Mirror_00007*)

[SWS_Mirror_00025] [A CAN range filter dynamically added by a call to `Mirror_AddCanRangeFilter` matches the reported `canId`, if the value of this `canId` is greater than or equal to the `lowerId` and smaller than or equal to the `upperId`.] (*SRS_Mirror_00007*)

7.3.1.4 CAN Status Acquisition

[SWS_Mirror_00026] [The Bus Mirroring module shall poll the status of each active CAN source bus by cyclically calling `CanIf_GetControllerMode` and `CanIf_GetTrcvMode` from the `Mirror_MainFunction`. If the returned `ControllerModePtr` is `CAN_CS_STARTED` and the returned `TransceiverModePtr` is `CANTRCV_TRCVMODE_NORMAL`, the reported CAN source bus state shall be

set to online, otherwise to offline. If the bus is online, the Bus Mirroring module shall call `CanIf_GetControllerErrorState`, and if the returned `ErrorStatePtr` is `CAN_ERRORSTATE_PASSIVE` or `CAN_ERRORSTATE_BUSOFF`, the reported CAN source bus state shall be set to error passive or bus-off, respectively. Additionally, if the bus is online, the Bus Mirroring module shall also call `CanIf_GetControllerTxErrorCounter`, and add the returned `TxErrorCounterPtr` to the reported CAN source bus state.]([SRS_Mirror_00008](#), [SRS_Mirror_00009](#))

The APIs `CanIf_GetControllerMode` and `CanIf_GetControllerErrorState` expect a `ControllerId`, and `CanIf_GetTrcvMode` expects a `TransceiverId`, but a network ID is required to report the status to the output bus. The translation of the ones to the other can be determined at generation time by following the references from the `CanIfCtrlId` and `CanTrcvChannelId`, respectively, to the `MirrorNetworkId` through the ECU configuration via [MirrorComMNetworkHandleRef](#).

7.3.2 Access to LIN

The Bus Mirroring module accesses the LIN bus through the LIN Interface module (`LinIf`). After the Bus Mirroring module starts the mirroring of a LIN bus, the LIN Interface module reports received and transmitted LIN frames to the Bus Mirroring module. The LIN bus state is partially reported together with the LIN frames, and partially polled cyclically from the [Mirror_MainFunction](#).

7.3.2.1 LIN Source Bus Activation

After initialization, the LIN Interface module does not report any frames to the Bus Mirroring module.

[SWS_Mirror_00027] [When [Mirror_StartSourceNetwork](#) is called to start a LIN source bus, the Bus Mirroring module shall call `LinIf_EnableBusMirroring` with `MirroringActive` set to `TRUE` to start reporting of received and transmitted LIN frames from that bus.]([SRS_Mirror_00010](#))

[SWS_Mirror_00028] [When [Mirror_StopSourceNetwork](#) is called to stop a LIN source bus, the Bus Mirroring module shall call `LinIf_EnableBusMirroring` with `MirroringActive` set to `FALSE` to stop reporting of received and transmitted LIN frames from that bus.]([SRS_Mirror_00010](#))

7.3.2.2 LIN Frame Acquisition

The LIN Interface module reports both received and transmitted LIN frames with a call to [Mirror_ReportLinFrame](#). Received and transmitted frames are reported from the LIN schedule processing after the corresponding status check has been executed.

[SWS_Mirror_00168] [The Bus Mirroring module shall apply appropriate mechanisms to allow calls of `Mirror_ReportLinFrame` from the partition to which the `ComM-Channel` referenced by `MirrorComMNetworkHandleRef` is assigned to, e.g. by providing a satellite in this partition.]([SRS_BSW_00459](#))

For each reported LIN frame, the LIN Interface module provides information about the receiving bus, about the protected ID (PID), the length, and the actual payload of the frame, and about the reception or transmission status.

[SWS_Mirror_00029] [When `Mirror_ReportLinFrame` is called to report a received or transmitted LIN frame, the Bus Mirroring module shall extract the frame ID from the reported `pid` and match it against all active statically configured and dynamically added filters of the corresponding source bus. If the LIN frame matches at least one filter, it is accepted by the Bus Mirroring module.]([SRS_Mirror_00006](#), [SRS_Mirror_00007](#))

The frame ID of a LIN frame is calculated from the PID by removing the two most significant bits.

7.3.2.3 LIN Frame Filters

[SWS_Mirror_00030] [A LIN mask filter statically configured as `MirrorSourceLinFilterMask` matches the reported frame ID, if this ID masked by the `MirrorSourceLinFilterLinIdMask` equals the `MirrorSourceLinFilterLinIdCode`.]([SRS_Mirror_00007](#))

[SWS_Mirror_00031] [A LIN mask filter dynamically added by a call to `Mirror_AddLinMaskFilter` matches the reported frame ID, if this ID masked by the `mask` equals the `id`.]([SRS_Mirror_00007](#))

[SWS_Mirror_00032] [A LIN range filter statically configured as `MirrorSourceLinFilterRange` matches the reported frame ID, if the value of this ID is greater than or equal to the `MirrorSourceLinFilterLower` and smaller than or equal to the `MirrorSourceLinFilterUpper`.]([SRS_Mirror_00007](#))

[SWS_Mirror_00033] [A LIN range filter dynamically added by a call to `Mirror_AddLinRangeFilter` matches the reported frame ID, if the value of this ID is greater than or equal to the `lowerId` and smaller than or equal to the `upperId`.]([SRS_Mirror_00007](#))

7.3.2.4 LIN Status Acquisition

[SWS_Mirror_00034] [The Bus Mirroring module shall evaluate the `status` reported by `Mirror_ReportLinFrame`. If it is `LIN_TX_HEADER_ERROR`, `LIN_TX_ERROR`, `LIN_RX_ERROR`, or `LIN_RX_NO_RESPONSE`, the reported LIN source bus state shall be set to header transmission error, transmission error, reception error, or no response.]([SRS_Mirror_00008](#), [SRS_Mirror_00009](#))

[SWS_Mirror_00035] [The Bus Mirroring module shall poll the status of each active LIN source bus by cyclically calling `LinIf_GetTrcvMode` from the `Mirror_MainFunction`. If the returned `TransceiverModePtr` is `LIN-TRCV_TRCV_MODE_NORMAL`, the reported LIN source bus state shall be set to online, otherwise to offline.]([SRS_Mirror_00008](#), [SRS_Mirror_00009](#))

7.3.3 Access to FlexRay

The Bus Mirroring module accesses the FlexRay bus through the FlexRay Interface module (`FrIf`). After the Bus Mirroring module starts the mirroring of a FlexRay bus, the FlexRay Interface module reports received and transmitted FlexRay frames to the Bus Mirroring module. The FlexRay bus state is polled cyclically from the `Mirror_MainFunction`. A FlexRay source bus corresponds to a FlexRay cluster, which can be connected to several controllers.

7.3.3.1 FlexRay Source Bus Activation

After initialization, the FlexRay Interface module does not report any frames to the Bus Mirroring module.

[SWS_Mirror_00036] [When `Mirror_StartSourceNetwork` is called to start a FlexRay source bus, the Bus Mirroring module shall call `FrIf_EnableBusMirroring` with `FrIf_MirroringActive` set to `TRUE` to start reporting of received and transmitted FlexRay frames from the corresponding FlexRay cluster.]([SRS_Mirror_00010](#))

`Mirror_StartSourceNetwork` receives a `ComMChannelId` as `network`, while `FrIf_EnableBusMirroring` expects a `FrIfClstIdx` as `FrIf_ClstIdx`. The translation of the one to the other can be determined at generation time by following the references from the `ComMChannelId` to the related `FrIfClstIdx` through the ECU configuration.

[SWS_Mirror_00037] [When `Mirror_StopSourceNetwork` is called to stop a FlexRay source bus, the Bus Mirroring module shall call `FrIf_EnableBusMirroring` with `FrIf_MirroringActive` set to `FALSE` to stop reporting of received and transmitted FlexRay frames from the corresponding FlexRay cluster.]([SRS_Mirror_00010](#))

7.3.3.2 FlexRay Frame Acquisition

The FlexRay Interface module reports both received and transmitted FlexRay frames with a call to `Mirror_ReportFlexRayFrame`. Received and transmitted frames are reported from the job list execution function or the transmit function of the FlexRay Interface.

[SWS_Mirror_00169] [The Bus Mirroring module shall apply appropriate mechanisms to allow calls of `Mirror_ReportFlexRayFrame` from the partition to which the `ComMChannel` referenced by `MirrorComMNetworkHandleRef` is assigned to, e.g. by providing a satellite in this partition.]([SRS_BSW_00459](#))

For each reported FlexRay frame, the FlexRay Interface module provides information about the receiving FlexRay controller and about the slot ID and cycle, the length and the actual payload of the frame, and information about transmission conflicts.

[SWS_Mirror_00038] [When `Mirror_ReportFlexRayFrame` is called to report a received or transmitted FlexRay frame (`txConflict` is reported as FALSE), the Bus Mirroring module shall match the `slotId` and `cycle` against all active statically configured and dynamically added filters of the corresponding source bus. If the FlexRay frame matches at least one filter, it is accepted by the Bus Mirroring module.]([SRS_Mirror_00006](#), [SRS_Mirror_00007](#))

On the destination bus, the source bus is identified by a network ID, but `Mirror_ReportFlexRayFrame` reports the `controllerId`. The translation of the one to the other can be determined at generation time by following the references from the `FrIfCtrlIdx` to the `MirrorNetworkId` through the ECU configuration via `MirrorComMNetworkHandleRef`.

7.3.3.3 FlexRay Frame Filters

[SWS_Mirror_00039] [A FlexRay filter statically configured as `MirrorSourceFlexRayFilter` matches the reported `slotId` and `cycle` if the `slotId` is greater than or equal to the `MirrorSourceFlexRayFilterLowerSlot` and smaller than or equal to the `MirrorSourceFlexRayFilterUpperSlot` and if the `cycle` modulo `MirrorSourceFlexRayFilterCycleRepetition` is greater than or equal to the `MirrorSourceFlexRayFilterLowerBaseCycle` and smaller than or equal to the `MirrorSourceFlexRayFilterUpperBaseCycle`.]([SRS_Mirror_00007](#))

[SWS_Mirror_00040] [A FlexRay filter dynamically added by a call to `Mirror_AddFlexRayFilter` matches the reported `slotId` and `cycle` if the `slotId` is greater than or equal to the `lowerSlotId` and smaller than or equal to the `upperSlotId` and if the `cycle` modulo `cycleRepetition` is greater than or equal to the `lowerBaseCycle` and smaller than or equal to the `upperBaseCycle`.]([SRS_Mirror_00007](#))

7.3.3.4 FlexRay Status Acquisition

[SWS_Mirror_00041] [When `Mirror_ReportFlexRayFrame` is called to report a transmission conflict (`txConflict` is reported as TRUE), the Bus Mirroring module shall match the `slotId` and `cycle` against all active statically configured and dynamically added filters. If it matches at least one filter, the reported FlexRay source bus

state for that frame shall be set to transmission conflict.]([SRS_Mirror_00008](#), [SRS_Mirror_00009](#))

The callback `Mirror_ReportFlexRayFrame` reports a `controllerId` and the API `FrIf_GetPOCStatus` expects a `FrIf_CtrlIdx`, but a network ID is required to report the status to the output bus. The translation of the one to the other can be determined at generation time by following the references from the `FrIfCtrlIdx` to the `MirrorNetworkId` through the ECU configuration via `MirrorComMNetworkHandleRef`.

[SWS_Mirror_00146] [When `Mirror_ReportFlexRayChannelStatus` is called to report the FlexRay channel state, the Bus Mirroring module shall compare the reported states with the previously reported states. If the states differ in Bit 1 (`vSSI!SyntaxError`), Bit 2 (`vSSI!ContentError`), and/or Bit 4 (`vSSI!Bviolation`), the Bus Mirroring module shall update the reported FlexRay source bus state accordingly.]([SRS_Mirror_00008](#), [SRS_Mirror_00009](#))

The callback `Mirror_ReportFlexRayChannelStatus` reports a `clusterId` and the API `FrIf_GetState` expects a `FrIf_ClstIdx`, but a network ID is required to report the status to the output bus. The translation of the one to the other can be determined at generation time by following the references from the `FrIfClstIdx` to the `MirrorNetworkId` through the ECU configuration via `MirrorComMNetworkHandleRef`.

[SWS_Mirror_00042] [The Bus Mirroring module shall poll the status of each active FlexRay source bus by cyclically calling `FrIf_GetState` from the `Mirror_MainFunction`. If the returned `FrIf_StatePtr` is `FRIF_STATE_ONLINE`, the reported FlexRay source bus state shall be set to online, otherwise to offline. If the bus is online, the Bus Mirroring module shall also call `FrIf_GetPOCStatus` for each controller connected to the FlexRay cluster. If the returned `Fr_POCStateType` is `FR_POCSTATE_NORMAL_ACTIVE` for all controllers, the reported source bus state shall be synchronous and normal active; if `Fr_POCStateType` is `FR_POCSTATE_NORMAL_PASSIVE` for at least one controller, the reported source bus state shall be synchronous but not normal active; if `Fr_POCStateType` is in any other state for at least one controller, the reported source bus state shall be neither synchronous nor normal active.]([SRS_Mirror_00008](#), [SRS_Mirror_00009](#))

7.4 Mirroring to FlexRay, IP, and CDD

When mirroring to a FlexRay destination bus, an IP destination bus like Ethernet, or a proprietary network connected as CDD, the Bus Mirroring module applies a protocol to pack several smaller frames into one large frame of the destination bus.

The first section of this chapter (section 7.4.1) defines how the Bus Mirroring module places the source frames onto a destination frame using the mirroring protocol, and how the queueing is applied before transmitting a destination frames.

The second section (section 7.4.2) shows the exact layout of the protocol and the meaning and usage of the fields in the protocol.

7.4.1 Handling of Destination Frames

This section describes how to handle the mirroring protocol, which is defined in section 7.4.2.

7.4.1.1 Creation

[SWS_Mirror_00043] [When the Bus Mirroring module is initialized or when `Mirror_SwitchDestNetwork` is called to activate a FlexRay (`MirrorDestNetworkFlexRay`), IP (`MirrorDestNetworkIp`), or proprietary (`MirrorDestNetworkCdd`) destination bus, the Bus Mirroring module shall activate a new destination frame buffer and reset the `SequenceNumber` to 0.] (*SRS_Mirror_00008*)

[SWS_Mirror_00044] [When the first data item is added to an empty destination frame buffer (as described in [SWS_Mirror_00045], [SWS_Mirror_00046], or [SWS_Mirror_00047]) the Bus Mirroring module shall first write the header to the buffer in the layout defined by [SWS_Mirror_00055].

The `ProtocolVersion` field shall be set to 1, the `SequenceNumber` to the incremented `SequenceNumber` of the last destination frame, the `HeaderTimestamp` shall be filled with the information returned by `StbM_GetCurrentTime`, and the `DataLength` field shall be set to 0.

If the optional configuration parameter `MirrorDestTransmissionDeadline` is configured, the Bus Mirroring module shall start the transmission timeout timer.] (*SRS_Mirror_00008*)

[SWS_Mirror_00045] [When a source frame has been received as described in [SWS_Mirror_00021], [SWS_Mirror_00029], or [SWS_Mirror_00038], the Bus Mirroring module shall create a new data item and place it as at the end of the currently active destination frame buffer in the layout defined by [SWS_Mirror_00064], and it shall add the size of the new data item to the header field `DataLength`.

The `Timestamp` field of the new data item shall be set to the difference between the time stamp contained in the header and the current time acquired using `StbM_GetCurrentTime` expressed in multiples of $10\ \mu\text{s}$, the `FrameIDAvailable` and `PayloadAvailable` bits shall be set to 1, and the fields `NetworkType`, `NetworkID`, `FrameID`, `PayloadLength`, and `Payload` shall be set according to the received source frame.

If the reported source bus state changed since the last transmission of a source frame, the `NetworkStateAvailable` bit shall be set to 1 and the `NetworkState` field to the reported source bus state. Otherwise, the `NetworkStateAvailable` bit shall be set to 0 and the `NetworkState` field shall be omitted.] (*SRS_Mirror_00008*)

[SWS_Mirror_00046] [When a new FlexRay transmission conflict was reported as described in [\[SWS_Mirror_00041\]](#), the Bus Mirroring module shall create a new data item and place it at the end of the currently active destination frame buffer in the layout defined by [\[SWS_Mirror_00064\]](#), and it shall add the size of the new data item to the header field `DataLength`.

The `Timestamp` field of the data item shall be set to the difference between the time stamp contained in the header and the current time acquired using `StbM_GetCurrentTime` expressed in multiples of $10\ \mu s$, the `FrameIDAvailable` and `NetworkStateAvailable` bits shall be set to 1, and the fields `NetworkType`, `NetworkID`, and `FrameID` shall be set according to the reported transmission conflict. The `NetworkState` field shall be set to the reported source bus state.

The `PayloadAvailable` bit shall be set to 0, and the fields `PayloadLength` and `Payload` shall be omitted.] ([SRS_Mirror_00008](#))

Each reported FlexRay transmission conflict invalidates a preceding FlexRay frame. The invalidated FlexRay frame could be located in another destination frame than the corresponding transmission conflict.

[SWS_Mirror_00047] [When the reported source bus state has changed and if no source frame is received from the same source bus within one main function cycle, the Bus Mirroring module shall create a new data item and place it at the end of the currently active destination frame buffer in the layout defined by [\[SWS_Mirror_00064\]](#), and it shall add the size of the new data item to the header field `DataLength`.

The `Timestamp` field of the data item shall be set to the difference between the time stamp contained in the header and the current time acquired using `StbM_GetCurrentTime` expressed in multiples of $10\ \mu s$. The `NetworkStateAvailable` bit shall be set to 1, the fields `NetworkType` and `NetworkID` shall be set according to the reported source bus, and the `NetworkState` field shall be set to the reported source bus state.

Depending on the currently reported source bus state, the `FrameIDAvailable` shall be set to 1 or 0. In the first case, the `FrameID` shall be set according to the reported source bus, and in the latter case the `FrameID` shall be omitted.

The `PayloadAvailable` bit shall be set to 0, and the fields `PayloadLength` and `Payload` shall be omitted.] ([SRS_Mirror_00008](#))

Section [7.4.2.2.7](#) lists the error codes that can be reported in the `NetworkState` field and describes the necessity to provide the `FrameID`.

7.4.1.2 Queueing

[SWS_Mirror_00048] [When a data item does not fit in the remaining space of the currently active destination frame buffer, the Bus Mirroring module shall place this buffer in the queue and activate a new destination frame buffer. The data item shall then be placed in the new buffer.] ([SRS_Mirror_00008](#), [SRS_Mirror_00013](#))

[SWS_Mirror_00049] [When the relative time stamp of a data item exceeds 655.35 ms , the Bus Mirroring module shall place the currently active destination frame buffer in the queue and activate a new destination frame buffer. The data item shall then be placed in the new buffer.]([SRS_Mirror_00008](#), [SRS_Mirror_00013](#))

[SWS_Mirror_00050] [If the optional configuration parameter [MirrorDestTransmissionDeadline](#) is configured and the transmission timeout expires, the Bus Mirroring module shall place the currently active destination frame buffer in the queue and activate a new destination frame buffer.]([SRS_Mirror_00008](#), [SRS_Mirror_00013](#))

The size of the queue for the serialized destination frames is determined by the configuration parameter [MirrorDestQueueSize](#), the size of the queue elements by the [PduLength](#) of the [Pdu](#) referenced by [MirrorDestPduRef](#).

[SWS_Mirror_00113] [If a destination frame cannot be placed in the queue because the queue is already full, the Bus Mirroring module shall drop that destination frame, report the runtime error [Mirror.MIRROR_E_QUEUE_OVERRUN](#), and shall set (to 1) the Frames Lost bit of the [NetworkState](#) of the next data item created in the currently active destination frame buffer.]([SRS_Mirror_00013](#))

7.4.1.3 Transmission

[SWS_Mirror_00051] [To initiate the transmission of a queued serialized destination frame, the Bus Mirroring module shall call [PduR_MirrorTransmit](#) with [PduInfoPtr->MetaDataPtr](#) set to the [NULL_PTR](#) and [PduInfoPtr->SduLength](#) set to the actually written part of the destination frame. If [MirrorDestPduUsesTriggerTransmit](#) is enabled, [PduInfoPtr->SduDataPtr](#) shall be set to the [NULL_PTR](#), otherwise to the used part of the queued destination frame.]([SRS_Mirror_00013](#))

A [NULL_PTR](#) for [PduInfoPtr->SduDataPtr](#) ensures that the destination bus interface module ([FrIf](#), [SoAd](#), or a [CDD](#)) fetches the destination frame using [Mirror_TriggerTransmit](#).

[SWS_Mirror_00150] [If the [PduR_MirrorTransmit](#) returns [E_NOT_OK](#), the Bus Mirroring module shall immediately remove the destination frame from the queue, shall report the runtime error [Mirror.MIRROR_E_TRANSMIT_FAILED](#), and shall set (to 1) the Frames Lost bit of the [NetworkState](#) of the next data item created in the currently active destination frame buffer.]([SRS_Mirror_00013](#))

[SWS_Mirror_00053] [The Bus Mirroring module shall initiate the transmission of queued serialized destination frames from the [Mirror_MainFunction](#) and from the [Mirror_TxConfirmation](#) callback.]([SRS_Mirror_00013](#))

This ensures that queued destination frames are transmitted as fast as possible.

To enable a suitable throughput on a FlexRay destination bus, the [MirrorDestNetworkFlexRay](#) may contain a set of [MirrorDestPdus](#).

[SWS_Mirror_00160] [If a set of `MirrorDestPdus` is configured for a `MirrorDestNetworkFlexRay`, the Bus Mirroring module shall use the PDUs of this set in arbitrary order.] (*SRS_Mirror_00013*)

The `SequenceNumber` together with the `Timestamp` of the data items will ensure that a tester can sort them correctly.

[SWS_Mirror_00052] [In case the active destination channel is `MirrorDestNetworkIp` or `MirrorDestNetworkCdd`, the Bus Mirroring module shall not transmit the next serialized destination frame before the previous destination frame has been confirmed by a call to `Mirror_TxConfirmation`.] (*SRS_Mirror_00013*)

[SWS_Mirror_00161] [In case the active destination channel is `MirrorDestNetworkFlexRay`, the Bus Mirroring module shall not transmit the next serialized destination frame using the same `MirrorDestPdu` before the previous transmission of that `MirrorDestPdu` has been confirmed by a call to `Mirror_TxConfirmation`.] (*SRS_Mirror_00013*)

[SWS_Mirror_00054] [When `Mirror_TriggerTransmit` is called for a serialized destination frame, the Mirror module shall copy the used part of the queued destination frame to `PduInfoPtr->SduDataPtr` and update `PduInfoPtr->SduLength` accordingly.] (*SRS_Mirror_00013*)

[SWS_Mirror_00151] [If the `PduInfoPtr->SduLength` provided by `Mirror_TriggerTransmit` is too small for the currently transmitted serialized destination frame, the Bus Mirroring module shall remove the destination frame from the queue, shall report the runtime error `Mirror.MIRROR_E_TRANSMIT_FAILED`, shall set (to 1) the Frames Lost bit of the `NetworkState` of the next data item created in the currently active serialized destination frame buffer, and shall return `E_NOT_OK` to stop this transmission.] (*SRS_Mirror_00013*)

[SWS_Mirror_00152] [When `Mirror_TxConfirmation` is called to report the successful or failed transmission of a serialized destination frame, the Bus Mirroring module shall remove the destination frame from the queue.] (*SRS_Mirror_00013*)

[SWS_Mirror_00153] [If the `Mirror_TxConfirmation` reports the failed transmission of a serialized destination frame (`result` is `E_NOT_OK`), the Bus Mirroring module shall report the runtime error `Mirror.MIRROR_E_TRANSMIT_FAILED`, and shall set (to 1) the Frames Lost bit of the `NetworkState` of the next data item created in the currently active destination frame buffer.] (*SRS_Mirror_00013*)

7.4.2 Mirroring Protocol

The protocol that is applied by the Bus Mirroring module for IP, FlexRay, and proprietary destination buses is shown in [Figure 7.2](#), in this example for an Ethernet destination bus.

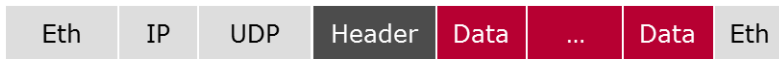


Figure 7.2: Bus Mirroring Serialization Protocol

The protocol consists of a header (see section 7.4.2.1) followed by several data items (see section 7.4.2.2).

In the tables and descriptions of this section, the byte numbers increase in the same sequence as the bytes are transmitted on the destination bus, starting from 0. The bit numbers decrease, the most significant bit of a byte being bit 7 and the least significant bit 0.

7.4.2.1 Header Layout

Every destination frame starts with a header, which is shown in Figure 7.3.

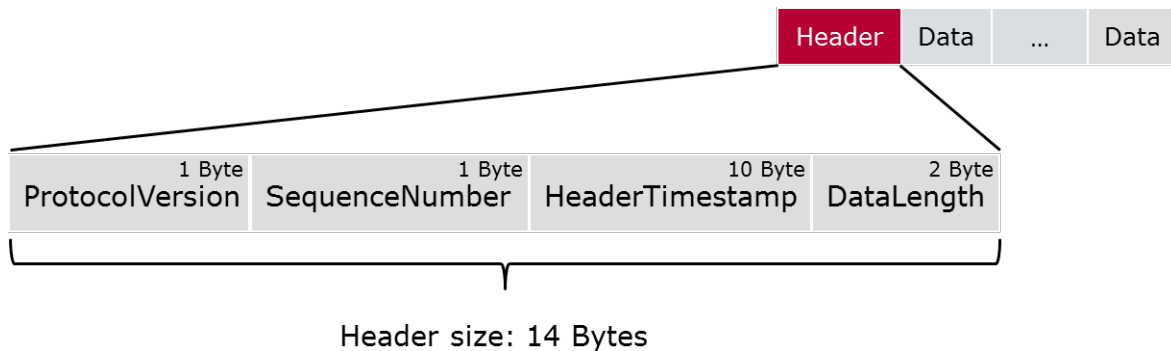


Figure 7.3: Bus Mirroring Protocol Header

[SWS_Mirror_00055] [The header of a Bus Mirroring destination frame shall contain the following fields in this order:

1. `ProtocolVersion`
2. `SequenceNumber`
3. `HeaderTimestamp`
4. `DataLength`

]([SRS_Mirror_00008](#))

The fields of the header are described in detail in the following subsections.

7.4.2.1.1 ProtocolVersion

[SWS_Mirror_00056] [The `ProtocolVersion` shall indicate the layout of the header and the data items. The layout currently defined in this section is identified by `ProtocolVersion` 1. The range [2 .. 127] is reserved for future extensions of the AUTOSAR

defined protocol, the range [128 .. 255] is available for customer specific protocols.] ([SRS_Mirror_00008](#))

The protocol version allows the tester tool to interpret the protocol correctly, and to enable different layouts of the protocol.

[SWS_Mirror_00057] [The width of the `ProtocolVersion` field shall be 8 bits.] ([SRS_Mirror_00008](#))

7.4.2.1.2 SequenceNumber

[SWS_Mirror_00058] [The `SequenceNumber` shall increase with each transmission of a destination frame. After initialization or after switching the destination bus with `Mirror_SwitchDestNetwork`, it shall start from 0.] ([SRS_Mirror_00008](#))

The sequence number allows the tester tool to identify lost destination frames.

[SWS_Mirror_00059] [The width of the `SequenceNumber` field shall be 8 bits.] ([SRS_Mirror_00008](#))

This means that the `SequenceNumber` will wrap around to 0 after it reached 255. A tester has to cope with this behavior and still sort the frames correctly.

7.4.2.1.3 HeaderTimestamp

[SWS_Mirror_00060] [The `HeaderTimestamp` shall reflect the time when collection of data items into the destination frame started. This time shall be given as the absolute number of seconds and nanoseconds since January 1st of 1970.] ([SRS_Mirror_00008](#))

[SWS_Mirror_00061] [The width of the `HeaderTimestamp` field shall be 10 bytes, the layout is shown in [Table 7.1](#). The elements of the the `HeaderTimestamp` field shall be encoded in network byte order (MSB first).] ([SRS_Mirror_00008](#))

| HeaderTimestamp | | | | | | | | | |
|------------------------------|--------|--------|--------|--------|--------|----------------------------------|--------|--------|--------|
| Byte 0 | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 | Byte 9 |
| Seconds (48 bits, MSB first) | | | | | | Nanoseconds (32 bits, MSB first) | | | |

Table 7.1: Layout of `HeaderTimestamp`

7.4.2.1.4 DataLength

[SWS_Mirror_00062] [The `DataLength` shall give the number of bytes following the header. It is the sum of the length of all data items in the destination frame.] ([SRS_Mirror_00008](#))

[SWS_Mirror_00063] [The width of the `DataLength` field shall be 16 bits. It shall be encoded in network byte order (MSB first).] (*SRS_Mirror_00008*)

7.4.2.2 Data Item Layout

Every source frame is placed in a data item, which is shown in [Figure 7.4](#).

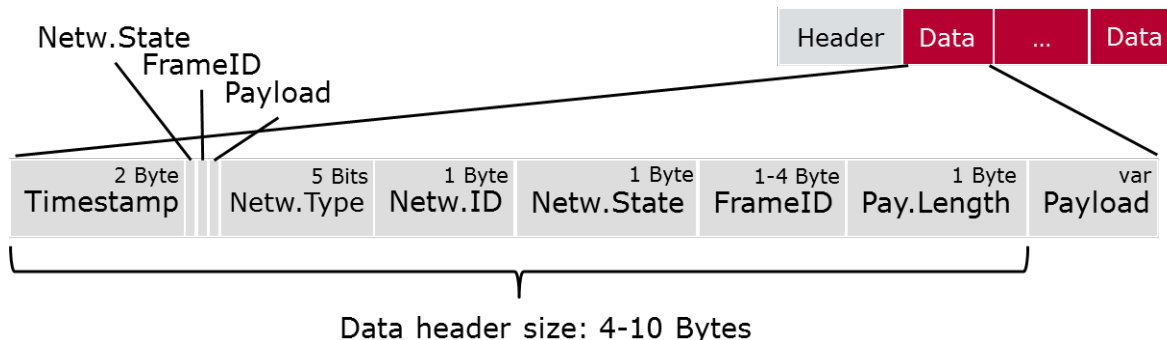


Figure 7.4: Bus Mirroring Protocol Data Item

[SWS_Mirror_00064] [Data items of a Bus Mirroring destination frame shall contain the following fields in this order:

1. `Timestamp`
2. `NetworkStateAvailable`
3. `FrameIDAvailable`
4. `PayloadAvailable`
5. `NetworkType`
6. `NetworkID`
7. `NetworkState` (optional)
8. `FrameID` (optional)
9. `PayloadLength` (optional)
10. `Payload` (optional)

] (*SRS_Mirror_00008*)

The fields of the data item are described in detail in the following subsections.

7.4.2.2.1 Timestamp

[SWS_Mirror_00065] [The `Timestamp` shall reflect the temporal offset of the source frame reception from the `HeaderTimestamp`, i.e. the time that passed since collection

of data items into the destination frame started. It shall be given in multiples of 10 μ s.]
(SRS_Mirror_00008)

[SWS_Mirror_00066] [The width of the `Timestamp` field shall be 16 bits. It shall be encoded in network byte order (MSB first).] (SRS_Mirror_00008)

7.4.2.2.2 NetworkStateAvailable

[SWS_Mirror_00067] [The `NetworkStateAvailable` shall indicate whether the field `NetworkState` is present in the data item. If `NetworkStateAvailable` is 1, that field shall be present. If it is 0, that field shall be omitted.] (SRS_Mirror_00008)

[SWS_Mirror_00068] [The width of the `NetworkStateAvailable` field shall be 1 bit.] (SRS_Mirror_00008)

7.4.2.2.3 FrameIDAvailable

[SWS_Mirror_00069] [The `FrameIDAvailable` shall indicate whether the field `FrameID` is present in the data item. If `FrameIDAvailable` is 1, that field shall be present. If it is 0, that field shall be omitted.] (SRS_Mirror_00008)

[SWS_Mirror_00070] [The width of the `FrameIDAvailable` field shall be 1 bit.] (SRS_Mirror_00008)

7.4.2.2.4 PayloadAvailable

[SWS_Mirror_00071] [The `PayloadAvailable` shall indicate whether the fields `PayloadLength` and `Payload` are present in the data item. If `PayloadAvailable` is 1, these fields shall be present. If it is 0, these fields shall be omitted.] (SRS_Mirror_00008)

[SWS_Mirror_00072] [The width of the `PayloadAvailable` field shall be 1 bit.] (SRS_Mirror_00008)

7.4.2.2.5 NetworkType

[SWS_Mirror_00073] [The `NetworkType` shall indicate the type of the source bus.] (SRS_Mirror_00008)

[SWS_Mirror_00074] [The width of the `NetworkType` field shall be 5 bits, the possible values are shown in Table 7.2. The range [5 .. 15] is reserved for future extensions of the AUTOSAR defined protocol, the range [16 .. 31] is available for customer specific bus types.] (SRS_Mirror_00008)

| | |
|---------------------|------------------|
| <i>Invalid</i> | 0 |
| Network Type | Numerical |
| CAN | 1 |
| LIN | 2 |
| FlexRay | 3 |
| Ethernet | 4 |

Table 7.2: Values of `NetworkType`

7.4.2.2.6 NetworkID

[SWS_Mirror_00075] [The `NetworkID` shall identify a bus of a certain `NetworkType` uniquely, i.e. the same `NetworkID` can appear on different `NetworkTypes`, but not on the same `NetworkType`.] (*SRS_Mirror_00008*)

[SWS_Mirror_00076] [The width of the `NetworkID` field shall be 8 bits.] (*SRS_Mirror_00008*)

7.4.2.2.7 NetworkState

[SWS_Mirror_00077] [The `NetworkState` shall provide information about the source bus state. It shall only be present when the source bus state has changed since the last time it was reported, the presence shall be indicated by `NetworkStateAvailable`.] (*SRS_Mirror_00008*)

[SWS_Mirror_00078] [The width of the `NetworkState` field shall be 8 bits, the layout is bus specific and is defined separately for each bus as `NetworkStateCAN`, `NetworkStateLIN`, and `NetworkStateFlexRay`.] (*SRS_Mirror_00008*)

[SWS_Mirror_00079] [Bit 7 (the most significant bit) of the `NetworkState` shall always contain the Frames Lost state. This is a sporadic error that is not related to the source frame that is reported in the same data item, but shall not be reported in a separate data item. The Frames Lost state shall be set once to 1 after one or more source frames that passed the filters were lost because the queue of the destination bus was full or the transmission failed. Afterwards it shall be set to 0 again.] (*SRS_Mirror_00008*)

[SWS_Mirror_00080] [Bit 6 of the `NetworkState` shall always contain the Bus Online state. This is a continuous state that is not related to the source frame that is reported in the same data item, and may also be reported in a data item where the `FrameIDAvailable` and `PayloadAvailable` fields are set to 0. The Bus Online state shall be set to 1 when the source bus is online, i.e. when both the controller and the transceiver are able to communicate. Otherwise it shall be set to 0.] (*SRS_Mirror_00008*)

7.4.2.2.7.1 NetworkStateCAN

The layout of the [NetworkState](#) for a CAN bus is shown in [Table 7.3](#).

| NetworkState | | | | | | | |
|--------------|------------|---------------|---------|--------------------------------|-------|-------|-------|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Frames Lost | Bus Online | Error-Passive | Bus-Off | Tx error counter, divided by 8 | | | |

Table 7.3: Layout of CAN [NetworkState](#)

[SWS_Mirror_00081] [Bit 5 of the [NetworkStateCAN](#) shall contain the Error-Passive state. This is a continuous state that is not related to the source frame that is reported in the same data item, and may also be reported in a data item where the [FrameIDAvailable](#) and [PayloadAvailable](#) fields are set to 0.

The Error-Passive state shall be set to 1 when the CAN controller is in the Error-Passive state, and to 0 when it is in the Error-Active or Bus-Off state.]([SRS_Mirror_00008](#))

[SWS_Mirror_00082] [Bit 4 of the [NetworkStateCAN](#) shall contain the Bus-Off state. This is a continuous state that is not related to the source frame that is reported in the same data item, and may also be reported in a data item where the [FrameIDAvailable](#) and [PayloadAvailable](#) fields are set to 0.

The Bus-Off state shall be set to 1 when the CAN controller is in the Bus-Off state, and to 0 when it is in the Error-Active or Error-Passive state.]([SRS_Mirror_00008](#))

[SWS_Mirror_00083] [Bits 3 – 0 of the [NetworkStateCAN](#) shall contain the Tx error counter of the can controller divided by 8. This is a continuous state that is not related to the source frame that is reported in the same data item, and may also be reported in a data item where the [FrameIDAvailable](#) and [PayloadAvailable](#) fields are set to 0.]([SRS_Mirror_00008](#))

7.4.2.2.7.2 NetworkStateLIN

The layout of the [NetworkState](#) for a LIN bus is shown in [Table 7.4](#).

| NetworkState | | | | | | | |
|--------------|------------|-----------------|-------|-----------------|----------|----------|----------------|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Frames Lost | Bus Online | <i>reserved</i> | | Header Tx Error | Tx Error | Rx Error | Rx No Response |

Table 7.4: Layout of LIN [NetworkState](#)

[SWS_Mirror_00084] [Bits 5 and 4 of the [NetworkStateLIN](#) are currently reserved. They shall always be set to 0.]([SRS_Mirror_00008](#))

[SWS_Mirror_00085] [Bit 3 of the [NetworkStateLIN](#) shall contain the Header Tx Error state. This is an error that is related to the source frame that is reported in the same data item.

The Header Tx Error state shall be set to 1 when the LIN controller detected an error during transmission of a LIN header. Otherwise it shall be set to 0.] ([SRS_Mirror_00008](#))

[SWS_Mirror_00086] [Bit 2 of the [NetworkStateLIN](#) shall contain the Tx Error state. This is an error that is related to the source frame that is reported in the same data item.

The Tx Error state shall be set to 1 when the LIN controller detected an error during transmission of a LIN frame. Otherwise it shall be set to 0.] ([SRS_Mirror_00008](#))

[SWS_Mirror_00087] [Bit 1 of the [NetworkStateLIN](#) shall contain the Rx Error state. This is an error that is related to the source frame that is reported in the same data item.

The Rx Error state shall be set to 1 when the LIN controller detected an error during reception of a LIN frame. Otherwise it shall be set to 0.] ([SRS_Mirror_00008](#))

[SWS_Mirror_00088] [Bit 0 of the [NetworkStateLIN](#) shall contain the Header Rx No Response state. This is an error that is related to the source frame that is reported in the same data item.

The Rx No Response state shall be set to 1 when the LIN controller did not receive the expected LIN frame after transmission of a LIN header. Otherwise it shall be set to 0.] ([SRS_Mirror_00008](#))

7.4.2.2.7.3 NetworkStateFlexRay

The layout of the [NetworkState](#) for a FlexRay bus is shown in [Table 7.5](#).

| NetworkState | | | | | | | |
|--------------|------------|-----------------|---------------|--------------|---------------|--------------------|-------------|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Frames Lost | Bus Online | Bus Synchronous | Normal Active | Syntax Error | Content Error | Boundary Violation | Tx Conflict |

Table 7.5: Layout of FlexRay [NetworkState](#)

[SWS_Mirror_00089] [Bit 5 of the [NetworkStateFlexRay](#) shall contain the Bus Synchronous state. This is a continuous state that is not related to the source frame that is reported in the same data item, and may also be reported in a data item where the [FrameIDAvailable](#) and [PayloadAvailable](#) fields are set to 0.

The Bus Synchronous state shall be set to 1 when all FlexRay controllers connected to that bus are synchronous to the network time. Otherwise it shall be set to 0.] ([SRS_Mirror_00008](#))

[SWS_Mirror_00090] [Bit 4 of the `NetworkStateFlexRay` shall contain the Normal Active state. This is a continuous state that is not related to the source frame that is reported in the same data item, and may also be reported in a data item where the `FrameIDAvailable` and `PayloadAvailable` fields are set to 0.

The Normal Active state shall be set to 1 when all FlexRay controllers connected to that bus are synchronous and in the normal active state. Otherwise it shall be set to 0.](*SRS_Mirror_00008*)

[SWS_Mirror_00091] [Bit 3 of the `NetworkStateFlexRay` shall contain the Syntax Error state. This is an aggregated error flag of the FlexRay channels that is related to the channel assignment of the `FrameID`, but not to a source frame and its `FrameID` that is reported in the same data item. It may also be reported in a data item where the `PayloadAvailable` field is set to 0 and the `FrameIDAvailable` is set to 1 with the slot valid flag of the `FrameID` set to 0.

The Syntax Error state shall be set to 1 once after a FlexRay controller detected a syntax error. Otherwise it shall be set to 0.](*SRS_Mirror_00008*)

[SWS_Mirror_00092] [Bit 2 of the `NetworkStateFlexRay` shall contain the Content Error state. This is an aggregated error flag of the FlexRay channels that is related to the channel assignment of the `FrameID`, but not to a source frame and its `FrameID` that is reported in the same data item. It may also be reported in a data item where the `PayloadAvailable` field is set to 0 and the `FrameIDAvailable` is set to 1 with the slot valid flag of the `FrameID` set to 0.

The Content Error state shall be set to 1 once after a FlexRay controller detected a content error. Otherwise it shall be set to 0.](*SRS_Mirror_00008*)

[SWS_Mirror_00093] [Bit 1 of the `NetworkStateFlexRay` shall contain the Boundary Violation state. This is an aggregated error flag of the FlexRay channels that is related to the channel assignment of the `FrameID`, but not to a source frame and its `FrameID` that is reported in the same data item. It may also be reported in a data item where the `PayloadAvailable` field is set to 0 and the `FrameIDAvailable` is set to 1 with the slot valid flag of the `FrameID` set to 0.

The Boundary Violation state shall be set to 1 once after a FlexRay controller detected a boundary violation. Otherwise it shall be set to 0.](*SRS_Mirror_00008*)

[SWS_Mirror_00094] [Bit 0 of the `NetworkStateFlexRay` shall contain the Tx Conflict state. This is an error that is related to the previous source frame that was reported with the same `FrameID` and is always reported in a data item where the `FrameIDAvailable` field is set to 1 and the `PayloadAvailable` field is set to 0.

The Tx Conflict state shall be set to 1 when a FlexRay controller detected a transmission conflict. Otherwise it shall be set to 0.](*SRS_Mirror_00008*)

7.4.2.2.8 FrameID

[SWS_Mirror_00095] [The `FrameID` shall provide the identification of the source frame. This identification shall be unique for one source bus identified by `NetworkType` and `NetworkID`. The `FrameID` may be omitted when reporting a source bus state change, the presence shall be indicated by `FrameIDAvailable`.] (*SRS_Mirror_00008*)

[SWS_Mirror_00096] [The width and layout of the `FrameID` field is bus specific and is defined separately for each bus as `FrameIDCAN`, `FrameIDLIN`, and `FrameIDFlexRay`.] (*SRS_Mirror_00008*)

7.4.2.2.8.1 FrameIDCAN

The layout of the `FrameID` for a CAN bus is shown in [Table 7.6](#).

| FrameID | | | | | | |
|-------------------|------------|-------|---------------------------|---------------------------|--------------------------|-------------------------|
| Byte 0 | | | | Byte 1 | Byte 2 | Byte 3 |
| Bit 7 | Bit 6 | Bit 5 | Bits 4 .. 0 | | | |
| Ext.ID/ Std.ID | FD/ 2.0 | res. | CAN ID (Bits 28 .. 24) | CAN ID (Bits 23 .. 16) | CAN ID (Bits 15 .. 8) | CAN ID (Bits 7 .. 0) |

Table 7.6: Layout of CAN `FrameID`

The layout of the `FrameIDCAN` corresponds to the `Can_IdType` provided by `Mirror_ReportCanFrame`.

[SWS_Mirror_00097] [The width of the `FrameIDCAN` field shall be 4 bytes.] (*SRS_Mirror_00008*)

[SWS_Mirror_00098] [Bit 7 of Byte 0 of the `FrameIDCAN` shall be set to 1 for an Extended CAN ID and to 0 for a Standard CAN ID.] (*SRS_Mirror_00008*)

[SWS_Mirror_00099] [Bit 6 of Byte 0 of the `FrameIDCAN` shall be set to 1 for a CAN-FD frame and to 0 for a CAN 2.0 frame.] (*SRS_Mirror_00008*)

[SWS_Mirror_00100] [Bit 5 of Byte 0 of the `FrameIDCAN` is currently reserved. It shall always be set 0.] (*SRS_Mirror_00008*)

[SWS_Mirror_00101] [Bits 4 – 0 of Byte 0 and Bytes 1 – 3 of the `FrameIDCAN` shall contain the CAN ID of the reported CAN frame in network byte order (MSB first).] (*SRS_Mirror_00008*)

7.4.2.2.8.2 FrameIDLIN

The layout of the `FrameID` for a LIN bus is shown in [Table 7.7](#).

| |
|----------------|
| FrameID |
| Byte 0 |
| LIN PID |

Table 7.7: Layout of LIN `FrameID`

[SWS_Mirror_00102] [The width of the `FrameIDLIN` field shall be 1 byte.]([SRS_Mirror_00008](#))

[SWS_Mirror_00103] [Byte 0 of the `FrameIDLIN` shall contain the LIN PID of the reported LIN frame.]([SRS_Mirror_00008](#))

7.4.2.2.8.3 `FrameIDFlexRay`

The layout of the `FrameID` for a FlexRay bus is shown in [Table 7.8](#).

| FrameID | | | | | | |
|-------------------|-------------------|-----------------|---------------|---------------------------|--------------------------|--------|
| Byte 0 | | | | | Byte 1 | Byte 2 |
| Bit 7 | Bit 6 | Bit 5 .. 4 | Bit 3 | Bits 2 .. 0 | | |
| Chan- nel B | Chan- nel A | <i>reserved</i> | Slot Valid | Slot ID (Bits 10 .. 8) | Slot ID (Bits 7 .. 0) | Cycle |

Table 7.8: Layout of FlexRay `FrameID`

[SWS_Mirror_00104] [The width of the `FrameIDFlexRay` field shall be 3 bytes.]([SRS_Mirror_00008](#))

[SWS_Mirror_00105] [Bits 7 – 6 of Byte 0 of the `FrameIDFlexRay` shall contain the channel assignment of the reported FlexRay frame. Bit 7 shall be set to 1 if the reported FlexRay frame is available on channel B of the FlexRay controller, otherwise it shall be set to 0. Bit 6 shall be set to 1 if the reported FlexRay frame is available on channel A of the FlexRay controller, otherwise it shall be set to 0. A reported FlexRay frame is either assigned exclusively to channel A or B or to both channels.]([SRS_Mirror_00008](#))

This layout of the channel assignment corresponds to the `Fr_ChannelType` reported by [Mirror_ReportFlexRayFrame](#).

[SWS_Mirror_00106] [Bits 5 – 4 of Byte 0 of the `FrameIDFlexRay` are currently reserved. They shall always be set 0.]([SRS_Mirror_00008](#))

[SWS_Mirror_00159] [Bit 3 of Byte 0 of the `FrameIDFlexRay` shall contain a flag indicating whether the reported slot ID and cycle are valid (flag is 1) or unused (flag is 0). It shall only be set to 0 when an aggregated error of the FlexRay channels is reported independently of a source frame or transmission conflict. Otherwise it shall always be set to 1.]([SRS_Mirror_00008](#))

[SWS_Mirror_00107] [Bits 2 – 0 of Byte 0 and Byte 1 of the [FrameIDFlexRay](#) shall contain the slot ID of the reported FlexRay frame in network byte order (MSB first).] ([SRS_Mirror_00008](#))

[SWS_Mirror_00108] [Byte 2 of the [FrameIDFlexRay](#) shall contain the cycle in which the reported FlexRay frame was sent or received.] ([SRS_Mirror_00008](#))

Please note: For received frames and for frames sent in the static segment, the cycle is always reliable. For frames sent in the dynamic segment, the actual cycle cannot be known in advance, because the frame might not be transmitted in the planned cycle.

7.4.2.2.9 PayloadLength

[SWS_Mirror_00109] [The [PayloadLength](#) shall provide the length of the payload of the source frame. It may be omitted when reporting a source bus state change, the presence shall be indicated by [PayloadAvailable](#).] ([SRS_Mirror_00008](#))

[SWS_Mirror_00110] [The width of the [PayloadLength](#) field shall be 8 bits.] ([SRS_Mirror_00008](#))

7.4.2.2.10 Payload

[SWS_Mirror_00111] [The [Payload](#) shall provide the actual payload of the source frame. It may be omitted when reporting a source bus state change, the presence shall be indicated by [PayloadAvailable](#).] ([SRS_Mirror_00008](#))

[SWS_Mirror_00112] [The width of the [Payload](#) field shall correspond to the reported source frame. The maximum values are 8 bytes for LIN and CAN 2.0, 64 bytes for CAN-FD, and 254 for FlexRay.] ([SRS_Mirror_00008](#))

7.5 Mirroring to CAN

When mirroring to a CAN destination bus, the Bus Mirroring module sends received CAN and LIN frames directly to the destination bus, though possibly with a changed CAN ID to avoid conflicts with regular messages on the destination bus.

This chapter defines how the Bus Mirroring module translates CAN IDs and queues the source frames and how it creates and queues status frames before transmitting them on the destination bus.

7.5.1 Handling of Source Frames

This section describes how to process and transmit the source frames that were received from the CAN and LIN bus as described in sections 7.3.1.2 and 7.3.2.2, respectively.

7.5.1.1 ID Mapping

Usually, CAN source frames can be transmitted unchanged on the destination bus, while the PIDs of LIN source frames have to be mapped to a range of CAN ID.

But sometimes, it is hard to find a consecutive sequence of unused CAN IDs for mapping of the LIN PIDs, or the same CAN ID is also used by frames that are usually transmitted on the destination CAN bus.

In these cases, certain CAN IDs and LIN PIDs have to be remapped to special CAN IDs.

7.5.1.1.1 ID Mapping on CAN

[SWS_Mirror_00114] [If the `canId` of a CAN source frame matches the `MirrorSourceCanSingleIdMappingSourceCanId` of a `MirrorSourceCanSingleIdMapping`, the destination frame shall be transmitted with the `MirrorSourceCanSingleIdMappingDestCanId` of that mapping.](*SRS_Mirror_00015*)

[SWS_Mirror_00115] [If the `canId` of a CAN source frame masked by the `MirrorSourceCanMaskBasedIdMappingSourceCanIdMask` of a `MirrorSourceCanMaskBasedIdMapping` matches the `MirrorSourceCanMaskBasedIdMappingSourceCanIdCode` of that mapping, the CAN destination frame shall be transmitted with the masked `canId` added to the `MirrorSourceCanMaskBasedIdMappingDestBaseId`.](*SRS_Mirror_00015*)

[SWS_Mirror_00116] [If the `canId` of a CAN source frame matches neither a `MirrorSourceCanSingleIdMapping` nor a `MirrorSourceCanMaskBasedIdMapping`, the CAN destination frame shall be transmitted with the original `canId`, i.e. identical CAN ID, ID type (Extended or Standard), and frame type (CAN-FD or CAN 2.0).](*SRS_Mirror_00015*)

7.5.1.1.2 ID Mapping on LIN

[SWS_Mirror_00117] [If the frame ID extracted from the `pid` of a LIN source frame matches the `MirrorSourceLinToCanIdMappingLinId` of a `MirrorSourceLinToCanIdMapping`, the CAN destination frame shall be transmitted with the `MirrorSourceLinToCanIdMappingCanId` of that mapping.](*SRS_Mirror_00015*)

[SWS_Mirror_00118] [If the frame ID extracted from the `pid` of a LIN source frame matches no `MirrorSourceLinToCanIdMapping`, the CAN destination frame shall be transmitted with the LIN frame ID added to the `MirrorSourceLinToCanBaseId`.] (*SRS_Mirror_00015*)

7.5.1.2 Queuing

[SWS_Mirror_00119] [The Bus Mirroring module shall place all CAN destination frames in the queue.] (*SRS_Mirror_00013*)

The size of the queue for the CAN destination frames is determined by the configuration parameter `MirrorDestQueueSize`, the size of the queue elements by the `PduLength` of the `Pdu` referenced by `MirrorDestPduRef`.

[SWS_Mirror_00120] [If a destination frame cannot be placed in the queue because the queue is already full, the Bus Mirroring module shall drop that destination frame, report the runtime error `Mirror.MIRROR_E_QUEUE_OVERRUN`, and set (to 1) the Frames Lost bit of the `NetworkState` in the next status frame.] (*SRS_Mirror_00013*)

The handling of status frames is defined in section 7.5.2.

7.5.1.3 Transmission

To be able to transmit arbitrary CAN IDs with arbitrary type (Extended / Standard) in CAN frames of arbitrary type (CAN 2.0 / CAN-FD), the Bus Mirroring module uses a `MirrorDestPdu` with `MetaData` and open `CanIdMask` (see [*SWS_Mirror_CONSTR_00001*]).

[SWS_Mirror_00121] [To initiate the transmission of a queued CAN destination frame, the Bus Mirroring module shall call `PduR_MirrorTransmit` with `PduInfoPtr->MetaDataPtr` set to `MetaData` containing the CAN ID of the destination frame and `PduInfoPtr->SduLength` set to the length of the destination frame. If `MirrorDestPduUsesTriggerTransmit` is enabled, `PduInfoPtr->SduDataPtr` shall be set to the `NULL_PTR`, otherwise to the payload of the source frame.] (*SRS_Mirror_00013*)

A `NULL_PTR` for `PduInfoPtr->SduDataPtr` ensures that the destination bus interface module (`CanIf`) fetches the destination frame using `Mirror_TriggerTransmit`.

[SWS_Mirror_00154] [If the `PduR_MirrorTransmit` returns `E_NOT_OK`, the Bus Mirroring module shall immediately remove the destination frame from the queue, shall report the runtime error `Mirror.MIRROR_E_TRANSMIT_FAILED`, and shall set (to 1) the Frames Lost bit of the `NetworkState` of the next status frame.] (*SRS_Mirror_00013*)

[SWS_Mirror_00155] [The Bus Mirroring module shall initiate the transmission of queued CAN destination frames from the `Mirror_MainFunction` and from the `Mirror_TxConfirmation` callback.]([SRS_Mirror_00013](#))

This ensures that queued destination frames are transmitted as fast as possible.

[SWS_Mirror_00156] [The Bus Mirroring module shall not transmit the next CAN destination frame before the previous destination frame has been confirmed by a call to `Mirror_TxConfirmation`.]([SRS_Mirror_00013](#))

[SWS_Mirror_00122] [When `Mirror_TriggerTransmit` is called for a CAN destination frame, the Mirror module shall copy the payload of the source frame to `PduInfoPtr->SduDataPtr` and update `PduInfoPtr->SduLength` accordingly.]([SRS_Mirror_00013](#))

On the CAN bus, it is not possible that `Mirror_TriggerTransmit` provides a `PduInfoPtr->SduLength` that is too small for the destination frame, because the destination frame has by configuration a size of 8 bytes for CAN 2.0 or 64 bytes for CAN-FD, and the `CanIf` will always provide the hardware buffer size, which is also 8 bytes for CAN 2.0 and 64 bytes for CAN-FD.

[SWS_Mirror_00157] [When `Mirror_TxConfirmation` is called to report the successful or failed transmission of a CAN destination frame, the Bus Mirroring module shall remove the destination frame from the queue.]([SRS_Mirror_00013](#))

[SWS_Mirror_00158] [If the `Mirror_TxConfirmation` reports the failed transmission of a CAN destination frame (`result` is `E_NOT_OK`), the Bus Mirroring module shall report the runtime error `Mirror.MIRROR_E_TRANSMIT_FAILED`, and shall set (to 1) the Frames Lost bit of the `NetworkState` of the next status frame.]([SRS_Mirror_00013](#))

7.5.2 Creation of Status Frames

[SWS_Mirror_00123] [If `MirrorStatusCanId` is configured and when one or more source bus states have changed, the Bus Mirroring module shall allocate a new status frame buffer and write the header in the layout defined by [\[SWS_Mirror_00127\]](#).

The `SHProtocolVersion` field shall be set to 1.]([SRS_Mirror_00009](#))

[SWS_Mirror_00124] [If `MirrorStatusCanId` is configured, the Bus Mirroring module shall create a new status item for each source bus where the reported state has changed and place it at the end of the currently active status frame buffer in the layout defined by [\[SWS_Mirror_00129\]](#).

The fields `SINetworkType` and `SINetworkID` shall be set according to the reported source bus, the `SINetworkState` field shall be set to the reported source bus state.

Depending on the currently reported source bus state, the `SIFrameIDAvailable` shall be set to 1 or 0. In the first case, the `SIFrameID` shall be set according to the

reported source bus, and in the latter case the `SIFrameID` shall be omitted.]([SRS_Mirror_00009](#))

Section 7.4.2.2.7 lists the error codes that can be reported in the `SINetworkState` field and describes the necessity to provide the `SIFrameID`.

[SWS_Mirror_00125] [When a status item does not fit in the remaining space of the currently active status frame buffer, the Bus Mirroring module shall place this buffer in the queue with the CAN ID configured in `MirrorStatusCanId` and activate a new status frame buffer.]([SRS_Mirror_00009](#), [SRS_Mirror_00013](#))

[SWS_Mirror_00126] [When status items have been written for all source buses where the reported state has changed, the Bus Mirroring module shall place the currently active status frame buffer in the queue with the CAN ID configured in `MirrorStatusCanId`.]([SRS_Mirror_00009](#), [SRS_Mirror_00013](#))

7.5.3 Status Protocol

The protocol that is applied by the Bus Mirroring module for transmission of status frames on CAN consists of a header (see section 7.5.3.1) followed by several data items (see section 7.5.3.2).

In the tables and descriptions of this section, the byte numbers increase in the same sequence as the bytes are transmitted on the destination bus, starting from 0. The bit numbers decrease, the most significant bit of a byte being bit 7 and the least significant bit 0.

7.5.3.1 Status Header Layout

Every status frame starts with a header, which is shown in [Figure 7.5](#).

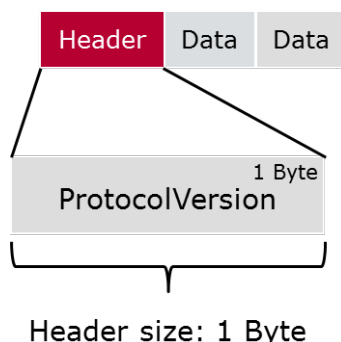


Figure 7.5: Status Frame Header

[SWS_Mirror_00127] [The header of a Bus Mirroring status frame shall contain the `SHPProtocolVersion`.]([SRS_Mirror_00009](#))

7.5.3.1.1 SHProtocolVersion

[SWS_Mirror_00128] [The `SHProtocolVersion` shall be identical to the `ProtocolVersion` of a serialized destination frame.] ([SRS_Mirror_00009](#))

The `ProtocolVersion` is defined in section 7.4.2.1.1.

7.5.3.2 Status Item Layout

Every source bus state is placed in a status item, which is shown in [Figure 7.6](#).

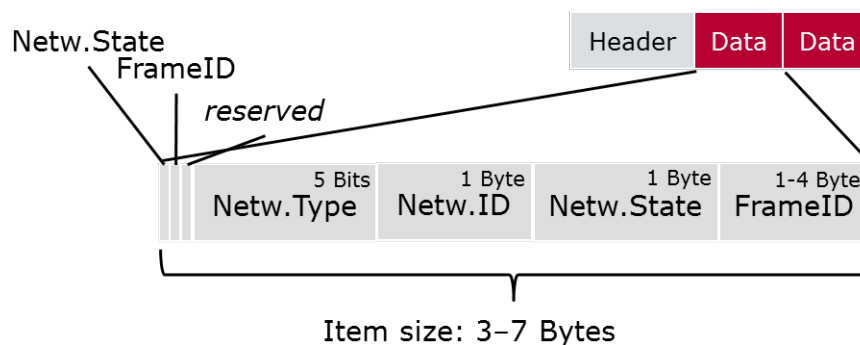


Figure 7.6: Status Frame Item

[SWS_Mirror_00129] [Status items of a Bus Mirroring status frame shall contain the following fields in this order:

1. `SINetworkStateAvailable`
2. `SIFrameIDAvailable`
3. *reserved*
4. `SINetworkType`
5. `SINetworkID`
6. `SINetworkState`
7. `SIFrameID` (optional)

] ([SRS_Mirror_00009](#))

[SWS_Mirror_00132] [Bit 5 of Byte 0 of the status item is currently reserved and shall always be set to 0.] ([SRS_Mirror_00009](#))

The fields of the status item are described in detail in the following subsections.

7.5.3.2.1 SINetworkStateAvailable

[SWS_Mirror_00149] [The layout and semantics of the [SINetworkStateAvailable](#) shall be identical to the [NetworkStateAvailable](#) used in a serialized data item. It shall always be set to 1.] ([SRS_Mirror_00009](#))

The [NetworkStateAvailable](#) is defined in section 7.4.2.2.2. The receiver of a Bus Mirroring status frame can use the [SINetworkStateAvailable](#) to check for a valid status item: If this bit is 0, the remainder of the frame can be ignored, it is probably just padding (see also [[SWS_Mirror_CONSTR_00002](#)]).

7.5.3.2.2 SIFrameIDAvailable

[SWS_Mirror_00131] [The layout and semantics of the [SIFrameIDAvailable](#) shall be identical to the [FrameIDAvailable](#) used in a serialized data item.] ([SRS_Mirror_00009](#))

The [FrameIDAvailable](#) is defined in section 7.4.2.2.3.

7.5.3.2.3 SINetworkType

[SWS_Mirror_00133] [The layout and semantics of the [SINetworkType](#) shall be identical to the [NetworkType](#) used in a serialized data item.] ([SRS_Mirror_00009](#))

The [SINetworkType](#) is defined in section 7.4.2.2.5.

7.5.3.2.4 SINetworkID

[SWS_Mirror_00134] [The layout and semantics of the [SINetworkID](#) shall be identical to the [NetworkID](#) used in a serialized data item.] ([SRS_Mirror_00009](#))

The [NetworkID](#) is defined in section 7.4.2.2.6.

7.5.3.2.5 SINetworkState

[SWS_Mirror_00135] [The layout and semantics of the [SINetworkState](#) shall be identical to the [NetworkState](#) used in a serialized data item.] ([SRS_Mirror_00009](#))

The [NetworkState](#) is defined in section 7.4.2.2.7.

7.5.3.2.6 SIFrameID

[SWS_Mirror_00136] [The layout and semantics of the `SIFrameID` shall be identical to the `FrameID` used in a serialized data item.] ([SRS_Mirror_00009](#))

The `FrameID` is defined in section [7.4.2.2.8](#).

7.6 Error Classification

Section 7.2 “Error Handling” of the document “General Specification of Basic Software Modules” [2] describes the error handling of the Basic Software in detail. Above all, it constitutes a classification scheme consisting of five error types which may occur in BSW modules.

Based on this foundation, this section specifies particular errors arranged in the respective subsections below.

7.6.1 Development Errors

[SWS_Mirror_00007] [

| <i>Type of error</i> | <i>Related error code</i> | <i>Error value</i> |
|--|-----------------------------|--------------------|
| An API was called while the module was uninitialized | MIRROR_E_UNINIT | 0x01 |
| The init API was called twice | MIRROR_E_REINIT | 0x02 |
| Mirror_Init was called with an invalid configuration pointer | MIRROR_E_INIT_FAILED | 0x03 |
| An API service was called with a NULL pointer | MIRROR_E_PARAM_POINTER | 0x10 |
| An API service was called with a wrong ID | MIRROR_E_INVALID_PDU_SDU_ID | 0x11 |
| An API service was called with wrong network handle | MIRROR_E_INVALID_NETWORK_ID | 0x12 |

]([SRS_BSW_00385](#))

7.6.2 Runtime Errors

[SWS_Mirror_00008] [

| <i>Type of error</i> | <i>Related error code</i> | <i>Error value</i> |
|--|---------------------------|--------------------|
| A message could not be stored in the queue | MIRROR_E_QUEUE_OVERRUN | 0x40 |
| A message could not be transmitted | MIRROR_E_TRANSMIT_FAILED | 0x41 |

]([SRS_BSW_00385](#))

7.6.3 Transient Faults

The Bus Mirroring module does not define transient faults.

7.6.4 Production Errors

The Bus Mirroring module does not define production errors.

7.6.5 Extended Production Errors

The Bus Mirroring module does not define extended production errors.

8 API Specification

8.1 API Parameter Checking

The Bus Mirroring module reports the development error `Mirror.MIRROR_E_PARAM_POINTER` when a `NULL_PTR` is not accepted as an argument to a service or callback function. The exact behavior is specified in [SWS_BSW_00050] and [SWS_BSW_00212].

[SWS_Mirror_00137] [If development error detection is enabled by `MirrorDevErrorDetect`, the Bus Mirroring module shall check the `TxPduId` of the callback functions `Mirror_TxConfirmation` and `Mirror_TriggerTransmit` against `MirrorDestPduId`, and shall report the development error `Mirror.MIRROR_E_INVALID_PDU_SDU_ID` when an unknown ID is provided by the call.] (*SRS_Mirror_00013*)

[SWS_Mirror_00138] [If development error detection is enabled by `MirrorDevErrorDetect`, the Bus Mirroring module shall check the `NetworkHandleType` parameters of its service functions against the `ComMChannelId` referenced via `MirrorComMNetworkHandleRef`, and shall report the development error `Mirror.MIRROR_E_INVALID_NETWORK_ID` when an unknown network handle is provided by the call.] (*SRS_Mirror_00010*, *SRS_Mirror_00011*)

8.2 Imported Types

In this chapter, all types used by the Bus Mirroring module are listed together with the defining module:

[SWS_Mirror_01100] [

| <i>Module</i> | <i>Header File</i> | <i>Imported Type</i> |
|----------------|--------------------|-------------------------|
| Can | Can_GeneralTypes.h | Can_ControllerStateType |
| | Can_GeneralTypes.h | Can_ErrorStateType |
| | Can_GeneralTypes.h | Can_IdType |
| CanTrcv | Can_GeneralTypes.h | CanTrcv_TrcvModeType |
| ComStack_Types | ComStack_Types.h | NetworkHandleType |
| | ComStack_Types.h | PduIdType |
| | ComStack_Types.h | PduInfoType |
| | ComStack_Types.h | PduLengthType |
| Fr | Fr_GeneralTypes.h | Fr_ChannelType |
| | Fr_GeneralTypes.h | Fr_ErrorModeType |
| | Fr_GeneralTypes.h | Fr_POCTestType |
| | Fr_GeneralTypes.h | Fr_POCTestStatusType |
| | Fr_GeneralTypes.h | Fr_SlotModeType |





| <i>Module</i> | <i>Header File</i> | <i>Imported Type</i> |
|---------------|--------------------|-------------------------------|
| | Fr_GeneralTypes.h | Fr_StartupStateType |
| | Fr_GeneralTypes.h | Fr_WakeupStatusType |
| FrIf | FrIf.h | FrIf_StateType |
| Lin | Lin_GeneralTypes.h | Lin_FramePidType |
| | Lin_GeneralTypes.h | Lin_StatusType |
| LinTrcv | Lin_GeneralTypes.h | LinTrcv_TrcvModeType |
| StbM | Rte_StbM_Type.h | StbM_SynchronizedTimeBaseType |
| | Rte_StbM_Type.h | StbM_TimeBaseStatusType |
| | Rte_StbM_Type.h | StbM_TimeStampType |
| | Rte_StbM_Type.h | StbM_UserDataType |
| Std | Std_Types.h | Std_ReturnType |
| | Std_Types.h | Std_VersionInfoType |

]()

8.3 Type Definitions

8.3.1 Mirror_ConfigType

[SWS_Mirror_01002] [

| | | |
|----------------------|--|---|
| Name | Mirror_ConfigType | |
| Kind | Structure | |
| Elements | Implementation specific. | |
| | Type | – |
| | Comment | – |
| Description | <p>This is the base type for the configuration of the Bus Mirroring module.</p> <p>A pointer to an instance of this structure will be used in the initialization of the Bus Mirroring module.</p> <p>The content of this structure is defined in chapter 10 Configuration specification.</p> | |
| Available via | Mirror.h | |

]()

8.3.2 MIRROR_INVALID_NETWORK

[SWS_Mirror_00165] [

| | | | |
|----------------------|--|------|---------------------|
| Range | MIRROR_INVALID_NETWORK | 0xFF | Invalid network ID. |
| Description | This type represents a special value of NetworkHandleType, representing an invalid network handle. | | |
| Available via | Mirror.h | | |

}]()

8.4 Function Definitions

This is a list of functions provided for upper layer modules.

8.4.1 Generic Functions

8.4.1.1 Mirror_Init

[SWS_Mirror_01003] [

| | | | |
|---------------------------|--|---|--|
| Service Name | Mirror_Init | | |
| Syntax | <pre>void Mirror_Init (const Mirror_ConfigType* configPtr)</pre> | | |
| Service ID [hex] | 0x01 | | |
| Sync/Async | Synchronous | | |
| Reentrancy | Non Reentrant | | |
| Parameters (in) | configPtr | Pointer to selected configuration structure | |
| Parameters (inout) | None | | |
| Parameters (out) | None | | |
| Return value | None | | |
| Description | <p>This function initializes the Bus Mirroring module.</p> <p>In configurations, in which Mirror is assigned to more than one partition (i.e. Mirror_Main Functions are mapped to partitions), Mirror may provide one init function per partition.</p> | | |
| Available via | Mirror.h | | |

}]()

8.4.1.2 Mirror_Delnit

[SWS_Mirror_01004] [

| | |
|---------------------|---------------|
| Service Name | Mirror_Delnit |
|---------------------|---------------|





| | |
|---------------------------|--|
| Syntax | <code>void Mirror_DeInit (</code> <code> void</code> <code>)</code> |
| Service ID [hex] | 0x02 |
| Sync/Async | Synchronous |
| Reentrancy | Non Reentrant |
| Parameters (in) | None |
| Parameters (inout) | None |
| Parameters (out) | None |
| Return value | None |
| Description | This function resets the Bus Mirroring module to the uninitialized state. |
| Available via | Mirror.h |

]()

8.4.1.3 Mirror_GetVersionInfo

[SWS_Mirror_01005] [

| | |
|---------------------------|--|
| Service Name | Mirror_GetVersionInfo |
| Syntax | <code>void Mirror_GetVersionInfo (</code> <code> Std_VersionInfoType* versionInfo</code> <code>)</code> |
| Service ID [hex] | 0x03 |
| Sync/Async | Synchronous |
| Reentrancy | Reentrant |
| Parameters (in) | None |
| Parameters (inout) | None |
| Parameters (out) | versionInfo Pointer to where to store the version information of this module. |
| Return value | None |
| Description | Returns the version information of this module. |
| Available via | Mirror.h |

]()

8.4.2 Filter Handling

8.4.2.1 Mirror_GetStaticFilterState

[SWS_Mirror_01006] [

| | | |
|---------------------------|--|--|
| Service Name | Mirror_GetStaticFilterState | |
| Syntax | <pre>Std_ReturnType Mirror_GetStaticFilterState (NetworkHandleType network, uint8 filterId, boolean* isActive)</pre> | |
| Service ID [hex] | 0x23 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant | |
| Parameters (in) | network | ComM channel that corresponds to the source bus to which the filter is attached. |
| | filterId | ID of the filter. |
| Parameters (inout) | None | |
| Parameters (out) | isActive | Pointer to where to store the current filter state. |
| Return value | Std_ReturnType | E_OK: Filter state copied to isActive. E_NOT_OK: Function was called with invalid parameters. |
| Description | Returns the state of a pre-configured filter. | |
| Available via | Mirror.h | |

}]()

8.4.2.2 Mirror_SetStaticFilterState

[SWS_Mirror_01007] [

| | | |
|---------------------------|---|---|
| Service Name | Mirror_SetStaticFilterState | |
| Syntax | <pre>Std_ReturnType Mirror_SetStaticFilterState (NetworkHandleType network, uint8 filterId, boolean isActive)</pre> | |
| Service ID [hex] | 0x14 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel that corresponds to the source bus to which the filter is attached. |
| | filterId | ID of the filter. |
| | isActive | TRUE: Activate filter FALSE: Deactivate filter |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | Std_ReturnType | E_OK: Filter state updated from isActive. E_NOT_OK: Function was called with invalid parameters. |
| Description | Sets the state of a pre-configured filter. | |
| Available via | Mirror.h | |

}]()

8.4.2.3 Mirror_AddCanRangeFilter

[SWS_Mirror_01008] [

| | | |
|---------------------------|---|--|
| Service Name | Mirror_AddCanRangeFilter | |
| Syntax | <pre>Std_ReturnType Mirror_AddCanRangeFilter (NetworkHandleType network, uint8* filterId, Can_IdType lowerId, Can_IdType upperId)</pre> | |
| Service ID [hex] | 0x15 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel that corresponds to the CAN bus to which the filter shall be attached. |
| | lowerId | Lower CAN ID of the range. |
| | upperId | Upper CAN ID of the range. |
| Parameters (inout) | None | |
| Parameters (out) | filterId | ID of the newly created filter. |
| Return value | Std_ReturnType | E_OK: New filter created. E_NOT_OK: Creation of filter failed because of invalid parameters or because no filter on the given network was free. |
| Description | Creates a CAN ID range filter. | |
| Available via | Mirror.h | |

]()

8.4.2.4 Mirror_AddCanMaskFilter

[SWS_Mirror_01009] [

| | | |
|---------------------------|--|---|
| Service Name | Mirror_AddCanMaskFilter | |
| Syntax | <pre>Std_ReturnType Mirror_AddCanMaskFilter (NetworkHandleType network, uint8* filterId, Can_IdType id, Can_IdType mask)</pre> | |
| Service ID [hex] | 0x16 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel that corresponds to the CAN bus to which the filter shall be attached. |
| | id | CAN ID used to match a received or transmitted CAN ID. |
| | mask | Mask that defines the bits of 'id' that are relevant for comparison with the actual CAN ID. |
| Parameters (inout) | None | |





| | | |
|-------------------------|-------------------------------|--|
| Parameters (out) | filterId | ID of the newly created filter. |
| Return value | Std_ReturnType | E_OK: New filter created. E_NOT_OK: Creation of filter failed because of invalid parameters or because no filter on the given network was free. |
| Description | Creates a CAN ID mask filter. | |
| Available via | Mirror.h | |

]()

8.4.2.5 Mirror_AddLinRangeFilter

[SWS_Mirror_01010] [

| | | |
|---------------------------|---|--|
| Service Name | Mirror_AddLinRangeFilter | |
| Syntax | <pre>Std_ReturnType Mirror_AddLinRangeFilter (NetworkHandleType network, uint8* filterId, uint8 lowerId, uint8 upperId)</pre> | |
| Service ID [hex] | 0x17 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel that corresponds to the LIN bus to which the filter shall be attached. |
| | lowerId | Lower frame ID of the range. |
| | upperId | Upper frame ID of the range. |
| Parameters (inout) | None | |
| Parameters (out) | filterId | ID of the newly created filter. |
| Return value | Std_ReturnType | E_OK: New filter created. E_NOT_OK: Creation of filter failed because of invalid parameters or because no filter on the given network was free. |
| Description | Creates a LIN frame ID range filter. | |
| Available via | Mirror.h | |

]()

8.4.2.6 Mirror_AddLinMaskFilter

[SWS_Mirror_01011] [

| | |
|---------------------|-------------------------|
| Service Name | Mirror_AddLinMaskFilter |
|---------------------|-------------------------|





| | | |
|---------------------------|--|--|
| Syntax | <pre>Std_ReturnType Mirror_AddLinMaskFilter (NetworkHandleType network, uint8* filterId, uint8 id, uint8 mask)</pre> | |
| Service ID [hex] | 0x18 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel that corresponds to the LIN bus to which the filter shall be attached. |
| | id | Frame ID used to match a received or transmitted frame ID. |
| | mask | Mask that defines the bits of 'id' that are relevant for comparison with the actual frame ID. |
| Parameters (inout) | None | |
| Parameters (out) | filterId | ID of the newly created filter. |
| Return value | Std_ReturnType | E_OK: New filter created. E_NOT_OK: Creation of filter failed because of invalid parameters or because no filter on the given network was free. |
| Description | Creates a LIN frame ID mask filter. | |
| Available via | Mirror.h | |

]()

8.4.2.7 Mirror_AddFlexRayFilter

[SWS_Mirror_01012] [

| | | |
|-------------------------|---|---|
| Service Name | Mirror_AddFlexRayFilter | |
| Syntax | <pre>Std_ReturnType Mirror_AddFlexRayFilter (NetworkHandleType network, uint8* filterId, uint16 lowerSlotId, uint16 upperSlotId, uint8 lowerBaseCycle, uint8 upperBaseCycle, uint8 cycleRepetition, Fr_ChannelType frChannel)</pre> | |
| Service ID [hex] | 0x19 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel that corresponds to the FlexRay bus to which the filter shall be attached. |
| | lowerSlotId | Lower slot ID of a range of slot IDs. |
| | upperSlotId | Upper slot ID of a range of slot IDs. |
| | lowerBaseCycle | Lower base cycle of a range of cycles. |
| | upperBaseCycle | Upper base cycle of a range of cycles. |



△

| | | |
|---------------------------|---------------------------|--|
| | cycleRepetition | Repetition pattern of selected cycles (2 ⁿ). |
| | frChannel | FlexRay channel assignment. |
| Parameters (inout) | None | |
| Parameters (out) | filterId | ID of the newly created filter. |
| Return value | Std_ReturnType | E_OK: New filter created. E_NOT_OK: Creation of filter failed because of invalid parameters or because no filter on the given network was free. |
| Description | Creates a FlexRay filter. | |
| Available via | Mirror.h | |

]()

8.4.2.8 Mirror_RemoveFilter

[SWS_Mirror_01013] [

| | | |
|---------------------------|---|---|
| Service Name | Mirror_RemoveFilter | |
| Syntax | Std_ReturnType Mirror_RemoveFilter (NetworkHandleType network, uint8 filterId) | |
| Service ID [hex] | 0x1a | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel that corresponds to the source bus to which the filter is attached. |
| | filterId | ID of the filter. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | Std_ReturnType | E_OK: Filter was removed. E_NOT_OK: Function was called with invalid parameters. |
| Description | Removes a CAN, LIN, or FlexRay filter that was added at runtime. | |
| Available via | Mirror.h | |

]()

8.4.3 State Handling

8.4.3.1 Mirror_IsMirrorActive

[SWS_Mirror_01014] [

| | |
|---------------------------|--|
| Service Name | Mirror_IsMirrorActive |
| Syntax | <pre>boolean Mirror_IsMirrorActive (void)</pre> |
| Service ID [hex] | 0x20 |
| Sync/Async | Synchronous |
| Reentrancy | Reentrant |
| Parameters (in) | None |
| Parameters (inout) | None |
| Parameters (out) | None |
| Return value | boolean TRUE: Bus Mirroring module is active FALSE: Bus Mirroring module is inactive |
| Description | Returns the global mirroring state. |
| Available via | Mirror.h |

]()

8.4.3.2 Mirror_Offline

[SWS_Mirror_01015] [

| | |
|---------------------------|---|
| Service Name | Mirror_Offline |
| Syntax | <pre>void Mirror_Offline (void)</pre> |
| Service ID [hex] | 0x13 |
| Sync/Async | Synchronous |
| Reentrancy | Non Reentrant |
| Parameters (in) | None |
| Parameters (inout) | None |
| Parameters (out) | None |
| Return value | None |
| Description | Completely disables any mirroring activities. Source buses are reset to disabled, queued messages are purged, and the destination bus is reset to the default destination. Pre-configured filters are disabled, and filters added at runtime are removed. |
| Available via | Mirror.h |

]()

8.4.3.3 Mirror_GetDestNetwork

[SWS_Mirror_01016] [

| | | |
|---------------------------|--|--|
| Service Name | Mirror_GetDestNetwork | |
| Syntax | NetworkHandleType Mirror_GetDestNetwork (void) | |
| Service ID [hex] | 0x21 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant | |
| Parameters (in) | None | |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | NetworkHandleType | ComM channel that corresponds to the currently active destination network. |
| Description | Returns the currently selected destination bus. | |
| Available via | Mirror.h | |

]()

8.4.3.4 Mirror_SwitchDestNetwork

[SWS_Mirror_01017] [

| | | |
|---------------------------|---|--|
| Service Name | Mirror_SwitchDestNetwork | |
| Syntax | Std_ReturnType Mirror_SwitchDestNetwork (NetworkHandleType network) | |
| Service ID [hex] | 0x12 | |
| Sync/Async | Synchronous | |
| Reentrancy | Non Reentrant | |
| Parameters (in) | network | ComM channel corresponding to the destination bus that shall be enabled. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | Std_ReturnType | E_OK: Destination bus was changed. E_NOT_OK: Function was called with invalid parameters. |
| Description | Changes the destination bus to the given ComM channel. The previously active destination bus and all source buses are disabled. | |
| Available via | Mirror.h | |

]()

8.4.3.5 Mirror_IsSourceNetworkStarted

[SWS_Mirror_01018] [

| | | |
|---------------------------|--|---|
| Service Name | Mirror_IsSourceNetworkStarted | |
| Syntax | <pre>boolean Mirror_IsSourceNetworkStarted (NetworkHandleType network)</pre> | |
| Service ID [hex] | 0x22 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant | |
| Parameters (in) | network | ComM channel corresponding to the source bus that shall be checked. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | boolean | TRUE: Source bus is active. FALSE: Source bus is inactive. |
| Description | Returns the state of a source bus. | |
| Available via | Mirror.h | |

]()

8.4.3.6 Mirror_StartSourceNetwork

[SWS_Mirror_01019] [

| | | |
|---------------------------|---|---|
| Service Name | Mirror_StartSourceNetwork | |
| Syntax | <pre>Std_ReturnType Mirror_StartSourceNetwork (NetworkHandleType network)</pre> | |
| Service ID [hex] | 0x10 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel corresponding to the source bus that shall be started. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | Std_ReturnType | E_OK: Source bus was activated. E_NOT_OK: Function was called with invalid parameters. |
| Description | Activates a source bus. | |
| Available via | Mirror.h | |

]()

8.4.3.7 Mirror_StopSourceNetwork

[SWS_Mirror_01020] [

| | | |
|---------------------------|---|---|
| Service Name | Mirror_StopSourceNetwork | |
| Syntax | Std_ReturnType Mirror_StopSourceNetwork (NetworkHandleType network) | |
| Service ID [hex] | 0x11 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |
| Parameters (in) | network | ComM channel corresponding to the source bus that shall be stopped. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | Std_ReturnType | E_OK: Source bus was deactivated. E_NOT_OK: Function was called with invalid parameters. |
| Description | Deactivates a source bus. | |
| Available via | Mirror.h | |

]()

8.4.4 Support Functions

8.4.4.1 Mirror_GetNetworkType

[SWS_Mirror_01021] [

| | | |
|---------------------------|--|--|
| Service Name | Mirror_GetNetworkType | |
| Syntax | Mirror_NetworkType Mirror_GetNetworkType (NetworkHandleType network) | |
| Service ID [hex] | 0x24 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant | |
| Parameters (in) | network | ComM channel corresponding to one of the buses configured as source or destination bus. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | Mirror_NetworkType | Network type of the bus identified by 'network', or MIRROR_NT_INVALID if the bus is not configured for Mirror. |
| Description | Returns the network type of the given network. | |
| Available via | Mirror.h | |

]()

8.4.4.2 Mirror_GetNetworkId

[SWS_Mirror_01022] [

| | | |
|---------------------------|--|---|
| Service Name | Mirror_GetNetworkId | |
| Syntax | <pre>uint8 Mirror_GetNetworkId (NetworkHandleType network)</pre> | |
| Service ID [hex] | 0x25 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant | |
| Parameters (in) | network | ComM channel corresponding to one of the buses configured as source or destination bus. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | uint8 | Network ID of the bus identified by 'network', or 0xFF if the bus is not configured for Mirror. |
| Description | Returns the network ID of the given network. | |
| Available via | Mirror.h | |

]()

8.4.4.3 Mirror_GetNetworkHandle

[SWS_Mirror_01023] [

| | | |
|---------------------------|---|---|
| Service Name | Mirror_GetNetworkHandle | |
| Syntax | <pre>NetworkHandleType Mirror_GetNetworkHandle (Mirror_NetworkType networkType, uint8 networkId)</pre> | |
| Service ID [hex] | 0x26 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant | |
| Parameters (in) | networkType | Network type of the bus to be identified. |
| | networkId | Network ID of the bus to be identified. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | NetworkHandleType | ComM channel that corresponds to the bus identified by the given network type and network ID. MIRROR_INVALID_NETWORK, if no configured network corresponds to the given combination of networkType and networkId. |
| Description | Returns the network handle (ComMChannel) of the bus identified by the given network type and network ID, or MIRROR_INVALID_NETWORK. | |
| Available via | Mirror.h | |

]()

8.5 Callback Notifications

This is a list of functions provided for other modules.

8.5.1 Mirror_ReportCanFrame

[SWS_Mirror_01024] [

| | | |
|---------------------------|---|--|
| Service Name | Mirror_ReportCanFrame | |
| Syntax | <pre>void Mirror_ReportCanFrame (uint8 controllerId, Can_IdType canId, uint8 length, const uint8* payload)</pre> | |
| Service ID [hex] | 0x50 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different controllerIds. Non reentrant for the same controllerId. | |
| Parameters (in) | controllerId | ID of the CAN controller that received or transmitted the frame. |
| | canId | CAN ID of the CAN frame. |
| | length | Length of the CAN frame. |
| | payload | Content of the CAN frame. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | None | |
| Description | Reports a received or transmitted CAN frame. All received CAN frames that pass the hardware acceptance filter are reported, independent of the software filter configuration. Transmitted CAN frames are reported when the transmission is confirmed. | |
| Available via | Mirror.h | |

]()

8.5.2 Mirror_ReportLinFrame

[SWS_Mirror_01027] [

| | | |
|-------------------------|--|--|
| Service Name | Mirror_ReportLinFrame | |
| Syntax | <pre>void Mirror_ReportLinFrame (NetworkHandleType network, Lin_FramePidType pid, const PduInfoType* pdu, Lin_StatusType status)</pre> | |
| Service ID [hex] | 0x51 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different networks. Non reentrant for the same network. | |





| | | |
|---------------------------|--|--|
| Parameters (in) | network | ComM channel associated with the LIN channel on which the frame was received or transmitted. |
| | pid | Protected ID of the LIN frame. |
| | pdu | Content of the LIN frame. |
| | status | Rx/Tx status of the frame access through the LIN driver. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | None | |
| Description | Reports a received or transmitted LIN frame. | |
| Available via | Mirror.h | |

]()

8.5.3 Mirror_ReportFlexRayFrame

[SWS_Mirror_01026] [

| | | |
|---------------------------|--|--|
| Service Name | Mirror_ReportFlexRayFrame | |
| Syntax | <pre>void Mirror_ReportFlexRayFrame (uint8 controllerId, uint16 slotId, uint8 cycle, Fr_ChannelType frChannel, const PduInfoType* frame, boolean txConflict)</pre> | |
| Service ID [hex] | 0x52 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different controllerIds. Non reentrant for the same controllerId. | |
| Parameters (in) | controllerId | FlexRay controller that received/transmitted the frame. |
| | slotId | ID of the slot in which the received/transmitted frame is located. |
| | cycle | Cycle in which the reception/transmission takes place. |
| | frChannel | FlexRay channel(s) on which the reception/transmission takes place. |
| | frame | Content of the FlexRay frame, or NULL when a txConflict is reported. |
| | txConflict | TRUE in case a txConflict has been detected, FALSE otherwise. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | None | |
| Description | Reports a received or transmitted FlexRay frame or a Tx conflict. | |
| Available via | Mirror.h | |

]()

8.5.4 Mirror_ReportFlexRayChannelStatus

[SWS_Mirror_01025] [

| | | |
|---------------------------|--|---|
| Service Name | Mirror_ReportFlexRayChannelStatus | |
| Syntax | <pre>void Mirror_ReportFlexRayChannelStatus (uint8 clusterId, uint16 channelAStatus, uint16 channelBStatus)</pre> | |
| Service ID [hex] | 0x53 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different clusterIds. Non reentrant for the same clusterId. | |
| Parameters (in) | clusterId | FlexRay cluster for which the status is reported. |
| | channelAStatus | Status of FlexRay channel A. |
| | channelBStatus | Status of FlexRay channel B. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | None | |
| Description | Reports the aggregated channel status for FlexRay channels A and B of a cluster. The status is encoded as specified in SWS_Fr_00558. | |
| Available via | Mirror.h | |

]()

8.5.5 Mirror_TxConfirmation

[SWS_Mirror_01028] [

| | | |
|---------------------------|--|--|
| Service Name | Mirror_TxConfirmation | |
| Syntax | <pre>void Mirror_TxConfirmation (PduIdType TxPduId, Std_ReturnType result)</pre> | |
| Service ID [hex] | 0x40 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different PduIds. Non reentrant for the same PduId. | |
| Parameters (in) | TxPduId | ID of the PDU that has been transmitted. |
| | result | E_OK: The PDU was transmitted. E_NOT_OK: Transmission of the PDU failed. |
| Parameters (inout) | None | |
| Parameters (out) | None | |
| Return value | None | |
| Description | The lower layer communication interface module confirms the transmission of a PDU, or the failure to transmit a PDU. | |
| Available via | Mirror.h | |

]()

8.5.6 Mirror_TriggerTransmit

[SWS_Mirror_01029] [

| | | |
|---------------------------|--|---|
| Service Name | Mirror_TriggerTransmit | |
| Syntax | <pre>Std_ReturnType Mirror_TriggerTransmit (PduIdType TxPduId, PduInfoType* PduInfoPtr)</pre> | |
| Service ID [hex] | 0x41 | |
| Sync/Async | Synchronous | |
| Reentrancy | Reentrant for different PduIds. Non reentrant for the same PduId. | |
| Parameters (in) | TxPduId | ID of the SDU that is requested to be transmitted. |
| Parameters (inout) | PduInfoPtr | Contains a pointer to a buffer (SduDataPtr) to where the SDU data shall be copied, and the available buffer size in SduLength. On return, the service will indicate the length of the copied SDU data in SduLength. |
| Parameters (out) | None | |
| Return value | Std_ReturnType | E_OK: SDU has been copied and SduLength indicates the number of copied bytes. E_NOT_OK: No SDU data has been copied. PduInfoPtr must not be used since it may contain a NULL pointer or point to invalid data. |
| Description | Within this API, the upper layer module (called module) shall check whether the available data fits into the buffer size reported by PduInfoPtr->SduLength. If it fits, it shall copy its data into the buffer provided by PduInfoPtr->SduDataPtr and update the length of the actual copied data in PduInfoPtr->SduLength. If not, it returns E_NOT_OK without changing PduInfoPtr. | |
| Available via | Mirror.h | |

]()

8.6 Scheduled Functions

This function is directly called by Basic Software Scheduler (SchM).

8.6.1 Mirror_MainFunction

[SWS_Mirror_01030] [

| | | |
|-------------------------|--|--|
| Service Name | Mirror_MainFunction | |
| Syntax | <pre>void Mirror_MainFunction (void)</pre> | |
| Service ID [hex] | 0x04 | |





| | |
|----------------------|---|
| Description | Main function of the Bus Mirroring module. Used for scheduling purposes and timeout supervision. Per configured MirrorMainFunction instance one Mirror_MainFunction_<shortName> shall be implemented. Hereby <shortName> is the short name of the MirrorMainFunction configuration container in the ECU configuration. |
| Available via | SchM_Mirror.h |

]()

8.7 Expected Interfaces

In this section, all interfaces required from other modules are listed.

8.7.1 Mandatory Interfaces

This section defines all interfaces that are required to fulfill the core functionality of the module.

[SWS_Mirror_01101] [

| API Function | Header File | Description |
|---------------------|--------------------|---------------------------------|
| PduR_MirrorTransmit | PduR_Mirror.h | Requests transmission of a PDU. |

]()

8.7.2 Optional Interfaces

This section defines all interfaces that are required to fulfill an optional functionality of the module.

[SWS_Mirror_01102] [

| API Function | Header File | Description |
|-----------------------------------|--------------------|---|
| CanIf_EnableBusMirroring | CanIf.h | Enables or disables mirroring for a CAN controller. |
| CanIf_GetControllerErrorState | CanIf.h | This service calls the corresponding CAN Driver service for obtaining the error state of the CAN controller. |
| CanIf_GetControllerMode | CanIf.h | This service calls the corresponding CAN Driver service for obtaining the current status of the CAN controller. |
| CanIf_GetControllerTxErrorCounter | CanIf.h | This service calls the corresponding CAN Driver service for obtaining the Tx error counter of the CAN controller. |





| API Function | Header File | Description |
|--------------------------|-------------|---|
| Canlf_GetTrcvMode | Canlf.h | This function invokes CanTrcv_GetOpMode and updates the parameter TransceiverModePtr with the value OpMode provided by CanTrcv. |
| Det_ReportError | Det.h | Service to report development errors. |
| Frlf_EnableBusMirroring | Frlf.h | Enables or disables mirroring for all FlexRay controllers connected to the addressed FlexRay cluster. |
| Frlf_GetPOCStatus | Frlf.h | Wraps the FlexRay Driver API function Fr_Get POCStatus(). |
| Frlf_GetState | Frlf.h | Get current Frlf state. |
| Linlf_EnableBusMirroring | Linlf.h | Enables or disables mirroring for a LIN channel. |
| Linlf_GetTrcvMode | Linlf.h | Returns the actual state of a LIN Transceiver Driver. |
| StbM_GetCurrentTime | StbM.h | Returns a time value (Local Time Base derived from Global Time Base) in standard format. Note: This API shall be called with locked interrupts / within an Exclusive Area to prevent interruption (i.e., the risk that the time stamp is outdated on return of the function call). |

]()

8.8 Service Interfaces

8.8.1 Implementation Data Types

8.8.1.1 Mirror_NetworkType

[SWS_Mirror_01000] [

| | | | |
|----------------------|---|------|---------------------|
| Name | Mirror_NetworkType | | |
| Kind | Enumeration | | |
| Range | MIRROR_NT_INVALID | 0x00 | Invalid network |
| | MIRROR_NT_CAN | 0x01 | CAN network |
| | MIRROR_NT_LIN | 0x02 | LIN network |
| | MIRROR_NT_FLEXRAY | 0x03 | FlexRay network |
| | MIRROR_NT_ETHERNET | 0x04 | Ethernet network |
| | MIRROR_NT_PROPRIETARY | 0x05 | Proprietary network |
| Description | This type represents the bus types that are supported as source or destination buses for the Bus Mirroring module. The invalid type is used as a return value if a function cannot return a valid type. | | |
| Variation | – | | |
| Available via | Rte_Mirror_Type.h | | |

]()

8.8.2 Client-Server Interfaces

8.8.2.1 MirrorControl

[SWS_Mirror_01033] [

| | | | |
|------------------------|---|----------|----------------------|
| Name | MirrorControl | | |
| Comment | Provides access to the control functions of the Bus Mirroring module. | | |
| IsService | true | | |
| Variation | – | | |
| Possible Errors | 0 | E_OK | Operation successful |
| | 1 | E_NOT_OK | Operation failed |

| | | | |
|------------------------|---|---|--|
| Operation | AddCanMaskFilter | | |
| Comment | Creates a CAN ID mask filter. | | |
| Variation | – | | |
| Parameters | network | | |
| | Type | NetworkHandleType | |
| | Direction | IN | |
| | Comment | ComM channel that corresponds to the CAN bus to which the filter shall be attached. | |
| | Variation | – | |
| | filterId | | |
| | Type | uint8* | |
| | Direction | OUT | |
| | Comment | ID of the newly created filter. | |
| | Variation | – | |
| | id | | |
| | Type | Can_IdType | |
| | Direction | IN | |
| | Comment | CAN ID used to match a received or transmitted CAN ID. | |
| | Variation | – | |
| | mask | | |
| Type | Can_IdType | | |
| Direction | IN | | |
| Comment | Mask that defines the bits of 'id' that are relevant for comparison with the actual CAN ID. | | |
| Variation | – | | |
| Possible Errors | E_OK E_NOT_OK | | |

| | | | |
|-------------------|--------------------------------|---|--|
| Operation | AddCanRangeFilter | | |
| Comment | Creates a CAN ID range filter. | | |
| Variation | – | | |
| Parameters | network | | |
| | Type | NetworkHandleType | |
| | Direction | IN | |
| | Comment | ComM channel that corresponds to the CAN bus to which the filter shall be attached. | |





| | | |
|------------------------|--|---------------------------------|
| | Variation | – |
| | filterId | |
| | Type | uint8* |
| | Direction | OUT |
| | Comment | ID of the newly created filter. |
| | Variation | – |
| | lowerId | |
| | Type | Can_IdType |
| | Direction | IN |
| | Comment | Lower CAN ID of the range. |
| | Variation | – |
| | upperId | |
| | Type | Can_IdType |
| | Direction | IN |
| | Comment | Upper CAN ID of the range. |
| Variation | – | |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|------------------------|--|---|
| Operation | AddFlexRayFilter | |
| Comment | Creates a FlexRay filter. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel that corresponds to the FlexRay bus to which the filter shall be attached. |
| | Variation | – |
| | filterId | |
| | Type | uint8* |
| | Direction | OUT |
| | Comment | ID of the newly created filter. |
| | Variation | – |
| | lowerSlotId | |
| | Type | uint16 |
| | Direction | IN |
| | Comment | Lower slot ID of a range of slot IDs. |
| | Variation | – |
| | upperSlotId | |
| | Type | uint16 |
| | Direction | IN |
| | Comment | Upper slot ID of a range of slot IDs. |
| | Variation | – |
| | lowerBaseCycle | |
| | Type | uint8 |
| | Direction | IN |
| | Comment | Lower base cycle of a range of cycles. |
| | Variation | – |
| | upperBaseCycle | |
| | Type | uint8 |
| | Direction | IN |
| | Comment | Upper base cycle of a range of cycles. |
| | Variation | – |
| | cycleRepetition | |
| | Type | uint8 |
| Direction | IN | |
| Comment | Repetition pattern of selected cycles (2 ⁿ). | |
| Variation | – | |
| frChannel | | |
| Type | Fr_ChannelType | |
| Direction | IN | |
| Comment | FlexRay channel assignment. | |
| Variation | – | |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|------------------------|---|---|
| Operation | AddLinMaskFilter | |
| Comment | Creates a LIN frame ID mask filter. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel that corresponds to the LIN bus to which the filter shall be attached. |
| | Variation | – |
| | filterId | |
| | Type | uint8* |
| | Direction | OUT |
| | Comment | ID of the newly created filter. |
| | Variation | – |
| | id | |
| | Type | uint8 |
| | Direction | IN |
| | Comment | Frame ID used to match a received or transmitted frame ID. |
| Variation | – | |
| mask | | |
| Type | uint8 | |
| Direction | IN | |
| Comment | Mask that defines the bits of 'id' that are relevant for comparison with the actual frame ID. | |
| Variation | – | |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|-------------------|--------------------------------------|---|
| Operation | AddLinRangeFilter | |
| Comment | Creates a LIN frame ID range filter. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel that corresponds to the LIN bus to which the filter shall be attached. |
| | Variation | – |
| | filterId | |
| | Type | uint8* |
| | Direction | OUT |
| | Comment | ID of the newly created filter. |
| | Variation | – |
| | lowerId | |
| | Type | uint8 |
| | Direction | IN |
| | Comment | Lower frame ID of the range. |
| Variation | – | |
| upperId | | |
| Type | uint8 | |





| | | |
|------------------------|------------------|------------------------------|
| | Direction | IN |
| | Comment | Upper frame ID of the range. |
| | Variation | – |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|------------------------|---|--|
| Operation | GetDestNetwork | |
| Comment | Returns the currently selected destination bus. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | OUT |
| | Comment | ComM channel that corresponds to the currently active destination network. |
| | Variation | – |
| Possible Errors | E_OK | |

| | | |
|------------------------|--|---|
| Operation | GetNetworkHandle | |
| Comment | Returns the network handle (ComMChannel) of the bus identified by the given network type and network ID. | |
| Variation | – | |
| Parameters | networkType | |
| | Type | Mirror_NetworkType |
| | Direction | IN |
| | Comment | Network type of the bus to be identified. |
| | Variation | – |
| | networkId | |
| | Type | uint8 |
| | Direction | IN |
| | Comment | Network ID of the bus to be identified. |
| | Variation | – |
| | network | |
| | Type | NetworkHandleType |
| | Direction | OUT |
| | Comment | ComM channel that corresponds to the bus identified by the given network type and network ID. |
| Variation | – | |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|-------------------|--|---|
| Operation | GetNetworkId | |
| Comment | Returns the network ID of the given network. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel corresponding to one of the buses configured as source or destination bus. |
| | Variation | – |





| | | |
|------------------------|------------------|--|
| | networkId | |
| | Type | uint8 |
| | Direction | OUT |
| | Comment | Network ID of the bus identified by 'network'. |
| | Variation | – |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|------------------------|--|---|
| Operation | GetNetworkType | |
| Comment | Returns the network type of the given network. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel corresponding to one of the buses configured as source or destination bus. |
| | Variation | – |
| | networkType | |
| | Type | Mirror_NetworkType |
| | Direction | OUT |
| | Comment | Network type of the bus identified by 'network'. |
| | Variation | – |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|-------------------|---|--|
| Operation | GetStaticFilterState | |
| Comment | Returns the state of a pre-configured filter. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel that corresponds to the source bus to which the filter is attached. |
| | Variation | – |
| | filterId | |
| | Type | uint8 |
| | Direction | IN |
| | Comment | ID of the filter. |
| | Variation | – |
| | isActive | |
| | Type | boolean* |
| | Direction | OUT |
| | Comment | Pointer to where to store the current filter state. |
| | Variation | – |
| | Possible Errors | E_OK E_NOT_OK |

| | | |
|------------------------|-------------------------------------|-------------------------|
| Operation | IsMirrorActive | |
| Comment | Returns the global mirroring state. | |
| Variation | – | |
| Parameters | mirrorActive | |
| | Type | boolean |
| | Direction | OUT |
| | Comment | Global mirroring state. |
| | Variation | – |
| Possible Errors | E_OK | |

| | | |
|------------------------|------------------------------------|---|
| Operation | IsSourceNetworkStarted | |
| Comment | Returns the state of a source bus. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel corresponding to the source bus that shall be checked. |
| | Variation | – |
| | sourceNetworkStarted | |
| | Type | boolean |
| | Direction | OUT |
| | Comment | State of a source bus. TRUE: Source bus is active. FALSE: Source bus is inactive. |
| | Variation | – |
| Possible Errors | E_OK | |

| | | |
|------------------------|---|--|
| Operation | Offline | |
| Comment | Completely disables any mirroring activities. Source buses are reset to disabled, queued messages are purged, and the destination bus is reset to the default destination. Pre-configured filters are disabled, and filters added at runtime are removed. | |
| Variation | – | |
| Possible Errors | E_OK | |

| | | |
|------------------------|--|--|
| Operation | RemoveFilter | |
| Comment | Removes a CAN, LIN, or FlexRay filter that was added at runtime. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel that corresponds to the source bus to which the filter is attached. |
| | Variation | – |
| | filterId | |
| | Type | uint8 |
| | Direction | IN |
| | Comment | ID of the filter. |
| | Variation | – |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|------------------------|---|--|
| Operation | SetStaticFilterState | |
| Comment | Sets the state of a pre-configured filter. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel that corresponds to the source bus to which the filter is attached. |
| | Variation | – |
| | filterId | |
| | Type | uint8 |
| | Direction | IN |
| | Comment | ID of the filter. |
| | Variation | – |
| | isActive | |
| | Type | boolean |
| Direction | IN | |
| Comment | TRUE: Activate filter FALSE: Deactivate filter | |
| Variation | – | |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|------------------------|-------------------------|---|
| Operation | StartSourceNetwork | |
| Comment | Activates a source bus. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel corresponding to the source bus that shall be started. |
| | Variation | – |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|------------------------|---------------------------|---|
| Operation | StopSourceNetwork | |
| Comment | Deactivates a source bus. | |
| Variation | – | |
| Parameters | network | |
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel corresponding to the source bus that shall be stopped. |
| | Variation | – |
| Possible Errors | E_OK E_NOT_OK | |

| | | |
|-------------------|---|--|
| Operation | SwitchDestNetwork | |
| Comment | Changes the destination bus to the given ComM channel. The previously active destination bus and all source buses are disabled. | |
| Variation | – | |
| Parameters | network | |



△

| | | |
|------------------------|--|--|
| | Type | NetworkHandleType |
| | Direction | IN |
| | Comment | ComM channel corresponding to the destination bus that shall be enabled. |
| | Variation | – |
| Possible Errors | E_OK E_NOT_OK | |

]()

8.8.3 Provided Ports

8.8.3.1 MirrorControl

[SWS_Mirror_01031] [

| | | | |
|--------------------|--|------------------|-------------------------------|
| Name | MirrorControl | | |
| Kind | ProvidedPort | Interface | MirrorControl |
| Description | Provided port for the interface MirrorControl. | | |
| Variation | – | | |

]()

9 Sequence Diagrams

Currently, no sequence diagrams are available.

10 Configuration Specification

In general, this chapter defines configuration parameters and their clustering into containers. For general information about the definition of containers and parameters, refer to the section 10.1 “Introduction to configuration specification” in [2, SWS BSW General].

Section 10.1 specifies the structure (containers) and the parameters of the Bus Mirroring module.

Section 10.2 lists constraints on the configuration of the Bus Mirroring module.

Section 10.3 specifies published information of the Bus Mirroring module.

10.1 Containers and Configuration Parameters

The following sections summarize all configuration parameters of the Bus Mirroring module. The detailed meaning of the parameters is described in chapters 7 and 8.

10.1.1 Mirror

| | | |
|-----------------------------------|--|---|
| Module SWS Item | ECUC_Mirror_00001 | |
| Module Name | Mirror | |
| Module Description | Configuration of the Bus Mirroring module. | |
| Post-Build Variant Support | true | |
| Supported Config Variants | VARIANT-LINK-TIME, VARIANT-POST-BUILD, VARIANT-PRE-COMPILE | |
| Included Containers | | |
| Container Name | Multiplicity | Scope / Dependency |
| MirrorConfigSet | 1 | Contains the configuration parameters and sub containers of the Bus Mirroring module. |
| MirrorGeneral | 1 | Contains the general configuration parameters of the module. |

10.1.2 MirrorGeneral

| | |
|---------------------------------|--|
| SWS Item | [ECUC_Mirror_00002] |
| Container Name | MirrorGeneral |
| Parent Container | Mirror |
| Description | Contains the general configuration parameters of the module. |
| Configuration Parameters | |

| | | | |
|----------------------------------|---|---|--------------|
| Name | MirrorDevErrorDetect [ECUC_Mirror_00003] | | |
| Parent Container | MirrorGeneral | | |
| Description | Switches the development error detection and notification on or off. <ul style="list-style-type: none"> • true: detection and notification is enabled. • false: detection and notification is disabled. | | |
| Multiplicity | 1 | | |
| Type | EcucBooleanParamDef | | |
| Default Value | false | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | – | |
| | Post-build time | – | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|---|---|--------------|
| Name | MirrorVersionInfoApi [ECUC_Mirror_00005] | | |
| Parent Container | MirrorGeneral | | |
| Description | Pre-processor switch for enabling version info API support. | | |
| Multiplicity | 1 | | |
| Type | EcucBooleanParamDef | | |
| Default Value | false | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | – | |
| | Post-build time | – | |
| Scope / Dependency | scope: local | | |

| | | | |
|---|---|---|--------------|
| Name | MirrorEcucPartitionRef [ECUC_Mirror_00067] | | |
| Parent Container | MirrorGeneral | | |
| Description | Reference to EcucPartition, where BusMirroring module is assigned to. | | |
| Multiplicity | 0..1 | | |
| Type | Reference to EcucPartition | | |
| Post-Build Variant Multiplicity | false | | |
| Post-Build Variant Value | false | | |
| Multiplicity Configuration Class | Pre-compile time | X | All Variants |
| | Link time | – | |
| | Post-build time | – | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | – | |
| | Post-build time | – | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|--------------|
| Name | MirrorStbRef [ECUC_Mirror_00065] | | |
| Parent Container | MirrorGeneral | | |
| Description | Reference to the StbM time base to use for acquiring the time stamps used in the mirroring protocol. This reference is not required if all destination buses are CAN. | | |
| Multiplicity | 0..1 | | |
| Type | Symbolic name reference to StbMSynchronizedTimeBase | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | – | |
| | Post-build time | – | |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|------------------------------------|--------------|---|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorMainFunction | 1..* | Each element of this container defines one instance of Mirror_MainFunction. |

10.1.3 MirrorMainFunction

| | | | |
|---|---|---|--------------|
| SWS Item | [ECUC_Mirror_00068] | | |
| Container Name | MirrorMainFunction | | |
| Parent Container | MirrorGeneral | | |
| Description | Each element of this container defines one instance of Mirror_MainFunction. | | |
| Post-Build Variant Multiplicity | false | | |
| Multiplicity Configuration Class | Pre-compile time | X | All Variants |
| | Link time | – | |
| | Post-build time | – | |
| Configuration Parameters | | | |

| | | | |
|---------------------------------|--|--|--|
| Name | MirrorMainFunctionPeriod [ECUC_Mirror_00070] | | |
| Parent Container | MirrorMainFunction | | |
| Description | Execution cycle of the respective Mirror_MainFunction instance in seconds. | | |
| Multiplicity | 1 | | |
| Type | EcucFloatParamDef | | |
| Range |]0 .. INF[| | |
| Default Value | 0.05 | | |
| Post-Build Variant Value | false | | |

| | | | |
|----------------------------------|-------------------------|---|--------------|
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | – | |
| | Post-build time | – | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|--------------|
| Name | MirrorMainPartitionRef [ECUC_Mirror_00069] | | |
| Parent Container | MirrorMainFunction | | |
| Description | Reference to EcucPartition, where the according Mirror_MainFunction instance is assigned to. | | |
| Multiplicity | 1 | | |
| Type | Reference to EcucPartition | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | – | |
| | Post-build time | – | |
| Scope / Dependency | scope: local | | |

No Included Containers

10.1.4 MirrorConfigSet

| | |
|---------------------------------|---|
| SWS Item | [ECUC_Mirror_00008] |
| Container Name | MirrorConfigSet |
| Parent Container | Mirror |
| Description | Contains the configuration parameters and sub containers of the Bus Mirroring module. |
| Configuration Parameters | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorInitialDestNetworkRef [ECUC_Mirror_00007] | | |
| Parent Container | MirrorConfigSet | | |
| Description | Reference to the destination bus that is selected after initialization of the Bus Mirroring module. | | |
| Multiplicity | 1 | | |
| Type | Reference to MirrorDestNetwork | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|-------------------------------------|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorDestNetwork | 1..* | Destination bus to which frames are sent by the Bus Mirroring module. |
| MirrorSourceNetwork | 1..* | Source bus from which frames are received by the Bus Mirroring module. |

10.1.5 MirrorSourceNetwork

| | | | |
|----------------------------------|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00009] | | |
| Container Name | MirrorSourceNetwork | | |
| Parent Container | MirrorConfigSet | | |
| Description | Source bus from which frames are received by the Bus Mirroring module. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| Container Choices | | |
|--|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorSourceNetworkCan | 0..1 | Source bus representing a CAN network. |
| MirrorSourceNetworkFlexRay | 0..1 | Source bus representing a FlexRay network. |
| MirrorSourceNetworkLin | 0..1 | Source bus representing a LIN network. |

10.1.6 MirrorSourceNetworkCan

| | | | |
|----------------------------------|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00010] | | |
| Container Name | MirrorSourceNetworkCan | | |
| Parent Container | MirrorSourceNetwork | | |
| Description | Source bus representing a CAN network. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorNetworkId [ECUC_Mirror_00012] | | |
| Parent Container | MirrorSourceNetworkCan | | |
| Description | Network ID of the bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|--|---|--|
| Name | MirrorSourceMaxDynamicFilters [ECUC_Mirror_00013] | | |
| Parent Container | MirrorSourceNetworkCan | | |
| Description | Maximum number of filters that can be dynamically added using Mirror_AddXxxFilter(). | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 255 | | |
| Default Value | 5 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | - | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorComMNetworkHandleRef [ECUC_Mirror_00064] | | |
| Parent Container | MirrorSourceNetworkCan | | |
| Description | Reference to the ComMChannel that represents the bus. | | |
| Multiplicity | 1 | | |
| Type | Symbolic name reference to ComMChannel | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|---------------------------------------|--------------|---------------------------------------|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorSourceCanFilter | 0..255 | Pre-configured filter for CAN frames. |

| | | |
|---|------|--------------------------------------|
| MirrorSourceCanMaskBasedIdMapping | 0..* | Rule for remapping a set of CAN IDs. |
| MirrorSourceCanSingleIdMapping | 0..* | Rule for remapping a single CAN ID. |

10.1.7 MirrorSourceCanFilter

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00014] | | |
| Container Name | MirrorSourceCanFilter | | |
| Parent Container | MirrorSourceNetworkCan | | |
| Description | Pre-configured filter for CAN frames. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| Container Choices | | |
|--|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorSourceCanFilterMask | 0..1 | Pre-configured mask based filter for CAN frames. |
| MirrorSourceCanFilterRange | 0..1 | Pre-configured range filter for CAN frames. |

10.1.8 MirrorSourceCanFilterRange

| | | | |
|---|---|---|---------------------|
| SWS Item | [ECUC_Mirror_00015] | | |
| Container Name | MirrorSourceCanFilterRange | | |
| Parent Container | MirrorSourceCanFilter | | |
| Description | Pre-configured range filter for CAN frames. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | |
|-------------------------|--|--|
| Name | MirrorSourceCanFilterId [ECUC_Mirror_00018] | |
| Parent Container | MirrorSourceCanFilterRange | |
| Description | Unique identifier of the pre-configured CAN filter. | |
| Multiplicity | 1 | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | |
| Range | 0 .. 255 | |
| Default Value | | |

| | | | |
|----------------------------------|-------------------------|---|---------------------|
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceCanFilterLower [ECUC_Mirror_00016] | | |
| Parent Container | MirrorSourceCanFilterRange | | |
| Description | Lowest CAN ID that is accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceCanFilterUpper [ECUC_Mirror_00017] | | |
| Parent Container | MirrorSourceCanFilterRange | | |
| Description | Highest CAN ID that is accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

No Included Containers

10.1.9 MirrorSourceCanFilterMask

| | |
|-------------------------|--|
| SWS Item | [ECUC_Mirror_00019] |
| Container Name | MirrorSourceCanFilterMask |
| Parent Container | MirrorSourceCanFilter |
| Description | Pre-configured mask based filter for CAN frames. |

| | | | |
|---|-------------------------|---|---------------------|
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceCanFilterCanIdCode [ECUC_Mirror_00020] | | |
| Parent Container | MirrorSourceCanFilterMask | | |
| Description | Value to match masked CAN IDs. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceCanFilterCanIdMask [ECUC_Mirror_00021] | | |
| Parent Container | MirrorSourceCanFilterMask | | |
| Description | Mask applied to CAN IDs before comparison. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|---------------------------------|--|--|--|
| Name | MirrorSourceCanFilterId [ECUC_Mirror_00018] | | |
| Parent Container | MirrorSourceCanFilterMask | | |
| Description | Unique identifier of the pre-configured CAN filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |

| | | | |
|----------------------------------|-------------------------|---|---------------------|
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

No Included Containers

10.1.10 MirrorSourceCanSingleIdMapping

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00022] | | |
| Container Name | MirrorSourceCanSingleIdMapping | | |
| Parent Container | MirrorSourceNetworkCan | | |
| Description | Rule for remapping a single CAN ID. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorSourceCanSingleIdMappingDestCanId [ECUC_Mirror_00024] | | |
| Parent Container | MirrorSourceCanSingleIdMapping | | |
| Description | Mapped CAN ID. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|---------------------------------|---|--|--|
| Name | MirrorSourceCanSingleIdMappingSourceCanId [ECUC_Mirror_00023] | | |
| Parent Container | MirrorSourceCanSingleIdMapping | | |
| Description | Original CAN ID. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |

| | | | |
|----------------------------------|-------------------------|---|---------------------|
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

No Included Containers

10.1.11 MirrorSourceCanMaskBasedIdMapping

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00025] | | |
| Container Name | MirrorSourceCanMaskBasedIdMapping | | |
| Parent Container | MirrorSourceNetworkCan | | |
| Description | Rule for remapping a set of CAN IDs. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceCanMaskBasedIdMappingDestBaseId [ECUC_Mirror_00028] | | |
| Parent Container | MirrorSourceCanMaskBasedIdMapping | | |
| Description | Base ID merged with the masked parts of the original CAN ID to form the mapped CAN ID. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|-------------------------|---|--|--|
| Name | MirrorSourceCanMaskBasedIdMappingSourceCanIdCode [ECUC_Mirror_00026] | | |
| Parent Container | MirrorSourceCanMaskBasedIdMapping | | |
| Description | Value to match masked original CAN IDs. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |

| | | | |
|----------------------------------|-------------------------|---|---------------------|
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceCanMaskBasedIdMappingSourceCanIdMask [ECUC_Mirror_00027] | | |
| Parent Container | MirrorSourceCanMaskBasedIdMapping | | |
| Description | Mask applied to original CAN IDs before comparison. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

No Included Containers

10.1.12 MirrorSourceNetworkLin

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00029] | | |
| Container Name | MirrorSourceNetworkLin | | |
| Parent Container | MirrorSourceNetwork | | |
| Description | Source bus representing a LIN network. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|-------------------------|--|--|--|
| Name | MirrorNetworkId [ECUC_Mirror_00012] | | |
| Parent Container | MirrorSourceNetworkLin | | |
| Description | Network ID of the bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |

| | | | |
|----------------------------------|-------------------------|---|---------------------|
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceLinToCanBaseld [ECUC_Mirror_00041] | | |
| Parent Container | MirrorSourceNetworkLin | | |
| Description | Base ID merged with the LIN frame ID to form the CAN ID. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|--|
| Name | MirrorSourceMaxDynamicFilters [ECUC_Mirror_00013] | | |
| Parent Container | MirrorSourceNetworkLin | | |
| Description | Maximum number of filters that can be dynamically added using Mirror_AddXxxFilter(). | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 255 | | |
| Default Value | 5 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | - | |
| Scope / Dependency | scope: local | | |

| | | | |
|---------------------------------|---|--|--|
| Name | MirrorComMNetworkHandleRef [ECUC_Mirror_00064] | | |
| Parent Container | MirrorSourceNetworkLin | | |
| Description | Reference to the ComMChannel that represents the bus. | | |
| Multiplicity | 1 | | |
| Type | Symbolic name reference to ComMChannel | | |
| Post-Build Variant Value | false | | |

| | | | |
|----------------------------------|-------------------------|---|---------------------|
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|--|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorSourceLinFilter | 0..255 | Pre-configured filter for LIN frames. |
| MirrorSourceLinToCanId Mapping | 0..* | Rule for mapping a LIN frame ID to a special CAN ID. |

10.1.13 MirrorSourceLinFilter

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00030] | | |
| Container Name | MirrorSourceLinFilter | | |
| Parent Container | MirrorSourceNetworkLin | | |
| Description | Pre-configured filter for LIN frames. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| Container Choices | | |
|---|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorSourceLinFilter Mask | 0..1 | Pre-configured mask based filter for LIN frames. |
| MirrorSourceLinFilter Range | 0..1 | Pre-configured range filter for LIN frames. |

10.1.14 MirrorSourceLinFilterRange

| | | | |
|---|---|---|---------------------|
| SWS Item | [ECUC_Mirror_00031] | | |
| Container Name | MirrorSourceLinFilterRange | | |
| Parent Container | MirrorSourceLinFilter | | |
| Description | Pre-configured range filter for LIN frames. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceLinFilterId [ECUC_Mirror_00034] | | |
| Parent Container | MirrorSourceLinFilterRange | | |
| Description | Unique identifier of the pre-configured LIN filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorSourceLinFilterLower [ECUC_Mirror_00032] | | |
| Parent Container | MirrorSourceLinFilterRange | | |
| Description | Lowest frame ID that is accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 63 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceLinFilterUpper [ECUC_Mirror_00033] | | |
| Parent Container | MirrorSourceLinFilterRange | | |
| Description | Highest frame ID that is accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 63 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| |
|-------------------------------|
| No Included Containers |
|-------------------------------|

10.1.15 MirrorSourceLinFilterMask

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00035] | | |
| Container Name | MirrorSourceLinFilterMask | | |
| Parent Container | MirrorSourceLinFilter | | |
| Description | Pre-configured mask based filter for LIN frames. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceLinFilterId [ECUC_Mirror_00034] | | |
| Parent Container | MirrorSourceLinFilterMask | | |
| Description | Unique identifier of the pre-configured LIN filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceLinFilterLinIdCode [ECUC_Mirror_00036] | | |
| Parent Container | MirrorSourceLinFilterMask | | |
| Description | Value to match masked frame IDs. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 63 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceLinFilterLinIdMask [ECUC_Mirror_00037] | | |
| Parent Container | MirrorSourceLinFilterMask | | |
| Description | Mask applied to frame IDs before comparison. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 63 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

No Included Containers

10.1.16 MirrorSourceLinToCanIdMapping

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00038] | | |
| Container Name | MirrorSourceLinToCanIdMapping | | |
| Parent Container | MirrorSourceNetworkLin | | |
| Description | Rule for mapping a LIN frame ID to a special CAN ID. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceLinToCanIdMappingCanId [ECUC_Mirror_00040] | | |
| Parent Container | MirrorSourceLinToCanIdMapping | | |
| Description | CAN ID which lies outside of the range mapping. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceLinToCanIdMappingLinId [ECUC_Mirror_00039] | | |
| Parent Container | MirrorSourceLinToCanIdMapping | | |
| Description | Frame ID which is excluded from the range mapping. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 63 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

No Included Containers

10.1.17 MirrorSourceNetworkFlexRay

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00042] | | |
| Container Name | MirrorSourceNetworkFlexRay | | |
| Parent Container | MirrorSourceNetwork | | |
| Description | Source bus representing a FlexRay network. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorNetworkId [ECUC_Mirror_00012] | | |
| Parent Container | MirrorSourceNetworkFlexRay | | |
| Description | Network ID of the bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|--|---|---------------------------------------|
| Name | MirrorSourceMaxDynamicFilters [ECUC_Mirror_00013] | | |
| Parent Container | MirrorSourceNetworkFlexRay | | |
| Description | Maximum number of filters that can be dynamically added using Mirror_AddXxxFilter(). | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 255 | | |
| Default Value | 5 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | - | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorComMNetworkHandleRef [ECUC_Mirror_00064] | | |
| Parent Container | MirrorSourceNetworkFlexRay | | |
| Description | Reference to the ComMChannel that represents the bus. | | |
| Multiplicity | 1 | | |
| Type | Symbolic name reference to ComMChannel | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|--|--------------|---|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorSourceFlexRay Filter | 0..255 | Pre-configured filter for FlexRay frames. |

10.1.18 MirrorSourceFlexRayFilter

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00043] | | |
| Container Name | MirrorSourceFlexRayFilter | | |
| Parent Container | MirrorSourceNetworkFlexRay | | |
| Description | Pre-configured filter for FlexRay frames. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|--------------------------|---------------------|
| Name | MirrorSourceFlexRayFilterChannelAssignment [ECUC_Mirror_00049] | | |
| Parent Container | MirrorSourceFlexRayFilter | | |
| Description | FlexRay channels accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucEnumerationParamDef | | |
| Range | MIRROR_FR_CHANNEL_A | FlexRay channel A only. | |
| | MIRROR_FR_CHANNEL_AB | FlexRay channel A and B. | |
| | MIRROR_FR_CHANNEL_B | FlexRay channel B only. | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceFlexRayFilterCycleRepetition [ECUC_Mirror_00048] | | |
| Parent Container | MirrorSourceFlexRayFilter | | |
| Description | Cycle repetition of accepted cycles. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 1 .. 64 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceFlexRayFilterId [ECUC_Mirror_00050] | | |
| Parent Container | MirrorSourceFlexRayFilter | | |
| Description | Unique identifier of the pre-configured FlexRay filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorSourceFlexRayFilterLowerBaseCycle [ECUC_Mirror_00046] | | |
| Parent Container | MirrorSourceFlexRayFilter | | |
| Description | Lowest base cycle number that is accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 63 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceFlexRayFilterLowerSlot [ECUC_Mirror_00044] | | |
| Parent Container | MirrorSourceFlexRayFilter | | |
| Description | Lowest slot ID that is accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 1 .. 2047 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorSourceFlexRayFilterUpperBaseCycle [ECUC_Mirror_00047] | | |
| Parent Container | MirrorSourceFlexRayFilter | | |
| Description | Highest base cycle number that is accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 63 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorSourceFlexRayFilterUpperSlot [ECUC_Mirror_00045] | | |
| Parent Container | MirrorSourceFlexRayFilter | | |
| Description | Highest slot ID that is accepted by the filter. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 1 .. 2047 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

No Included Containers

10.1.19 MirrorDestNetwork

| | | | |
|---|---|---|---------------------|
| SWS Item | [ECUC_Mirror_00051] | | |
| Container Name | MirrorDestNetwork | | |
| Parent Container | MirrorConfigSet | | |
| Description | Destination bus to which frames are sent by the Bus Mirroring module. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

Container Choices

| Container Name | Multiplicity | Scope / Dependency |
|--|--------------|--|
| MirrorDestNetworkCan | 0..1 | Destination bus representing a CAN network. |
| MirrorDestNetworkCdd | 0..1 | Destination bus representing a user defined network. |
| MirrorDestNetworkFlexRay | 0..1 | Destination bus representing a FlexRay network. |
| MirrorDestNetworkIp | 0..1 | Destination bus representing an IP network. |

10.1.20 MirrorDestNetworkCan

| | | | |
|--|---|--|--|
| SWS Item | [ECUC_Mirror_00052] | | |
| Container Name | MirrorDestNetworkCan | | |
| Parent Container | MirrorDestNetwork | | |
| Description | Destination bus representing a CAN network. | | |
| Post-Build Variant Multiplicity | true | | |

| | | | |
|---|-------------------------|---|---------------------|
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|--|
| Name | MirrorDestQueueSize [ECUC_Mirror_00054] | | |
| Parent Container | MirrorDestNetworkCan | | |
| Description | Number of frames that can be stored in the output queue for the destination bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 1 .. 65535 | | |
| Default Value | 20 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | – | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorNetworkId [ECUC_Mirror_00012] | | |
| Parent Container | MirrorDestNetworkCan | | |
| Description | Network ID of the bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|-------------------------|--|--|--|
| Name | MirrorStatusCanId [ECUC_Mirror_00061] | | |
| Parent Container | MirrorDestNetworkCan | | |
| Description | CAN ID of the CAN status frame. If configured, a status frame will be sent on the CAN destination bus that contains the state of all active source buses. | | |
| Multiplicity | 0..1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 4294967295 | | |
| Default Value | | | |

| | | | |
|----------------------------------|-------------------------|---|---------------------|
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorComMNetworkHandleRef [ECUC_Mirror_00064] | | |
| Parent Container | MirrorDestNetworkCan | | |
| Description | Reference to the ComMChannel that represents the bus. | | |
| Multiplicity | 1 | | |
| Type | Symbolic name reference to ComMChannel | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|-------------------------------|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorDestPdu | 1 | I-PDU used for transmission of the mirrored frames on the destination bus. |

10.1.21 MirrorDestNetworkFlexRay

| | | | |
|---|---|---|---------------------|
| SWS Item | [ECUC_Mirror_00058] | | |
| Container Name | MirrorDestNetworkFlexRay | | |
| Parent Container | MirrorDestNetwork | | |
| Description | Destination bus representing a FlexRay network. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|--|
| Name | MirrorDestQueueSize [ECUC_Mirror_00054] | | |
| Parent Container | MirrorDestNetworkFlexRay | | |
| Description | Number of frames that can be stored in the output queue for the destination bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 1 .. 65535 | | |
| Default Value | 20 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | - | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorDestTransmissionDeadline [ECUC_Mirror_00059] | | |
| Parent Container | MirrorDestNetworkFlexRay | | |
| Description | Time in seconds after which the collection of source frames into the destination frame stopped and the frame is sent at the latest. If omitted, destination frames are only sent when full or when the time stamp overflows after 655.35ms. | | |
| Multiplicity | 0..1 | | |
| Type | EcucFloatParamDef | | |
| Range | [0.001 .. 0.655] | | |
| Default Value | 0.1 | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorNetworkId [ECUC_Mirror_00012] | | |
| Parent Container | MirrorDestNetworkFlexRay | | |
| Description | Network ID of the bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorComMNetworkHandleRef [ECUC_Mirror_00064] | | |
| Parent Container | MirrorDestNetworkFlexRay | | |
| Description | Reference to the ComMChannel that represents the bus. | | |
| Multiplicity | 1 | | |
| Type | Symbolic name reference to ComMChannel | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|--------------------------------------|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorDestPduFlexRay | 1..* | I-PDU used for transmission of the mirrored frames on the destination bus. For FlexRay, an arbitrary number of I-PDUs can be configured. |

10.1.22 MirrorDestNetworkIpc

| | | | |
|---|---|---|---------------------|
| SWS Item | [ECUC_Mirror_00060] | | |
| Container Name | MirrorDestNetworkIpc | | |
| Parent Container | MirrorDestNetwork | | |
| Description | Destination bus representing an IP network. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|--|
| Name | MirrorDestQueueSize [ECUC_Mirror_00054] | | |
| Parent Container | MirrorDestNetworkIpc | | |
| Description | Number of frames that can be stored in the output queue for the destination bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 1 .. 65535 | | |
| Default Value | 20 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | – | |

| | |
|---------------------------|--------------|
| Scope / Dependency | scope: local |
|---------------------------|--------------|

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorDestTransmissionDeadline [ECUC_Mirror_00059] | | |
| Parent Container | MirrorDestNetworkIp | | |
| Description | Time in seconds after which the collection of source frames into the destination frame stopped and the frame is sent at the latest. If omitted, destination frames are only sent when full or when the time stamp overflows after 655.35ms. | | |
| Multiplicity | 0..1 | | |
| Type | EcucFloatParamDef | | |
| Range | [0.001 .. 0.655] | | |
| Default Value | 0.1 | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorNetworkId [ECUC_Mirror_00012] | | |
| Parent Container | MirrorDestNetworkIp | | |
| Description | Network ID of the bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorComMNetworkHandleRef [ECUC_Mirror_00064] | | |
| Parent Container | MirrorDestNetworkIp | | |
| Description | Reference to the ComMChannel that represents the bus. | | |
| Multiplicity | 1 | | |
| Type | Symbolic name reference to ComMChannel | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |

| | |
|---------------------------|--------------|
| Scope / Dependency | scope: local |
|---------------------------|--------------|

| Included Containers | | |
|-------------------------------|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorDestPdu | 1 | I-PDU used for transmission of the mirrored frames on the destination bus. |

10.1.23 MirrorDestNetworkCdd

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00062] | | |
| Container Name | MirrorDestNetworkCdd | | |
| Parent Container | MirrorDestNetwork | | |
| Description | Destination bus representing a user defined network. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|--|
| Name | MirrorDestQueueSize [ECUC_Mirror_00054] | | |
| Parent Container | MirrorDestNetworkCdd | | |
| Description | Number of frames that can be stored in the output queue for the destination bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 1 .. 65535 | | |
| Default Value | 20 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | - | |
| Scope / Dependency | scope: local | | |

| | | | |
|-------------------------|--|--|--|
| Name | MirrorDestTransmissionDeadline [ECUC_Mirror_00059] | | |
| Parent Container | MirrorDestNetworkCdd | | |
| Description | Time in seconds after which the collection of source frames into the destination frame stopped and the frame is sent at the latest. If omitted, destination frames are only sent when full or when the time stamp overflows after 655.35ms. | | |
| Multiplicity | 0..1 | | |
| Type | EcucFloatParamDef | | |
| Range | [0.001 .. 0.655] | | |

| | | | |
|----------------------------------|-------------------------|---|---------------------|
| Default Value | 0.1 | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorNetworkId [ECUC_Mirror_00012] | | |
| Parent Container | MirrorDestNetworkCdd | | |
| Description | Network ID of the bus. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|---|---|---------------------|
| Name | MirrorComMNetworkHandleRef [ECUC_Mirror_00064] | | |
| Parent Container | MirrorDestNetworkCdd | | |
| Description | Reference to the ComMChannel that represents the bus. | | |
| Multiplicity | 1 | | |
| Type | Symbolic name reference to ComMChannel | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|-------------------------------|--------------|--|
| Container Name | Multiplicity | Scope / Dependency |
| MirrorDestPdu | 1 | I-PDU used for transmission of the mirrored frames on the destination bus. |

10.1.24 MirrorDestPdu

| | |
|-----------------------|---------------------|
| SWS Item | [ECUC_Mirror_00055] |
| Container Name | MirrorDestPdu |

| | | | |
|---|--|---|---------------------|
| Parent Container | MirrorDestNetworkCan , MirrorDestNetworkCdd , MirrorDestNetworkIpl | | |
| Description | I-PDU used for transmission of the mirrored frames on the destination bus. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|--------------|
| Name | MirrorDestPduId [ECUC_Mirror_00057] | | |
| Parent Container | MirrorDestPdu | | |
| Description | I-PDU identifier used for TxConfirmation from PduR. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 65535 | | |
| Default Value | | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | - | |
| | Post-build time | - | |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorDestPduUsesTriggerTransmit [ECUC_Mirror_00063] | | |
| Parent Container | MirrorDestPdu | | |
| Description | Switches transmission via TriggerTransmit. <ul style="list-style-type: none"> • true: The I-PDU is transmitted using TriggerTransmit. • false: The I-PDU is transmitted directly with the Transmit call. | | |
| Multiplicity | 1 | | |
| Type | EcucBooleanParamDef | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|---|---|--|
| Name | MirrorDestPduRef [ECUC_Mirror_00056] | | |
| Parent Container | MirrorDestPdu | | |
| Description | Reference to the Pdu object representing the I-PDU. | | |
| Multiplicity | 1 | | |
| Type | Reference to Pdu | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | - | |
| Scope / Dependency | scope: local | | |

No Included Containers

10.1.25 MirrorDestPduFlexRay

| | | | |
|---|--|---|---------------------|
| SWS Item | [ECUC_Mirror_00066] | | |
| Container Name | MirrorDestPduFlexRay | | |
| Parent Container | MirrorDestNetworkFlexRay | | |
| Description | I-PDU used for transmission of the mirrored frames on the destination bus. For FlexRay, an arbitrary number of I-PDUs can be configured. | | |
| Post-Build Variant Multiplicity | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Configuration Parameters | | | |

| | | | |
|----------------------------------|--|---|--------------|
| Name | MirrorDestPduId [ECUC_Mirror_00057] | | |
| Parent Container | MirrorDestPduFlexRay | | |
| Description | I-PDU identifier used for TxConfirmation from PduR. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 65535 | | |
| Default Value | | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | - | |
| | Post-build time | - | |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|--|---|---------------------|
| Name | MirrorDestPduUsesTriggerTransmit [ECUC_Mirror_00063] | | |
| Parent Container | MirrorDestPduFlexRay | | |
| Description | Switches transmission via TriggerTransmit. <ul style="list-style-type: none"> • true: The I-PDU is transmitted using TriggerTransmit. • false: The I-PDU is transmitted directly with the Transmit call. | | |
| Multiplicity | 1 | | |
| Type | EcucBooleanParamDef | | |
| Default Value | | | |
| Post-Build Variant Value | true | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|---|---|--|
| Name | MirrorDestPduRef [ECUC_Mirror_00056] | | |
| Parent Container | MirrorDestPduFlexRay | | |
| Description | Reference to the Pdu object representing the I-PDU. | | |
| Multiplicity | 1 | | |
| Type | Reference to Pdu | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | X | VARIANT-LINK-TIME, VARIANT-POST-BUILD |
| | Post-build time | – | |
| Scope / Dependency | scope: local | | |

| |
|-------------------------------|
| No Included Containers |
|-------------------------------|

10.2 Configuration Constraints

This section lists configuration constraints for the the [MirrorDestPdu](#)s of the supported destination buses.

10.2.1 CAN Destination Bus

[SWS_Mirror_CONSTR_00001] [The `MirrorDestPdu` of a `MirrorDestNetworkCan` requires a `MetaDataItem` of `MetaDataItemType` `CAN_ID_32`. The `CanIfTxPduCanIdMask` of the corresponding `CanIfTxPduCfg` shall be 0.] (*SRS_Mirror_00001*)

This way, the Bus Mirroring module can transmit CAN destination frames with any CAN ID.

[SWS_Mirror_CONSTR_00002] [The `CanFdPaddingValue` that is used to transmit the PDU referenced by `MirrorDestPduRef` for a CAN-FD destination bus shall be set to 0 to ensure that the `NetworkStateAvailable` of a CAN status item is 0 if the status item has not been written by the Bus Mirroring module but lies in a padded region of the status frame.] (*SRS_Mirror_00001*)

10.2.2 FlexRay Destination Bus

To avoid padding, the `MirrorDestPdu` used for a FlexRay destination bus shall be placed on dynamic frames.

[SWS_Mirror_CONSTR_00004] [`FrIfAllowDynamicLSduLength` shall be set to true for all `FrIfFrameStructures` that contain `FrIfTxPdus` referenced by a `MirrorDestPdu` of a `MirrorDestNetworkFlexRay`.] (*SRS_Mirror_00001*)

According to [SWS_FrIf_05092], a FlexRay PDU with dynamic length must be placed at the end of a FlexRay frame, or must be the only PDU within the frame.

10.2.3 Mirroring of Serialized Frames

In principal, when a serialized frame is received by an ECU that features Bus Mirroring, it would be nice to merge it into the stream of serialized messages created by the Bus Mirroring module. But as declared section 4.1, this would mean that the Bus Mirroring module would have to first de-serialize the received message and then re-serialize the elements of the message, which would be quite complicated and expensive regarding run-time, and it would require an extended configuration because the mirroring could not discern serialized frames from other frames that accidentally could be interpreted as serialized frames.

Note that this scenario can only happen on a FlexRay source bus, because IP/Ethernet and proprietary networks cannot be configured as source buses.

If a `MirrorSourceFlexRayFilter` accepts the serialized frames, they will therefore be packed as a single frame into the serialized destination frame, resulting in a nested serialization. To avoid such a nested serialization, it should be avoided that serialized frames are accepted by the Bus Mirroring module by setting the FlexRay frame filters accordingly.

[SWS_Mirror_CONSTR_00003] [The configured `MirrorSourceFlexRayFilters` shall be configured such that they do not include serialized frames transmitted on the source bus.] (*SRS_Mirror_00001*)

Instead, a direct routing of the serialized frame should be configured using PduR, resulting in additional PDUs which could carry serialized frames on the destination bus.

10.3 Published Information

For details, refer to the section 10.3 “Published Information” in [2, SWS BSW General].

A History of Constraints and Specification Items

Please note that the lists in this chapter also include constraints and specification items that have been removed from the specification in a later version. These constraints and specification items do not appear as hyperlinks in the document.

A.1 Constraint and Specification Item History of this Document According to AUTOSAR Release 4.4.0

A.1.1 Added Traceables in 4.4.0

[SWS_Mirror_00001] [SWS_Mirror_00002] [SWS_Mirror_00003] [SWS_Mirror_00004] [SWS_Mirror_00005] [SWS_Mirror_00006] [SWS_Mirror_00007] [SWS_Mirror_00008] [SWS_Mirror_00009] [SWS_Mirror_00011] [SWS_Mirror_00012] [SWS_Mirror_00013] [SWS_Mirror_00014] [SWS_Mirror_00015] [SWS_Mirror_00016] [SWS_Mirror_00017] [SWS_Mirror_00018] [SWS_Mirror_00019] [SWS_Mirror_00020] [SWS_Mirror_00021] [SWS_Mirror_00022] [SWS_Mirror_00023] [SWS_Mirror_00024] [SWS_Mirror_00025] [SWS_Mirror_00026] [SWS_Mirror_00027] [SWS_Mirror_00028] [SWS_Mirror_00029] [SWS_Mirror_00030] [SWS_Mirror_00031] [SWS_Mirror_00032] [SWS_Mirror_00033] [SWS_Mirror_00034] [SWS_Mirror_00035] [SWS_Mirror_00036] [SWS_Mirror_00037] [SWS_Mirror_00038] [SWS_Mirror_00039] [SWS_Mirror_00040] [SWS_Mirror_00041] [SWS_Mirror_00042] [SWS_Mirror_00043] [SWS_Mirror_00044] [SWS_Mirror_00045] [SWS_Mirror_00046] [SWS_Mirror_00047] [SWS_Mirror_00048] [SWS_Mirror_00049] [SWS_Mirror_00050] [SWS_Mirror_00051] [SWS_Mirror_00052] [SWS_Mirror_00053] [SWS_Mirror_00054] [SWS_Mirror_00055] [SWS_Mirror_00056] [SWS_Mirror_00057] [SWS_Mirror_00058] [SWS_Mirror_00059] [SWS_Mirror_00060] [SWS_Mirror_00061] [SWS_Mirror_00062] [SWS_Mirror_00063] [SWS_Mirror_00064] [SWS_Mirror_00065] [SWS_Mirror_00066] [SWS_Mirror_00067] [SWS_Mirror_00068] [SWS_Mirror_00069] [SWS_Mirror_00070] [SWS_Mirror_00071] [SWS_Mirror_00072] [SWS_Mirror_00073] [SWS_Mirror_00074] [SWS_Mirror_00075] [SWS_Mirror_00076] [SWS_Mirror_00077] [SWS_Mirror_00078] [SWS_Mirror_00079] [SWS_Mirror_00080] [SWS_Mirror_00081] [SWS_Mirror_00082] [SWS_Mirror_00083] [SWS_Mirror_00084] [SWS_Mirror_00085] [SWS_Mirror_00086] [SWS_Mirror_00087] [SWS_Mirror_00088] [SWS_Mirror_00089] [SWS_Mirror_00090] [SWS_Mirror_00091] [SWS_Mirror_00092] [SWS_Mirror_00093] [SWS_Mirror_00094] [SWS_Mirror_00095] [SWS_Mirror_00096] [SWS_Mirror_00097] [SWS_Mirror_00098] [SWS_Mirror_00099] [SWS_Mirror_00100] [SWS_Mirror_00101] [SWS_Mirror_00102] [SWS_Mirror_00103] [SWS_Mirror_00104] [SWS_Mirror_00105] [SWS_Mirror_00106] [SWS_Mirror_00107] [SWS_Mirror_00108] [SWS_Mirror_00109] [SWS_Mirror_00110] [SWS_Mirror_00111] [SWS_Mirror_00112] [SWS_Mirror_00113] [SWS_Mirror_00114] [SWS_Mirror_00115] [SWS_Mirror_00116] [SWS_Mirror_00117] [SWS_Mirror_00118] [SWS_Mirror_00119] [SWS_Mirror_00120] [SWS_Mirror_00121] [SWS_Mirror_00122]

[SWS_Mirror_00123] [SWS_Mirror_00124] [SWS_Mirror_00125] [SWS_Mirror_-00126] [SWS_Mirror_00127] [SWS_Mirror_00128] [SWS_Mirror_00129] [SWS_Mirror_00131] [SWS_Mirror_00132] [SWS_Mirror_00133] [SWS_Mirror_00134] [SWS_Mirror_00135] [SWS_Mirror_00136] [SWS_Mirror_00137] [SWS_Mirror_-00138] [SWS_Mirror_00142] [SWS_Mirror_00143] [SWS_Mirror_00144] [SWS_Mirror_00146] [SWS_Mirror_00147] [SWS_Mirror_00149] [SWS_Mirror_00150] [SWS_Mirror_00151] [SWS_Mirror_00152] [SWS_Mirror_00153] [SWS_Mirror_-00154] [SWS_Mirror_00155] [SWS_Mirror_00156] [SWS_Mirror_00157] [SWS_Mirror_00158] [SWS_Mirror_00159] [SWS_Mirror_00160] [SWS_Mirror_00161] [SWS_Mirror_00165] [SWS_Mirror_01000] [SWS_Mirror_01002] [SWS_Mirror_-01003] [SWS_Mirror_01004] [SWS_Mirror_01005] [SWS_Mirror_01006] [SWS_Mirror_01007] [SWS_Mirror_01008] [SWS_Mirror_01009] [SWS_Mirror_01010] [SWS_Mirror_01011] [SWS_Mirror_01012] [SWS_Mirror_01013] [SWS_Mirror_-01014] [SWS_Mirror_01015] [SWS_Mirror_01016] [SWS_Mirror_01017] [SWS_Mirror_01018] [SWS_Mirror_01019] [SWS_Mirror_01020] [SWS_Mirror_01021] [SWS_Mirror_01022] [SWS_Mirror_01023] [SWS_Mirror_01024] [SWS_Mirror_-01025] [SWS_Mirror_01026] [SWS_Mirror_01027] [SWS_Mirror_01028] [SWS_Mirror_01029] [SWS_Mirror_01030] [SWS_Mirror_01031] [SWS_Mirror_01033] [SWS_Mirror_01100] [SWS_Mirror_01101] [SWS_Mirror_01102] [SWS_Mirror_-CONSTR_00001] [SWS_Mirror_CONSTR_00002] [SWS_Mirror_CONSTR_00003] [SWS_Mirror_CONSTR_00004]

A.1.2 Changed Traceables in 4.4.0

none

A.1.3 Deleted Traceables in 4.4.0

none

A.2 Constraint and Specification Item History of this Document According to AUTOSAR Release R19-11

A.2.1 Added Traceables in R19-11

[SWS_Mirror_00166] [SWS_Mirror_00167] [SWS_Mirror_00168] [SWS_Mirror_-00169]

A.2.2 Changed Traceables in R19-11

[SWS_Mirror_00047] [SWS_Mirror_00097] [SWS_Mirror_00098] [SWS_Mirror_00099] [SWS_Mirror_00100] [SWS_Mirror_00101] [SWS_Mirror_00102] [SWS_Mirror_00103] [SWS_Mirror_00104] [SWS_Mirror_00105] [SWS_Mirror_00106] [SWS_Mirror_00107] [SWS_Mirror_00108] [SWS_Mirror_00124] [SWS_Mirror_00127] [SWS_Mirror_00128] [SWS_Mirror_00129] [SWS_Mirror_00131] [SWS_Mirror_00133] [SWS_Mirror_00134] [SWS_Mirror_00135] [SWS_Mirror_00136] [SWS_Mirror_00149] [SWS_Mirror_00159]

A.2.3 Deleted Traceables in R19-11

none

A.3 Constraint and Specification Item History of this Document According to AUTOSAR Release R20-11

A.3.1 Added Traceables in R20-11

none

A.3.2 Changed Traceables in R20-11

[SWS_Mirror_00022] [SWS_Mirror_00030] [SWS_Mirror_00114] [SWS_Mirror_00115] [SWS_Mirror_00116] [SWS_Mirror_00118]

A.3.3 Deleted Traceables in R20-11

none

A.4 Constraint and Specification Item History of this Document According to AUTOSAR Release R21-11

A.4.1 Added Traceables in R21-11

none

A.4.2 Changed Traceables in R21-11

none

A.4.3 Deleted Traceables in R21-11

none