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Table of Contents

| | | |
|-------|-----------------------------------------------------------------|----|
| 1 | Introduction and functional overview | 9 |
| 2 | Acronyms and definitions | 10 |
| 3 | Related documentation..... | 12 |
| 3.1 | Input documents..... | 12 |
| 3.2 | Related standards and norms | 13 |
| 3.3 | Related specification | 14 |
| 4 | Constraints and assumptions | 15 |
| 4.1 | Limitations | 15 |
| 4.2 | Applicability to car domains..... | 15 |
| 5 | Dependencies to other modules..... | 16 |
| 5.1 | File structure | 16 |
| 5.1.1 | Header file structure | 16 |
| 5.2 | AUTOSAR Runtime Environment (RTE)..... | 17 |
| 5.3 | ECU State Manager (EcuM)..... | 17 |
| 5.4 | Basic Software Mode Manager (BswM) | 18 |
| 5.5 | NVRAM Manager | 18 |
| 5.6 | Diagnostic Communication Manager (DCM) | 18 |
| 5.7 | LIN State Manager | 18 |
| 5.8 | CAN State Manager | 19 |
| 5.9 | FlexRay State Manager | 19 |
| 5.10 | Ethernet State Manager | 19 |
| 5.11 | Network Management (NM) | 19 |
| 5.12 | Default Error Tracer (DET)..... | 19 |
| 5.13 | Communication (COM) | 19 |
| 6 | Requirements traceability | 20 |
| 7 | Functional specification | 31 |
| 7.1 | Partial Network Cluster Management..... | 34 |
| 7.1.1 | Overview | 34 |
| 7.1.2 | Partial Network Cluster Management Functionality..... | 34 |
| 7.1.3 | ComM PNC state machine..... | 35 |
| 7.1.4 | PNC Gateway | 42 |
| 7.1.5 | ComM User to PNC Relations..... | 43 |
| 7.1.6 | Partial Networking Configuration Hints..... | 44 |
| 7.2 | ComM channel state machine..... | 44 |
| 7.2.1 | Behavior in state <code>COMM_NO_COMMUNICATION</code> | 48 |
| 7.2.2 | Behaviour in state <code>COMM_SILENT_COMMUNICATION</code> | 51 |
| 7.2.3 | Behaviour in state <code>COMM_FULL_COMMUNICATION</code> | 52 |
| 7.3 | Extended functionality | 56 |
| 7.3.1 | State duration extensions..... | 56 |
| 7.3.2 | Communication inhibition | 56 |
| 7.4 | Bus communication management..... | 59 |
| 7.5 | Network management dependencies..... | 60 |

| | | |
|--------|------------------------------------------------------------------------------|----|
| 7.6 | Bus error management | 61 |
| 7.6.1 | Network Start Indication | 61 |
| 7.7 | Test support requirements | 61 |
| 7.7.1 | Inhibited Full Communication Request Counter | 61 |
| 7.8 | Error classification | 62 |
| 7.8.1 | Development Errors | 62 |
| 7.8.2 | Runtime Errors | 62 |
| 7.8.3 | Transient Faults | 62 |
| 7.9 | Non functional requirements | 63 |
| 7.10 | Communication Manager Module Services | 63 |
| 7.10.1 | Architecture | 63 |
| 7.10.2 | Use Cases | 64 |
| 7.10.3 | Specification of Ports and Port Interfaces | 68 |
| 7.10.4 | Runnables and Entry points | 71 |
| 8 | API specification | 74 |
| 8.1 | Imported types | 74 |
| 8.1.1 | Standard types | 74 |
| 8.2 | Type definitions | 74 |
| 8.2.1 | ComM_InitStatusType | 74 |
| 8.2.2 | ComM_InhibitionStatusType | 74 |
| 8.2.3 | ComM_UserHandleType | 75 |
| 8.2.4 | ComM_ModeType | 75 |
| 8.2.5 | ComM_PncModeType | 75 |
| 8.2.6 | ComM_StateType | 76 |
| 8.2.7 | ComM_ConfigType | 76 |
| 8.3 | Function definitions | 76 |
| 8.3.1 | ComM_Init | 76 |
| 8.3.2 | ComM_Delnit | 77 |
| 8.3.3 | ComM_GetState | 78 |
| 8.3.4 | ComM_GetStatus | 78 |
| 8.3.5 | ComM_GetInhibitionStatus | 79 |
| 8.3.6 | ComM_RequestComMode | 79 |
| 8.3.7 | ComM_GetMaxComMode | 80 |
| 8.3.8 | ComM_GetRequestedComMode | 81 |
| 8.3.9 | ComM_GetCurrentComMode | 81 |
| 8.3.10 | ComM_PreventWakeUp | 82 |
| 8.3.11 | ComM_LimitChannelToNoComMode | 83 |
| 8.3.12 | ComM_LimitECUToNoComMode | 83 |
| 8.3.13 | ComM_ReadInhibitCounter | 84 |
| 8.3.14 | ComM_ResetInhibitCounter | 84 |
| 8.3.15 | ComM_SetECUGroupClassification | 85 |
| 8.3.16 | ComM_GetVersionInfo | 85 |
| 8.4 | Callback notifications | 86 |
| 8.4.1 | AUTOSAR Network Management Interface | 86 |
| 8.4.2 | AUTOSAR Diagnostic Communication Manager Interface | 88 |
| 8.4.3 | AUTOSAR ECU State Manager Interface | 89 |
| 8.4.4 | AUTOSAR ECU State Manager and Basic Software Mode Manager Interface | 90 |
| 8.4.5 | Bus State Manager Interface | 90 |

| | | |
|---------|-----------------------------------------------|-----|
| 8.4.6 | COM Interface | 91 |
| 8.5 | Scheduled functions | 91 |
| 8.5.1 | ComM_MainFunction | 91 |
| 8.6 | Expected interfaces | 92 |
| 8.6.1 | Mandatory Interfaces | 92 |
| 8.6.2 | Optional Interfaces | 95 |
| 8.6.3 | Configurable Interfaces | 95 |
| 8.6.4 | AUTOSAR COM | 95 |
| 8.7 | Service Interfaces | 96 |
| 8.7.1 | Sender-Receiver-interfaces | 96 |
| 8.7.2 | Client-Server-interfaces | 97 |
| 8.7.3 | Mode-Switch-Interfaces | 103 |
| 8.7.4 | Implementation Data Types | 103 |
| 8.7.5 | Ports | 105 |
| 8.7.6 | ModeDeclarationGroups | 106 |
| 9 | Sequence diagrams | 108 |
| 9.1 | Transmission and Reception start (CAN) | 108 |
| 9.2 | Passive Wake-up (CAN) | 109 |
| 9.3 | Network shutdown (CAN) | 110 |
| 9.4 | Communication request | 112 |
| 10 | Configuration specification | 113 |
| 10.1 | How to read this chapter | 113 |
| 10.2 | Containers and configuration parameters | 114 |
| 10.2.1 | VARIANT POST-BUILD | 115 |
| 10.2.2 | VARIANT-PRE-COMPILE | 115 |
| 10.2.3 | ComM | 115 |
| 10.2.4 | ComMGeneral | 116 |
| 10.2.5 | ComMConfigSet | 121 |
| 10.2.6 | ComMUser | 122 |
| 10.2.7 | ComMChannel | 123 |
| 10.2.8 | ComMNetworkManagement | 129 |
| 10.2.9 | ComMUserPerChannel | 131 |
| 10.2.10 | ComMPnc | 131 |
| 10.2.11 | ComMPncComSignal | 132 |
| 10.3 | Published information | 134 |
| 11 | Not applicable requirements | 135 |

List of Figures

| | |
|---------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 1: Communication Manager Module context view | 16 |
| Figure 2: PNC State Machine | 38 |
| Figure 3: User to Partial network and channel Mapping Use Cases..... | 43 |
| Figure 4: ComM channel state machine | 45 |
| Figure 5: ARPackage of the Communication Manager Module | 64 |
| Figure 6: SW-C requests state changes to the Communication Manager Module ... | 65 |
| Figure 7: SW-C requires state changes within the Communication Manager Module and reads out current communication state..... | 66 |
| Figure 8: Interaction between BswM and the ComM module | 68 |
| Figure 9: Starting transmission and reception on CAN | 108 |
| Figure 10: Reaction on a wake-up indicated by the ECU State Manager module .. | 109 |
| Figure 11: Network shutdown (CAN) | 111 |
| Figure 12: Request Communication | 112 |
| Figure 13: Configuration ComM..... | 116 |
| Figure 14: Configuration ComMGeneral | 121 |
| Figure 15: Configuration ComMUser | 123 |
| Figure 16: Configuration ComMChannel | 128 |
| Figure 17: Configuration ComMNetworkManagement..... | 130 |

1 Introduction and functional overview

The Communication Manager Module (COM Manager, ComM) is a component of the Basic Software (BSW). It is a Resource Manager, which encapsulates the control of the underlying communication services. The ComM module controls basic software modules relating to communication and not software components or runnable entities. The ComM module collects the bus communication access requests from communication requestors (see definition of term "User" in Chapter 2) and coordinates the bus communication access requests.

The purpose of the ComM module is:

1. Simplifying the usage of the bus communication stack for the user. This includes a simplified network management handling.
2. Coordinating the availability of the bus communication stack (allow sending and receiving of signals) of multiple independent software components on one ECU.

Comment: A user should not have any knowledge about the hardware (e.g. on which channel to communicate). A user simply requests a "Communication Mode" and ComM module switches the communication capability of the corresponding channel on/off.

3. Offer an API to disable sending of signals to prevent the ECU from (actively) waking up the communication bus.

Comment: On CAN every message wakes up the bus, on FlexRay it is only possible to wake up the bus with a so called wake-up pattern.

4. Controlling of more than one communication bus channel of an ECU by implementing a channel state machine for every channel.

Comment: The ComM module requests a Communication Mode from the corresponding Bus State Manager module. The actual bus states are controlled by the corresponding Bus State Manager module.

5. Offering the possibility to force an ECU that keeps the bus awake to the 'No Communication' mode (see Section 7.3.2.2 for details).
6. Simplifying the resource management by allocating all resources necessary for the requested Communication Mode.

Comment: E.g. check if communication is allowed when a user requests 'Full Communication' mode, and prevent the ECU from shutdown during communication.

2 Acronyms and definitions

| Abbreviation / Acronym: | Description: |
|-------------------------|----------------------------------|
| BSW | Basic Software |
| BswM | Basic Software Mode Manager |
| ComM | Communication Manager |
| DCM | Diagnostic Communication Manager |
| Det | Default Error Tracer |
| EcuM | ECU State Manager module |
| I-PDU | Information Protocol Data Unit |
| NM | Network Management |
| PDU | Protocol Data Unit |
| SW-C | Software Component |
| VMM | Vehicle Message Matrix |

| Term: | Description: |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DCM_ActiveDiagnostic indication | The DCM module indicates an active diagnostic session. DCM need "full communication" = COMM_FULL_COMMUNICATION for diagnostic purpose |
| Active wake-up | Wake-up caused by the hosting ECU e.g. by a sensor. |
| Application signal scheduling | Sending of application signals according to the VMM. Scheduling of CAN application signals is performed by the Communication Module, scheduling of LIN application I-PDUs (a PDU containing signals) is performed by the LIN interface and scheduling of FlexRay application PDUs is performed by the FlexRay Interface module. |
| Bus sleep | No activity required on the communication bus (e.g. CAN bus sleep). |
| Bus communication messages | Bus communication messages are all messages that are sent on the communication bus. This can be either a diagnostic message or an application message. |
| COM Inhibition status | Defines whether full communication, silent communication or wake-up is allowed or not. |
| Communication Channel | The medium used to convey information from a sender (or transmitter) to a receiver. |
| Communication Mode | Mode determining which kind of communication are allowed: "full communication" = COMM_FULL_COMMUNICATION "no communication" = COMM_NO_COMMUNICATION "silent communication" = COMM_SILENT_COMMUNICATION <i>Note: COMM_SILENT_COMMUNICATION can not be requested by a user. Internal mode for synchronizing network at shutdown</i> |
| Diagnostic PDU scheduling | Sending of diagnostic PDUs. Scheduling of CAN diagnostic PDUs is performed by the diagnostic module, scheduling of LIN diagnostic PDUs is performed by the diagnostic module and the LIN interface and scheduling of FlexRay diagnostic PDUs is performed by the diagnostic module and the FlexRay Interface module. |
| ECU shut down | See ECU State Manager specification [6]. |
| Fan-out | Same message/indication are sent to multiple destinations/receivers |
| Independent software component | A separately developed software component performing a coherent set of functions with a minimum amount of interfaces to other software applications on an ECU. This can be e.g. a basic software component or an application software component. |
| Passive wake-up | Wake-up by another ECU and propagated (e.g. by bus or wake-up-line) to the ECU currently in focus. |
| System User | An administration functionality (a specific "user", which is generated within the internal context of the ComM) for making a default request and for overriding the user requests. |
| User | Concept for requestors of the ECU State Manager module and of the |

| | |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Communication Manager Module. A user may be the BswM, a runnable entity, a SW-C or a group of SW-Cs, which act as a single unit towards the ECU State Manager module and the Communication Manager Module. |
| User Request | A User can request different Communication Modes from ComM |

3 Related documentation

3.1 Input documents

- [1] List of Basic Software Modules
AUTOSAR_TR_BSWModuleList.pdf
- [2] Layered Software Architecture
AUTOSAR_EXP_LayeredSoftwareArchitecture.pdf
- [3] General Requirements on Basic Software Modules
AUTOSAR_SRS_BSWGeneral.pdf
- [4] Requirements on Mode Management
AUTOSAR_SRS_ModeManagement.pdf
- [5] Specification of ECU Configuration
AUTOSAR_TPS_ECUConfiguration.pdf
- [6] Specification of ECU State Manager
AUTOSAR_SWS_ECUSTateManager.pdf
- [7] Specification of NVRAM Manager
AUTOSAR_SWS_NVRAMManager.pdf
- [8] Specification of RTE Software
AUTOSAR_SWS_RTE.pdf
- [9] Specification of Generic Network Management Interface
AUTOSAR_SWS_NetworkManagementInterface.pdf
- [10] Specification of Communication
AUTOSAR_SWS_COM.pdf
- [11] Specification of Diagnostic Communication Manager
AUTOSAR_SWS_DiagnosticCommunicationManager.pdf
- [12] Specification of LIN Interface
AUTOSAR_SWS_LINInterface.pdf
- [13] Specification of FlexRay Interface
AUTOSAR_SWS_FlexRayInterface.pdf
- [14] Specification of Default Error Tracer
AUTOSAR_SWS_DefaultErrorTracer.pdf
- [16] Specification of CAN Transceiver Driver
AUTOSAR_SWS_CANTransceiverDriver.pdf

- [17] Specification of CAN Interface
AUTOSAR_SWS_CANInterface.pdf
- [18] Specification of FlexRay Transceiver Driver
AUTOSAR_SWS_FlexRayTransceiver.pdf
- [19] Specification of PDU Router
AUTOSAR_SWS_PDURouter.pdf
- [20] Requirements on IPDU Multiplexer
AUTOSAR_SWS_IPDUM.pdf
- [21] Specification of System Services Mode Management
AUTOSAR_SystemServices_ModeManagement.pdf
- [22] Specification of C Implementation Rules
AUTOSAR_Tr_CImplementationRules.pdf
- [23] Specification of LIN State Manager
AUTOSAR_SWS_LINStateManager.pdf
- [24] Specification of CAN State Manager
AUTOSAR_SWS_CANStateManager.pdf
- [25] Specification of FlexRay State Manager
AUTOSAR_SWS_FlexRayStateManager.pdf
- [26] Basic Software Module Description Template,
AUTOSAR_TPS_BSWModuleDescriptionTemplate.pdf
- [27] Glossary,
AUTOSAR_TR_Glossary.pdf
- [28] Specification of Ethernet State Manager
AUTOSAR_SWS_EthernetStateManager.pdf
- [29] Specification of Basic Software Mode Manager
AUTOSAR_SWS_BSWModeManager.pdf
- [30] Specification of ECU State Manager Fixed
AUTOSAR_SWS_ECUStateManagerFixed.pdf
- [31] General Specification of Basic Software Modules
AUTOSAR_SWS_BSWGeneral.pdf

3.2 Related standards and norms

Not applicable.

3.3 Related specification

AUTOSAR provides a General Specification on Basic Software modules [31] (SWS BSW General), which is also valid for COM Manager.

Thus, the specification SWS BSW General shall be considered as additional and required specification for COM Manager.

4 Constraints and assumptions

4.1 Limitations

No limitations.

4.2 Applicability to car domains

No restrictions.

5 Dependencies to other modules

A context view which shows the Communication Manager Module and the dependencies to other modules is shown in Figure 1:

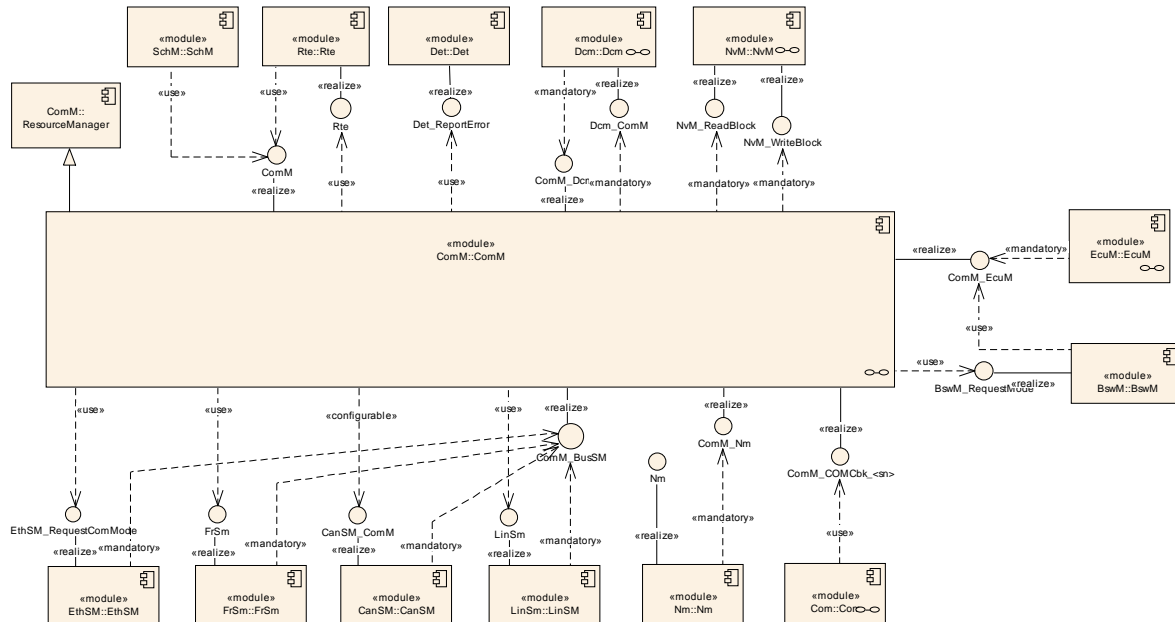


Figure 1: Communication Manager Module context view

The Communication Manager Module requests the communication capabilities, requested from the users, from the Bus State Manager modules.

5.1 File structure

5.1.1 Header file structure

[SWS_ComM_00506] | The ComM module shall, depending on the ComM configuration, include the header files of the modules providing interfaces to the ComM module (see Figure 1):

| | |
|-----------------------------------|--------------|
| ComM Schedule Manager: | SchM_ComM.h |
| RTE generated header file: | Rte_ComM.h |
| Default Error Tracer: | Det.h |
| Diagnostic Communication Manager: | Dcm_Cbk.h |
| NVRAM Manager: | NvM.h |
| ECU State Manager: | EcuM.h |
| Network Management Interface: | Nm.h |
| LIN State Manager: | LinSM.h |
| CAN State Manager: | CanSM_ComM.h |
| FlexRay State Manager: | FrSM.h |
| Ethernet State Manager: | EthSM.h |

Basic Software Mode Manager: BswM_ComM.h
Communication: Com.h
] (SRS_BSW_00436)

[SWS_ComM_00956] [The module header file `ComM.h` shall include `Rte_ComM_Type.h` to include the types which are common used by BSW Modules and Software Components.
This file shall only contain types, which are not already defined in `Rte_ComM_Type.h`.] ()

[SWS_ComM_00463] [The ComM module shall provide in addition to `ComM_Lcfcg.c` and `ComM_PBcfcg.c` at least the following files:
ComM header file: `ComM.h`
ComM callback declarations: `ComM_Nm.h`, `ComM_EcuMBswM.h`,
`ComM_Dcm.h`, `ComM_BusSM.h`,
`ComM_Com.h`
ComM configuration file: `ComM_Cfg.h`
ComM source file: `ComM.c`] (SRS_BSW_00346,
SRS_BSW_00381, SRS_BSW_00412, SRS_BSW_00415, SRS_BSW_00435)

Rationale for [SWS_ComM_00463](#): Source code and configuration are strictly separated. User defined configurations will not imply the change of the original source code.

5.2 AUTOSAR Runtime Environment (RTE)

Every user can request a Communication Mode. The RTE propagates the user request to the ComM module and the Communication Mode indications from the ComM to the users (for details refer to [8]).

5.3 ECU State Manager (EcuM)

Two different variants of EcuM can be used, called EcuM-Fixed and EcuM-Flex. For details about the difference between to two variants, refer to EcuM-Flex [6] and EcuM-Fixed [30].

The EcuM-Fixed is responsible for initialization of ComM. Both EcuMs are also responsible to validate wake-up events and send an indication to ComM if a wake-up is validated.

If EcuM-Fixed is used, EcuM-Fixed will indicate to ComM if communication is allowed to start or not. Then EcuM-Fixed must check with ComM if the ECU can be shutdown or not, i.e. if communication is in progress or not.

If EcuM-Flex is used, the above functionality (communication allowed and shutdown of ECU) is handled by EcuM-Flex together with BswM.

5.4 Basic Software Mode Manager (BswM)

The BswM realizes two functionalities Mode Arbitration and Mode Control to allow the application of an Application Mode Management and a Vehicle Mode Management.

The BswM propagates user requests to the ComM module, if configured in the action lists of BswM to be able to request ComM modes via BswM.

The BswM controls the PDU Groups in the AUTOSAR Communication Module (COM), if the call of `Com_IpduGroupControl` is configured in the action list.

[SWS_ComM_00976] [ComM indicates all channel main state changes and all PNC state changes to the BswM.] ()

If EcuM-Flex is used, BswM will indicate to ComM if communication is allowed or not.

5.5 NVRAM Manager

The ComM module uses the NVRAM Manager to store and read non-volatile data. For details on initial values of the NVRAM data refer to Chapter 10.

Comment: The NVRAM Manager must be initialized after a power up or reset of the ECU. It must be initialized before ComM, as when ComM is initialized, ComM assumes that NVRAM is ready to be used, and that it can read back non-volatile configuration data. When ComM is de-initialized, it writes non-volatile data to NVRAM.

5.6 Diagnostic Communication Manager (DCM)

The DCM performs the scheduling of diagnostic PDUs. The DCM acts as a user by requesting Communication Mode `COMM_FULL_COMMUNICATION` via a “DCM_ActiveDiagnostic” indication if diagnostics shall be performed. The DCM does not provide an API to start/stop sending and receiving but guarantees that the communication capabilities are according to the ComM module Communication Modes.

5.7 LIN State Manager

The LIN State Manager controls the actual states of the LIN bus that correspond to a Communication Mode of the ComM module. The ComM module requests a Communication Mode from the LIN State Manager and the LIN State Manager maps the Communication Mode to a bus state.

5.8 CAN State Manager

The CAN State Manager controls the actual states of the CAN bus that correspond to a Communication Mode of the ComM module. The ComM module requests a Communication Mode from the CAN State Manager and the CAN State Manager maps the Communication Mode to a bus state.

5.9 FlexRay State Manager

The FlexRay State Manager controls the actual states of the FlexRay bus that correspond to a Communication Mode of the ComM module. The ComM module requests a Communication Mode from the FlexRay State Manager and the FlexRay State Manager maps the Communication Mode to a bus state.

5.10 Ethernet State Manager

The Ethernet State Manager controls the actual states of the Ethernet bus that correspond to a Communication Mode of the ComM module. The ComM module requests a Communication Mode from the Ethernet State Manager and the Ethernet State Manager maps the Communication Mode to a bus state.

5.11 Network Management (NM)

The ComM module uses the NM to synchronize the control of communication capabilities across the network (synchronous start-up and shutdown).

5.12 Default Error Tracer (DET)

The DET provides services to store default errors (see Section 7.8).

5.13 Communication (COM)

[SWS_ComM_00975] [The AUTOSAR Communication module (COM) shall be used to distribute the status information about PNCs using COM signals.] ()

6 Requirements traceability

| Requirement | Description | Satisfied by |
|-------------|-------------|----------------|
| - | - | SWS_ComM_00066 |
| - | - | SWS_ComM_00069 |
| - | - | SWS_ComM_00071 |
| - | - | SWS_ComM_00073 |
| - | - | SWS_ComM_00084 |
| - | - | SWS_ComM_00085 |
| - | - | SWS_ComM_00092 |
| - | - | SWS_ComM_00103 |
| - | - | SWS_ComM_00133 |
| - | - | SWS_ComM_00140 |
| - | - | SWS_ComM_00141 |
| - | - | SWS_ComM_00142 |
| - | - | SWS_ComM_00143 |
| - | - | SWS_ComM_00151 |
| - | - | SWS_ComM_00157 |
| - | - | SWS_ComM_00160 |
| - | - | SWS_ComM_00161 |
| - | - | SWS_ComM_00162 |
| - | - | SWS_ComM_00182 |
| - | - | SWS_ComM_00191 |
| - | - | SWS_ComM_00215 |
| - | - | SWS_ComM_00218 |
| - | - | SWS_ComM_00219 |
| - | - | SWS_ComM_00261 |
| - | - | SWS_ComM_00266 |
| - | - | SWS_ComM_00275 |
| - | - | SWS_ComM_00288 |
| - | - | SWS_ComM_00295 |
| - | - | SWS_ComM_00296 |
| - | - | SWS_ComM_00301 |
| - | - | SWS_ComM_00313 |
| - | - | SWS_ComM_00322 |
| - | - | SWS_ComM_00355 |
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| - | - | SWS_ComM_01012 |
| BSW00431 | - | SWS_ComM_00499 |
| BSW00434 | - | SWS_ComM_00499 |
| SRS_BSW_00004 | All Basic SW Modules shall perform a pre-processor check of the versions of all imported include files | SWS_ComM_00418 |
| SRS_BSW_00005 | Modules of the μ C Abstraction Layer (MCAL) may not have hard coded horizontal interfaces | SWS_ComM_00499 |
| SRS_BSW_00009 | All Basic SW Modules shall be documented according to a common standard. | SWS_ComM_00499 |
| SRS_BSW_00010 | The memory consumption of all Basic SW Modules shall be documented for a defined configuration for all supported platforms. | SWS_ComM_00499 |
| SRS_BSW_00101 | The Basic Software Module shall be able to initialize variables and hardware in a | SWS_ComM_00146 |

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| | separate initialization function | |
| SRS_BSW_00158 | All modules of the AUTOSAR Basic Software shall strictly separate configuration from implementation | SWS_ComM_00464 |
| SRS_BSW_00161 | The AUTOSAR Basic Software shall provide a microcontroller abstraction layer which provides a standardized interface to higher software layers | SWS_ComM_00499 |
| SRS_BSW_00162 | The AUTOSAR Basic Software shall provide a hardware abstraction layer | SWS_ComM_00499 |
| SRS_BSW_00164 | The Implementation of interrupt service routines shall be done by the Operating System, complex drivers or modules | SWS_ComM_00499 |
| SRS_BSW_00167 | All AUTOSAR Basic Software Modules shall provide configuration rules and constraints to enable plausibility checks | SWS_ComM_00419 |
| SRS_BSW_00168 | SW components shall be tested by a function defined in a common API in the Basis-SW | SWS_ComM_00499 |
| SRS_BSW_00170 | The AUTOSAR SW Components shall provide information about their dependency from faults, signal qualities, driver demands | SWS_ComM_00499 |
| SRS_BSW_00314 | All internal driver modules shall separate the interrupt frame definition from the service routine | SWS_ComM_00499 |
| SRS_BSW_00323 | All AUTOSAR Basic Software Modules shall check passed API parameters for validity | SWS_ComM_00234 |
| SRS_BSW_00325 | The runtime of interrupt service routines and functions that are running in interrupt context shall be kept short | SWS_ComM_00499 |
| SRS_BSW_00326 | - | SWS_ComM_00499 |
| SRS_BSW_00327 | Error values naming convention | SWS_ComM_00234 |
| SRS_BSW_00331 | All Basic Software Modules shall strictly separate error and status information | SWS_ComM_00649 |
| SRS_BSW_00336 | Basic SW module shall be able to shutdown | SWS_ComM_00147 |
| SRS_BSW_00337 | Classification of development errors | SWS_ComM_00234 |
| SRS_BSW_00341 | Module documentation shall contains all needed informations | SWS_ComM_00499 |
| SRS_BSW_00342 | It shall be possible to create an AUTOSAR ECU out of modules provided as source code and modules provided as object code, even mixed | SWS_ComM_00459 |
| SRS_BSW_00343 | The unit of time for specification and configuration of Basic SW modules shall be preferably in physical time unit | SWS_ComM_00499 |
| SRS_BSW_00344 | BSW Modules shall support link-time configuration | SWS_ComM_00499 |

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| SRS_BSW_00345 | BSW Modules shall support pre-compile configuration | SWS_ComM_00456 |
| SRS_BSW_00346 | All AUTOSAR Basic Software Modules shall provide at least a basic set of module files | SWS_ComM_00463 |
| SRS_BSW_00348 | All AUTOSAR standard types and constants shall be placed and organized in a standard type header file | SWS_ComM_00820 |
| SRS_BSW_00353 | All integer type definitions of target and compiler specific scope shall be placed and organized in a single type header | SWS_ComM_00499 |
| SRS_BSW_00357 | For success/failure of an API call a standard return type shall be defined | SWS_ComM_00820 |
| SRS_BSW_00358 | The return type of init() functions implemented by AUTOSAR Basic Software Modules shall be void | SWS_ComM_00146 |
| SRS_BSW_00361 | All mappings of not standardized keywords of compiler specific scope shall be placed and organized in a compiler specific type and keyword header | SWS_ComM_00499 |
| SRS_BSW_00369 | All AUTOSAR Basic Software Modules shall not return specific development error codes via the API | SWS_ComM_00649 |
| SRS_BSW_00373 | The main processing function of each AUTOSAR Basic Software Module shall be named according the defined convention | SWS_ComM_00429 |
| SRS_BSW_00375 | Basic Software Modules shall report wake-up reasons | SWS_ComM_00499 |
| SRS_BSW_00376 | - | SWS_ComM_00429 |
| SRS_BSW_00377 | A Basic Software Module can return a module specific types | SWS_ComM_00649 |
| SRS_BSW_00378 | AUTOSAR shall provide a boolean type | SWS_ComM_00499 |
| SRS_BSW_00381 | The pre-compile time parameters shall be placed into a separate configuration header file | SWS_ComM_00463 |
| SRS_BSW_00385 | List possible error notifications | SWS_ComM_00234 |
| SRS_BSW_00386 | The BSW shall specify the configuration for detecting an error | SWS_ComM_00234 |
| SRS_BSW_00387 | - | SWS_ComM_00620 |
| SRS_BSW_00388 | Containers shall be used to group configuration parameters that are defined for the same object | SWS_ComM_00549 |
| SRS_BSW_00398 | The link-time configuration is achieved on object code basis in the stage after compiling and before linking | SWS_ComM_00499 |
| SRS_BSW_00404 | BSW Modules shall support post-build configuration | SWS_ComM_00499 |
| SRS_BSW_00405 | BSW Modules shall support multiple | SWS_ComM_00499 |

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| | configuration sets | |
| 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_ComM_00242, SWS_ComM_00612, SWS_ComM_00858 |
| SRS_BSW_00407 | Each BSW module shall provide a function to read out the version information of a dedicated module implementation | SWS_ComM_00370 |
| SRS_BSW_00412 | References to c-configuration parameters shall be placed into a separate h-file | SWS_ComM_00463 |
| SRS_BSW_00413 | An index-based accessing of the instances of BSW modules shall be done | SWS_ComM_00499 |
| SRS_BSW_00414 | Init functions shall have a pointer to a configuration structure as single parameter | SWS_ComM_00146 |
| SRS_BSW_00415 | Interfaces which are provided exclusively for one module shall be separated into a dedicated header file | SWS_ComM_00463 |
| SRS_BSW_00416 | The sequence of modules to be initialized shall be configurable | SWS_ComM_00499 |
| SRS_BSW_00417 | Software which is not part of the SW-C shall report error events only after the DEM is fully operational. | SWS_ComM_00499 |
| SRS_BSW_00422 | Pre-de-bouncing of error status information is done within the DEM | SWS_ComM_00499 |
| SRS_BSW_00423 | BSW modules with AUTOSAR interfaces shall be describable with the means of the SW-C Template | SWS_ComM_00499 |
| SRS_BSW_00424 | BSW module main processing functions shall not be allowed to enter a wait state | SWS_ComM_00499 |
| SRS_BSW_00425 | The BSW module description template shall provide means to model the defined trigger conditions of schedulable objects | SWS_ComM_00499 |
| SRS_BSW_00426 | BSW Modules shall ensure data consistency of data which is shared between BSW modules | SWS_ComM_00499 |
| SRS_BSW_00427 | ISR functions shall be defined and documented in the BSW module description template | SWS_ComM_00499 |
| SRS_BSW_00428 | A BSW module shall state if its main processing function(s) has to be executed in a specific order or sequence | SWS_ComM_00499 |
| SRS_BSW_00429 | BSW modules shall be only allowed to use OS objects and/or related OS services | SWS_ComM_00499 |
| SRS_BSW_00432 | Modules should have separate main processing functions for read/receive and write/transmit data path | SWS_ComM_00499 |
| SRS_BSW_00433 | Main processing functions are only | SWS_ComM_00499 |

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| | allowed to be called from task bodies provided by the BSW Scheduler | |
| SRS_BSW_00435 | - | SWS_ComM_00463 |
| SRS_BSW_00436 | - | SWS_ComM_00506 |
| SRS_BSW_00437 | Memory mapping shall provide the possibility to define RAM segments which are not to be initialized during startup | SWS_ComM_00499 |
| SRS_BSW_00438 | Configuration data shall be defined in a structure | SWS_ComM_00499 |
| SRS_BSW_00439 | Enable BSW modules to handle interrupts | SWS_ComM_00499 |
| SRS_BSW_00441 | Naming convention for type, macro and function | SWS_ComM_00649, SWS_ComM_00863 |
| SRS_ModeMgm_00049 | The Communication Manager shall initiate the wake-up and keep awake physical channels | SWS_ComM_00869, SWS_ComM_00870 |
| SRS_ModeMgm_09071 | It shall be possible to limit communication modes independently for each physical channel | SWS_ComM_00303 |
| SRS_ModeMgm_09078 | The Communication Manager shall coordinate multiple communication requests | SWS_ComM_00686 |
| SRS_ModeMgm_09080 | Each physical channel shall be controlled by an independent communication mode | SWS_ComM_00051 |
| SRS_ModeMgm_09081 | The Communication Manager shall provide an API allowing collecting communication requests | SWS_ComM_00110 |
| SRS_ModeMgm_09083 | The Communication Manager shall support two communication modes for each physical channel | SWS_ComM_00845, SWS_ComM_00846, SWS_ComM_00867, SWS_ComM_00868 |
| SRS_ModeMgm_09084 | The Communication Manager shall provide an API which allows application to query the current communication mode | SWS_ComM_00083 |
| SRS_ModeMgm_09085 | The Communication Manager shall provide an indication of communication mode changes | SWS_ComM_00091 |
| SRS_ModeMgm_09087 | The Minimum duration of communication request after wakeup shall be configurable | SWS_ComM_00893, SWS_ComM_00894 |
| SRS_ModeMgm_09089 | The Communication Manager shall be able to prevent waking up physical channels | SWS_ComM_00302 |
| SRS_ModeMgm_09090 | Relationship between users and physical channels shall be configurable at pre compile time | SWS_ComM_00159 |
| SRS_ModeMgm_09133 | It shall be possible to assign physical channels to the Communication Manager | SWS_ComM_00327 |
| SRS_ModeMgm_09149 | The Communication Manager shall provide an API for querying the | SWS_ComM_00079 |

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| | requested communication mode | |
| SRS_ModeMgm_09155 | The Communication Manager shall provide a counter for inhibited communication requests | SWS_ComM_00138 |
| SRS_ModeMgm_09156 | It shall be provided an API to retrieve the number of inhibited "Full Communication" mode requests | SWS_ComM_00108, SWS_ComM_00224 |
| SRS_ModeMgm_09157 | It shall be possible to revoke a communication mode limitation, independently for each physical channel | SWS_ComM_00124, SWS_ComM_00156, SWS_ComM_00163 |
| SRS_ModeMgm_09168 | The Communication Manager shall support users that are connected to no physical channel | SWS_ComM_00664 |
| SRS_ModeMgm_09172 | It shall be possible to evaluate the current communication mode | SWS_ComM_00176 |
| SRS_ModeMgm_09243 | The Communication Manager shall be able to handle the Partial Networks on Flexray and CAN | SWS_ComM_00164, SWS_ComM_00959 |
| SRS_ModeMgm_09246 | The communication manager shall arbitrate and coordinate requests from users on physical channel and users on PNCs | SWS_ComM_00165 |
| SRS_ModeMgm_09247 | For each configured PNC an independent state machine shall be instantiated | SWS_ComM_00165 |
| SRS_ModeMgm_09248 | it shall be possible to distinguish between internal and external PNC activation requests | SWS_ComM_00165 |

7 Functional specification

The Communication Manager (ComM) module simplifies the resource management for the users, whereat users may be runnable entities, SW-Cs, the BswM (e.g. SW-C request via BswM) or DCM (communication needed to diagnostic purpose).

[SWS_ComM_00867] [The ComM shall provide three different Communication Modes. The highest Communication Mode shall be `COMM_FULL_COMMUNICATION`. The lowest Communication Mode shall be `COMM_NO_COMMUNICATION`.] (SRS_ModeMgm_09083)

[SWS_ComM_00151] [For a user it shall only be possible to request the Communication Modes `COMM_NO_COMMUNICATION` and `COMM_FULL_COMMUNICATION` (see `ComM_RequestComMode()`, [SWS_ComM_00110](#)).] ()

Rationale for [SWS_ComM_00151](#): The Communication Mode `COMM_SILENT_COMMUNICATION` and sub-modes/sub-states are only necessary for synchronization with AUTOSAR NM.

[SWS_ComM_00868] [The Communication Mode `COMM_SILENT_COMMUNICATION` shall only be used for network synchronization.] (SRS_ModeMgm_09083)

Note: The possibility to request `COMM_SILENT_COMMUNICATION` mode is removed since release 2.0.

Comment: The ComM module allows querying the Communication Mode requested by a particular user (see `ComM_GetRequestedComMode()`, [SWS_ComM_00079](#)).

Comment: The ComM module allows querying the actual Communication Mode of a channel (see `ComM_GetCurrentComMode()`, [SWS_ComM_00083](#))

[SWS_ComM_00845] [In `COMM_FULL_COMMUNICATION` mode, the ComM module shall allow transmission and reception on the affected physical channel.] (SRS_ModeMgm_09083)

[SWS_ComM_00846] [In `COMM_NO_COMMUNICATION` mode, the ComM module shall prevent transmission and reception on the affected physical channel.] (SRS_ModeMgm_09083)

[SWS_ComM_00686] [If at least one of multiple independent user requests demands a higher Communication Mode (see [SWS_ComM_00867](#) and [SWS_ComM_00868](#)), the ComM module shall set this higher Communication Mode as the target Communication Mode.] (SRS_ModeMgm_09078)

Rationale for [SWS ComM 00686](#): ComM coordinates multiple independent user requests according to the "highest wins" strategy: `COMM_FULL_COMMUNICATION` Communication Mode overrules `COMM_NO_COMMUNICATION`.

[SWS_ComM_00500] [The ComM module shall not queue user requests. The latest user request of the same user shall overwrite an old user request even if the request is not finished.] ()

[SWS_ComM_00866] [If configuration parameter `ComMNmVariant=FULL|LIGHT|NONE` ([ECUC ComM 00568](#)), an `DCM_ActiveDiagnostic` indication shall be treated as a `COMM_FULL_COMMUNICATION` request for the specified communication channel (see `ComM_DCM_ActiveDiagnostic(channel)`, [SWS ComM 00873](#)).] ()

Rationale for [SWS ComM 00866](#): If more channels needed for diagnostic purpose, DCM needs to indicate `DCM_ActiveDiagnostic` for each channel.

[SWS_ComM_00092] [There shall be one Communication Mode target state (evaluated according to [SWS ComM 00686](#)) per communication channel. This target mode can differ temporarily from the actual mode controlled by the corresponding Bus State Manager module.] ()

Comment: Mode switching by the corresponding Bus State Manager module takes time and a mode inhibition can be active.

[SWS_ComM_00084] [The ComM module shall propagate a call of `ComM_GetCurrentComMode()` (see [SWS ComM 00083](#)) to the Bus State Manager module(s) for the channel(s) the user are configured to (see also [SWS ComM 00176](#) and [SWS ComM 00798](#)).] ()

Rationale for [SWS ComM 00084](#): State requests have to be propagated to the corresponding Bus State Manager module since the ComM module does not control the actual bus state.

Comment: This feature is not used by a "normal SW-C" because they don't have knowledge about channels. This feature is necessary for privileged SW-Cs, which (have to) know about the system topology, e.g. system diagnostic functions.

[SWS_ComM_00884] [The ComM module shall store status if communication for a channel is allowed or not allowed in separate `CommunicationAllowed` boolean flags for all supported channels. The default value after ComM initialization shall be communication is not allowed, i.e. `CommunicationAllowed=FALSE`.] ()

[SWS_ComM_00885] [Status changes for communication allowed or not allowed in [SWS ComM 00884](#) shall be provided to ComM in

ComM_CommunicationAllowed(<channel>,
TRUE|FALSE) ([SWS ComM 00871](#)) indications.] ()

7.1 Partial Network Cluster Management

7.1.1 Overview

ComM implements a state machine for each partial network cluster (PNC) to represent the communication mode of a PNC.

Each PNC has its own state. The state definitions are related to the states of ComM for a simple mapping.

ComM users are used to request and release the PNCs.

The status of all PNCs on the nodes of a system channel is exchanged via network management user data.

Each PNC uses a dedicated bit position within a bit vector in the NM user data on CAN and FlexRay. If a PNC is requested by a local ComM user on the node, the node sets the corresponding bit in the NM user data to 1. If the PNC is not requested anymore; the node sets the corresponding bit in the NM user data to 0. The BusNms collect and aggregate the NM user data for the PNCs and provide the status via a COM bit vector by means of a COM signal to ComM.

Each PNC uses the same bit position in the NM user data on every system channel with NM. ComM uses two types of bit vector named EIRA and ERA to exchange PNC status information. The definition of “EIRA” and “ERA” are located in the AUTOSAR SWS CAN NM and AUTOSAR SWS FlexRay NM.

ComM requests and releases the system communication bus channels needed for a PNC on a node.

Enabling or disabling the partial network cluster management in the node shall be post-build configurable. In order to enable or disable the PNC during runtime e.g. by a diagnostic service, the requested enabling or disabling PNC shall be stored non volatile and executed after the ECU reset during the startup.

Partial networking shall be supported on the bus types CAN, FlexRay. Activation and deactivation of the I-PDU groups of the PNCs on a FlexRay node is required to avoid false timeouts. Starting and Stopping of I-PDU groups in COM are handled in BSWM. Deactivation of single FlexRay ECU is not possible.

7.1.2 Partial Network Cluster Management Functionality

[SWS_ComM_00910] [PNC functionality shall only exist if the parameter ComMPncSupport is set to TRUE. (see SWS_ComM_00839_Conf).] ()

[SWS_ComM_00911] [Enabling or disabling of the PNC functionality shall be post-build configurable using the parameter ComMPncEnabled (see SWS_ComM_00878_Conf).] ()

[SWS_ComM_00999] [The parameter ComMPncEnable shall be stored non volatile and evaluated after the ECU reset during the startup.] ()

Comment: This is required to be able to enable or disable the PNC during runtime e.g. by a diagnostic service.

Comment: The ComM module notifies the BswM about every state change of the PNC state machine by calling `BswM_ComM_CurrentPncMode()`. (refer to [SWS_ComM_00908](#))

[SWS_ComM_00982] [For exchanging PNC status information, bit vectors shall be used. (i.e. only one signal containing a maximum of 56 PNC status information bits).] ()

Comment: ComM expects that the PNC bit vector is configured as an array of type `uint8_n`, see config parameter `ComMPncComSignalRef`.

[SWS_ComM_00825] [The `byteIndex` and `bitIndex`, in which a bit corresponding to one `ComMPncId` resides, shall be determined as follows:
 $\text{byteIndex} = (\text{ComMPncId} \div 8) - \text{pncVectorOffset}$
 $\text{bitIndex} = (\text{ComMPncId} \bmod 8)$] ()

Comment: ComM825 defines only the calculation of the `byteIndex` and `bitIndex`, not how it shall be implemented.

[SWS_ComM_00984] [ComM receives the bit vectors (signals) which can be `ComMPncComSignalKind` EIRA or ERA using `Com_ReceiveSignal()`] ()

[SWS_ComM_00986] [The ComM shall provide the API `ComM_COMCbK_<sn>()` to indicate a change of signal(s) within the module communication.] ()

[SWS_ComM_00916] [The ComM module shall be able to distribute the status of a PNC (result of the PNC state machine) via one or more communications busses using one or more COM signals ,as a bit vector, containing a bit which represents the status of the PNC with `ComMPncComSignalDirection` "TX" assigned to this PNC. (For more details, refer to Figure 2: PNC State Machine)] ()

7.1.3 ComM PNC state machine

[SWS_ComM_00953] [If the PNC functionality is enabled using the configuration parameter `ComMPncEnabled` set to TRUE (see `SWS_ComM_00878_Conf`), all actions related to PNC changes shall be

executed before the channel related actions (channel related actions, see Chapter 7.3).] ()

[SWS_ComM_00909] [For every Partial Network, only one PNC state machine shall be implemented (i.e. One PNC state machine per PNC, independent of the amount of ComMChannels).] ()

[SWS_ComM_00920] [The ComM module shall support up to 56 PNC state machines.] ()

[SWS_ComM_00924] [The PNC state machine shall consist of the two main states PNC_FULL_COMMUNICATION and PNC_NO_COMMUNICATION.] ()

[SWS_ComM_00907] [The PNC main state PNC_FULL_COMMUNICATION shall consist of the sub states PNC_PREPARE_SLEEP, PNC_READY_SLEEP and PNC_REQUESTED.] ()

[SWS_ComM_00908] [Every state change (listed within the ComM_PncModeType), excluding entering of the main state PNC_NO_COMMUNICATION coming from PowerOff, shall be notified by the API call BswM_ComM_CurrentPncMode() with the entered PNC state.] ()

[SWS_ComM_00978] [State transitions of the PNC state machines in ComM, triggered by a call to ComM_RequestComMode() shall be executed in the ComM_MainFunction_<Channel_Id> only.] ()

Comment: Every PN activation triggers sending of the PN-vector n-times thus it would increase the busload without debouncing.

[SWS_ComM_00944] [If at least one bit corresponding to the PNC within the Rx bitvectors with signal type "EIRA" equals '1', then the bit corresponding to this PNC within EIRA in ComM shall be set to '1'.] ()

[SWS_ComM_00945] [If the configuration parameter ComMPncGatewayEnabled (see SWS_ComM_00840_Conf) is true and the parameter ComMPncGatewayType is set to COMM_GATEWAY_TYPE_ACTIVE for a ComMChannel and at least one bit corresponding to the PNC within the Rx bitvectors with signal type "ERA" equals '1', then the bit corresponding to this PNC within ERA in ComM shall be set to '1'.] ()

[SWS_ComM_00971] [The trigger ComM_COMCbK represents a notification by the AUTOSAR Communication module about a received signal containing PNC status information called ERA of EIRA.] ()

[SWS_ComM_00972] [The trigger “ComMUser” represents a notification about a communication request of a ComMUser by calling the API

`ComM_RequestComMode()` .] ()

[SWS_ComM_00987] [Within the `ComM_MainFunction_<Channel_Id>` of a channel that is mapped to one or more PNCs, the requested state shall be handled in the following order:

1. ComM user requests of ComM users mapped to one or more PNCs of that channel
2. ComM user requests of ComM users mapped to that channel
3. ERA (if the configuration switch `ComMPncGatewayEnabled` is set to TRUE)
4. EIRA] ()

Comment: Requests are handled in main functions of those channels they affect.

[SWS_ComM_00919] [It shall be possible to assign more than one COM signal containing bits representing the PNC to one PNC using the configuration container `ComMPncComSignal` (see SWS_ComM_00881_Conf).] ()

Rational: This allows the configurator to assign e.g. one EIRA and n ERAs to one PNC.

Comment: The different IDs of EIRA can be configured to the physical supported channels FlexRay, Can1, Can2 ...

[SWS_ComM_00827][Regarding "Communication allowed" and mode inhibitions, requests originating from a pnc state machine shall be treated like user requests for the according channels.] ()

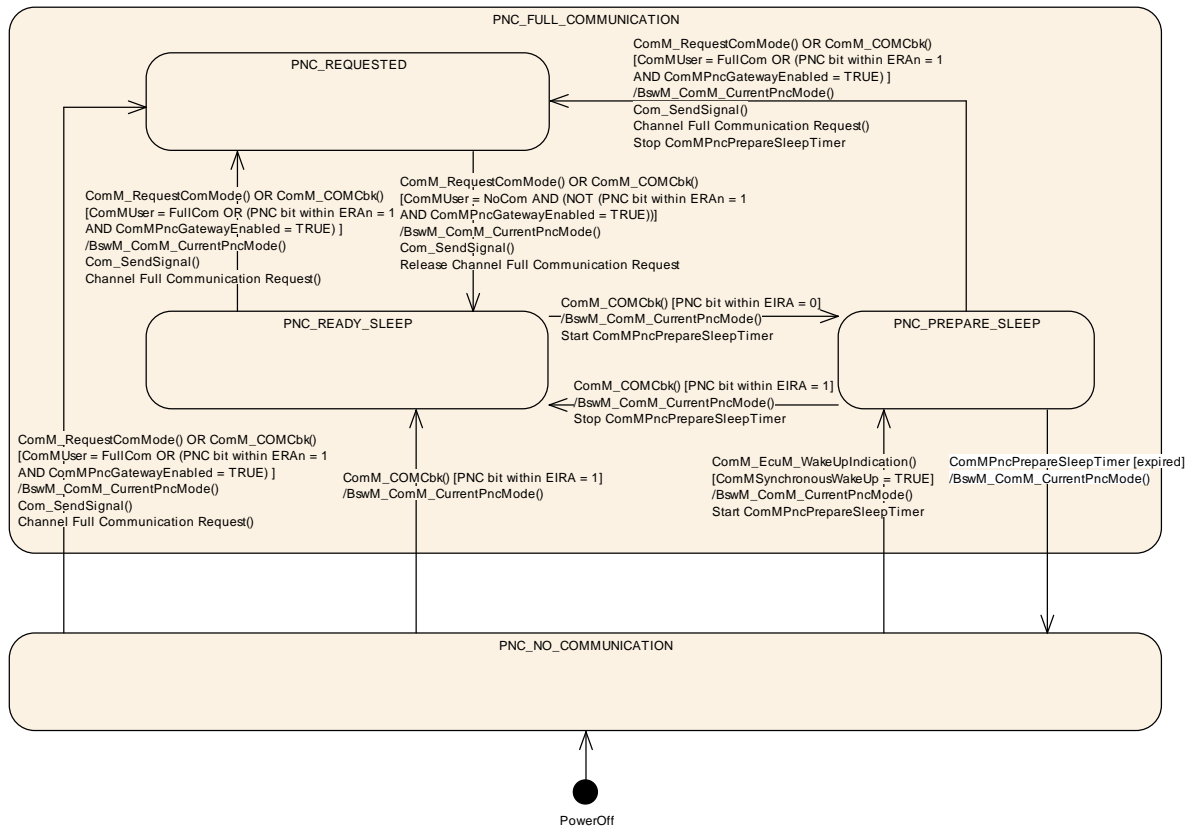


Figure 2: PNC State Machine

7.1.3.1 Behavior in PNC main state PNC_NO_COMMUNICATION

[SWS_ComM_00926] [The PNC main state PNC_NO_COMMUNICATION shall be the default PNC state from power off.] ()

The main state PNC_NO_COMMUNICATION is the target state as long as the PNC is neither requested ECU internally nor requested externally.

[SWS_ComM_00931] [If the API `ComM_EcuM_WakeUpIndication()` is called in PNC state PNC_NO_COMMUNICATION, and the configuration switch `ComMSynchronousWakeUp` is set to TRUE (see ComM695), the PNC main state PNC_NO_COMMUNICATION shall be left and the PNC sub state PNC_PREPARE_SLEEP shall be entered.] ()

[SWS_ComM_00990] [If the API `ComM_EcuM_WakeUpIndication()` is called in PNC state PNC_NO_COMMUNICATION, and the configuration switch `ComMSynchronousWakeUp` is set to FALSE, the PNC main state PNC_NO_COMMUNICATION shall be the current state.] ()

Comment: In case of asynchronous wake up, the PNC state shall stay in PNC_NO_COMMUNICATION until the PNC request is received (PNC bit in EIRA is set to '1').

[SWS_ComM_00932] [When at least one ComMUser assigned to this PNC requests “Full Communication” in PNC main state PNC_NO_COMMUNICATION, this state shall be left and the sub state PNC_REQUESTED of the main state PNC_FULL_COMMUNICATION shall be entered.] ()

[SWS_ComM_00933] [When in main state PNC_NO_COMMUNICATION at least one bit representing this PNC in EIRA changes to ‘1’, the main state PNC_NO_COMMUNICATION shall be left and the PNC_READY_SLEEP shall be entered.] ()

[SWS_ComM_00934] [When in main state PNC_NO_COMMUNICATION at least one bit representing this PNC in an ERAn changes to ‘1’, the main state PNC_NO_COMMUNICATION shall be left and the sub state PNC_REQUESTED shall be entered if the parameter ComMPncGatewayEnabled (SWS_ComM_00840_Conf) equals TRUE.] ()

7.1.3.2 On entry of PNC main state PNC_NO_COMMUNICATION from PowerOff

[SWS_ComM_00927] [After switching on the power supply, main state PNC_NO_COMMUNICATION shall be entered from PowerOff.] ()

7.1.3.3 Behavior in PNC main state PNC_FULL_COMMUNICATION

[SWS_ComM_00929] [All ComMChannels assigned to this PNC shall be in state Full Communication.] ()

7.1.3.4 On entry of PNC sub state PNC_REQUESTED

[SWS_ComM_00930] [When entering the PNC sub state PNC_REQUESTED and if ComMPncGatewayEnabled = FALSE, the API Com_SendSignal() shall be called with the value ‘1’ for the bit representing this PNC for the Com signal assigned to this PNC with ComMPncComSignalDirection “TX”.] ()

[SWS_ComM_00992] [When entering the PNC sub state PNC_REQUESTED and if ComMPncGatewayEnabled = TRUE, the API Com_SendSignal() shall be called with the value ‘1’ for the bits representing this PNC for the Com signals assigned to this PNC with ComMPncComSignalDirection “TX” for all ComM channels related to this PNC and having ComMPncGatewayType == COMM_GATEWAY_TYPE_ACTIVE.] ()

[SWS_ComM_00993] [Every time the sub state PNC_REQUESTED is entered from other states, ComM shall request COMM_FULL_COMMUNICATION for all configured ComM channels for this PNC, even if the channel is already requested.] ()

7.1.3.5 Behavior in PNC sub state PNC_REQUESTED

[SWS_ComM_00164] [If ComMPncGatewayEnabled == TRUE and either on entering PNC_REQUESTED or within PNC_REQUESTED, the API Com_SendSignal() shall be called with the value "1" for the bit representing this PNC for the Com signal assigned to this PNC with ComMPncComSignalDirection == "TX" on all ComM channels related to this PNC where ComMPncGatewayType == COMM_GATEWAY_TYPE_PASSIVE

if at least one ComM user assigned to this PNC request "Full Com" or at least one ComMPncComSignal received by Com_ReceiveSignal() from a channel where the signal attributes ComMPncComSignalDirection == "RX" and ComMPncComSignalKind == "ERA" and the channel attribute ComMPncGatewayType == "COMM_GATEWAY_TYPE_ACTIVE" is set to "1".] (SRS_ModeMgm_09243)

[SWS_ComM_00959] [If ComMPncGatewayEnabled == TRUE and within PNC_REQUESTED, the API Com_SendSignal() shall be called with the value "0" for the bit representing this PNC for the Com signal assigned to this PNC with ComMPncComSignalDirection == "TX" on all ComM channels related to this PNC where ComMPncGatewayType == COMM_GATEWAY_TYPE_PASSIVE if all ComM users assigned to this PNC request "No Com" and all ComMPncComSignals received by Com_ReceiveSignal() from a channel where the signal attributes ComMPncComSignalDirection == "RX" and ComMPncComSignalKind == "ERA" and the channel attribute ComMPncGatewayType == "COMM_GATEWAY_TYPE_ACTIVE" are set to "0".] (SRS_ModeMgm_09243)

As long as at least one ComMUser assigned to this PNC requests "Full Communication", PNC_REQUESTED will be the current PNC state.

As long as a PNC is requested remotely (i.e. at least one bit within the ERA signal assigned to this PNC equals '1') and the configuration switch ComMPncGatewayEnabled is set to TRUE (see SWS_ComM_00840_Conf), PNC_REQUESTED will be the current PNC state.

[SWS_ComM_00938] [When all ComMUsers assigned to this PNC request "No Communication", the sub state PNC_REQUESTED shall be left and the sub state PNC_READY_SLEEP shall be entered, if the configuration switch ComMPncGatewayEnabled is set to FALSE.] ()

[SWS_ComM_00991] [When all ComMUsers assigned to this PNC request "No Communication" and the PNC bit in all ERAn is equal to 0, the sub state PNC_REQUESTED shall be left and the sub state PNC_READY_SLEEP shall be entered, if the configuration switch ComMPncGatewayEnabled is set to TRUE.] ()

7.1.3.6 On entry PNC sub state PNC_READY_SLEEP

[SWS_ComM_00960] [When entering the PNC sub state PNC_READY_SLEEP from PNC_REQUESTED, the API Com_SendSignal() shall be called with the value '0' for the bit representing this PNC for all Com signals assigned to this PNC with ComMPncComSignalDirection "TX".] ()

[SWS_ComM_00961] [When entering the PNC sub state PNC_READY_SLEEP from PNC_REQUESTED, ComM shall release the COMM_FULL_COMMUNICATION request for all configured ComM channels for this PNC.] ()

7.1.3.7 Behavior in PNC sub state PNC_READY_SLEEP

As long as the PNC is requested (i.e. at least one PNC bit within EIRA equals '1') and no ComMUser assigned to this PNC requests "Full Communication", PNC_READY_SLEEP will be the current state.

[SWS_ComM_00940] [If the PNC is released (i.e. all PNC bits within EIRA equals '0'), the sub state PNC_READY_SLEEP shall be left and the sub state PNC_PREPARE_SLEEP shall be entered.] ()

[SWS_ComM_00165] [In PNC sub state PNC_READY_SLEEP when at least one ComMUser assigned to this PNC requests "Full Communication" or ComMPncGatewayEnabled ([ECUC ComM_00887](#)) equals TRUE and one bit representing this PNC in an ERAn changes to '1', this state shall be left and the sub state PNC_REQUESTED shall be entered.] (SRS_ModeMgm_09246 ,SRS_ModeMgm_09247, SRS_ModeMgm_09248)

7.1.3.8 On entry of PNC sub state PNC_PREPARE_SLEEP

[SWS_ComM_00952] [If the sub state PNC_PREPARE_SLEEP is entered, the timer ComMPncPrepareSleepTimer (see SWS_ComM_00841_Conf) shall be started with the configured initial value.] ()

7.1.3.9 Behavior in PNC sub state PNC_PREPARE_SLEEP

As long as the timer ComMPncPrepareSleepTimer (see SWS_ComM_00841_Conf) is running and no changes in ComMUser, EIRA or ERAn occur, PNC_PREPARE_SLEEP will be the current state.

[SWS_ComM_00947] [When the timer ComMPncPrepareSleepTimer (see SWS_ComM_00841_Conf) expires, the PNC sub state PNC_PREPARE_SLEEP shall be left and the PNC main state PNC_NO_COMMUNICATION shall be entered.] ()

[SWS_ComM_00948] [When in PNC_PREPARE_SLEEP at least one ComMUser assigned to this PNC requests "Full Communication", the PNC_PREPARE_SLEEP state shall be left. The timer ComMPncPrepareSleepTimer shall be stopped and the sub state PNC_REQUESTED state shall be entered.] ()

[SWS_ComM_00950] [When in PNC_PREPARE_SLEEP at least one PNC bit within EIRA changes to '1', the sub state PNC_PREPARE_SLEEP shall be left. The timer ComMPncPrepareSleepTimer shall be stopped and the sub state PNC_READY_SLEEP shall be entered.] ()

[SWS_ComM_00951] [When in sub state PNC_PREPARE_SLEEP at least one PNC bit within ERAn changes to '1' and the parameter ComMPncGatewayEnabled equals TRUE, the sub state PNC_PREPARE_SLEEP shall be left. The timer ComMPncPrepareSleepTimer shall be stopped and the sub state PNC_REQUESTED shall be entered.] ()

7.1.4 PNC Gateway

[SWS_ComM_00981] [If the configuration parameter `ComMPncGatewayEnabled` (see SWS_ComM_00840_Conf) is TRUE, the default gateway type shall be active (COMM_GATEWAY_TYPE_ACTIVE).] ()

Comment to SWS_ComM_00981:

It can be assumed that both signal types (i.e. `ComMPncComSignalKind = EIRA` and `ComMPncComSignalKind = ERA`) are configured.

7.1.4.1 Active PNC Gateway

Note: Even if the configuration parameter `ComMPncGatewayEnabled` (see SWS_ComM_00840_Conf) is TRUE and the parameter `ComMPncGatewayType` is set to `COMM_GATEWAY_TYPE_ACTIVE` for a `ComMChannel` (see SWS_ComM_00842_Conf), the active PNC gateway still behaves as shown in Figure 2: PNC State Machine.

Comment: An active PNC gateway on a system channel shall be the last node on a system channel that releases a PNC.

Comment: If the bit for a PNC is equal to zero in all ERA_n, no other node than the PNC gateway is requesting the PNC.

7.1.4.2 Passive PNC Gateway

Comment: The passively coordinated channels exist only if they are connected to more than one PNC gateway. If the PNC gateway functionality of ComM is enabled (`ComMPncGatewayEnabled = true`) ComM channels mapped to this gateway can be set to type active or passive (`COMM_GATEWAY_TYPE_ACTIVE` or `COMM_GATEWAY_TYPE_PASSIVE`). If a ComM channel is mapped to two different PNC gateways, only one gateway coordinates this channel actively, while the other passively. That means, a PNC gateway is always mapped to at least one ComM channel type active and may be mapped to one or some ComM channels type passive.

Comment: A PNC gateway requests the PNC if a local ComM user requests the PNC or at least one PNC bit within ERA originate from the actively coordinated system channels of a passive PNC gateway is not equal to 0.

Comment to SWS_ComM_00959: A PNC gateway calculates the PNCs bit value in the ERA Tx bitvectors to be sent for a passively coordinated channel, in the same manner as the bit value in ERA for an actively coordinated channel, but sets the PNC's bit to '0' according to the rules of SWS_ComM_00959.

7.1.5 ComM User to PNC Relations

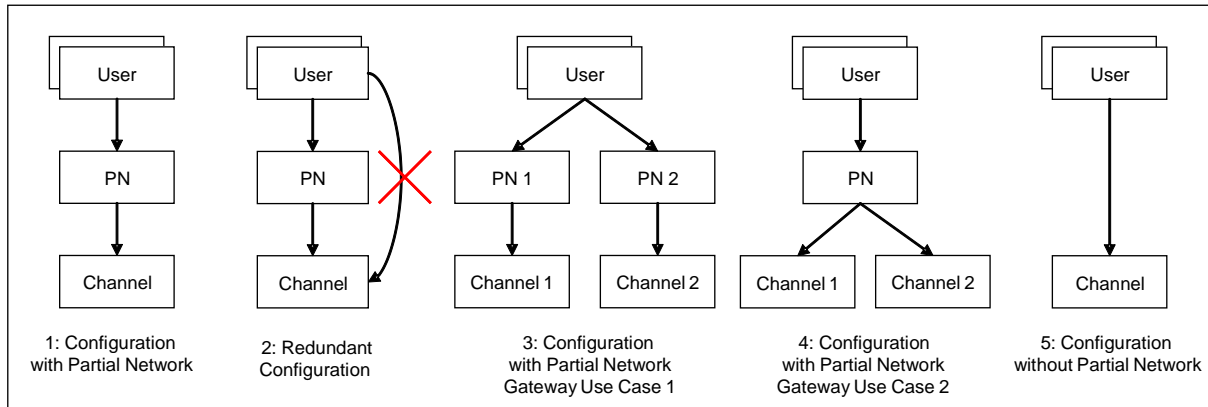


Figure 3: User to Partial network and channel Mapping Use Cases

[SWS_ComM_00912] [It shall be possible to map a configurable amount of ComMUsers to one or more PNCs using the parameter ComMUserPerPnc (see SWS_ComM_00876_Conf).] ()

[SWS_ComM_00994] [No restrictions from the configuration of the BusNm Filter for partial networking shall apply to ComM user assignment to PNCs.] ()

Comment: The BusNM Filter configuration shall be independant from the ComM PNC configuration.

Rational: This enables waking up a PNC without being a member of the PNC, e.g. if a node just triggers a wake up of a PNC but the node is not kept awake by the PNC and other nodes keep the PNC awake

[SWS_ComM_00995] [It shall be possible to map a configurable amount of ComMUsers to one or more ComM channels using the parameter ComMUserPerChannel.] ()

Comment: The existing mapping of ComM users to system channels shall still be possible for backward compatibility. (i.e. the configuration containers will stay untouched)

[SWS_ComM_00913] [It shall be possible to map a configurable amount of PNC(s) to a configurable amount of ComM channels using the parameter ComMChannelPerPnc (see SWS_ComM_00880_Conf).] ()

[SWS_ComM_00996] [It shall not be possible to map a ComMUsers to a PNC and in addition to a ComM channel which is already referenced by the PNC (see figure 3 Use Case 2)] ()

Rational: Avoid redundant configuration since the channel is implicitly already referenced by the PNC.

7.1.6 Partial Networking Configuration Hints

Typically, every PNCSignal is sent / received on ComMChannels which are linked to this PNC.

However, this is not mandatory, but it is also allowed having a configuration where:

- PNCSignal can be sent on a ComMChannel which is NOT linked to this PNC.
- A PNCSignal can be received via a ComMChannel which is NOT linked to this PNC.

7.2 ComM channel state machine

[SWS_ComM_00979] [If the optional PNC functionality is enabled (see SWS_ComM_00839_Conf), all PNC actions shall be performed before the channel related actions are executed.] ()

[SWS_ComM_00980] [If the parameter ComMPncNmRequest equals TRUE (see SWS_ComM_00886_conf), if the "FULL Communication" is requested due to a change in the PNC state machine to PNC_REQUESTED (see SWS_ComM_00993)API Nm_NetworkRequest() shall be called, even if the current state is already "Full communication".] ()

Rationale: It is the trigger to enable the NM to transmit the NM message immediately n-times (n=configurable) to ensure a wake up and a synchronization of the PNC transceiver.

[SWS_ComM_00051] [ComM shall implement one channel state machine as shown in Figure 4 with requirements as listed in Table 1 for every communication channel independently.] (SRS_ModeMgm_09080)

Rationale for [SWS ComM 00051](#): Needed communication capability of channels may be different, thus the controlling must be independent.

Use Case for [SWS ComM 00051](#): On an ECU with CAN and LIN channel, only the LIN requires full communication to request e.g. sensor values while the CAN remains inactive.

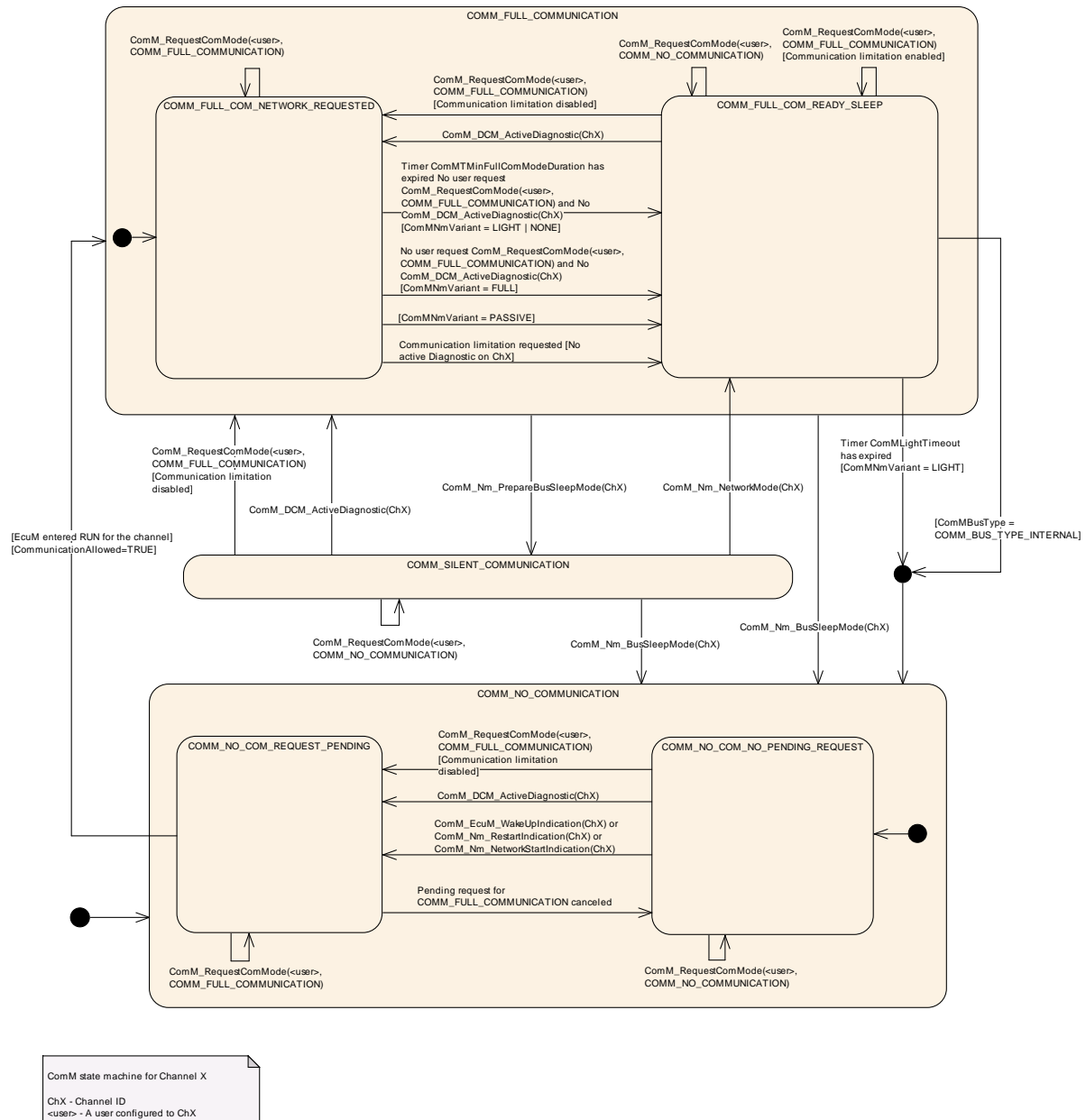


Figure 4: ComM channel state machine

| State | Section / Requirement |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COMM_NO_COMMUNICATION | 7.2.1 Entering state: SWS ComM 00898 , SWS ComM 00313 , SWS ComM 00073 , SWS ComM 00288 In sub-state <code>COMM_NO_COM_NO_PENDING_REQUEST</code> : SWS ComM 00875 , SWS ComM 00876 , SWS ComM 00893 , SWS ComM 00894 , SWS ComM 00694 In sub-state <code>COMM_NO_COM_REQUEST_PENDING</code> : SWS ComM 00895 , SWS ComM 00897 , ComM128 |
| COMM_SILENT_COMMUNICATION | 7.2.2 Entering state: SWS ComM 00071 In state: SWS ComM 00877 , |

| | SWS ComM_00878 , SWS ComM_00295 , SWS ComM_00296 |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COMM_FULL_COMMUNICATION | <p>7.2.3</p> <p>Entering state: SWS ComM_00069</p> <p>In state: SWS ComM_00637, [SWS ComM_00826]</p> <p>7.1.3.1</p> <p>sub-state</p> <p>COMM FULL COM NETWORK REQUESTED:</p> <p>In sub-state: SWS ComM_00869, SWS ComM_00870, SWS ComM_00665, SWS ComM_00888, SWS ComM_00889, SWS ComM_00890</p> <p>7.1.3.2</p> <p>sub-state</p> <p>COMM FULL COM READY SLEEP</p> <p>Entering sub-state: SWS ComM_00133</p> <p>In sub-state: SWS ComM_00610, SWS ComM_00671, SWS ComM_00882, SWS ComM_00883</p> |
| Transition | Requirement |
| COMM_NO_COMMUNICATION → COMM_FULL_COMMUNICATION | SWS ComM_00893 , SWS ComM_00894 , SWS ComM_00694 , SWS ComM_00875 SWS ComM_00876 , |
| COMM_FULL_COM_NETWORK_REQUESTED → COMM_FULL_COM_READY_SLEEP | SWS ComM_00665 |
| COMM_FULL_COM_READY_SLEEP → COMM_FULL_COM_NETWORK_REQUESTED | SWS ComM_00882 , SWS ComM_00883 |
| COMM_FULL_COMMUNICATION → COMM_SILENT_COMMUNICATION | SWS ComM_00826 |
| COMM_FULL_COM_READY_SLEEP → COMM_NO_COMMUNICATION | SWS ComM_00610 , SWS ComM_00671 |
| COMM_FULL_COMMUNICATION → COMM_NO_COMMUNICATION | SWS ComM_00637 |
| COMM_SILENT_COMMUNICATION → COMM_FULL_COMMUNICATION | SWS ComM_00877 , SWS ComM_00878 |
| COMM_SILENT_COMMUNICATION → COMM_FULL_COM_READY_SLEEP | SWS ComM_00296 |
| COMM_SILENT_COMMUNICATION → COMM_NO_COMMUNICATION | SWS ComM_00295 |

Table 1: Link to detailed explanation of the channel state machine resp. transition

[SWS_ComM_00879] [The ComM channel state machine shall consist of the three main states corresponding to the Communication Modes:
COMM_NO_COMMUNICATION, COMM_SILENT_COMMUNICATION and
COMM_FULL_COMMUNICATION.] ()

[SWS_ComM_00880] [The COMM_FULL_COMMUNICATION state shall have two sub-states COMM_FULL_COM_NETWORK_REQUESTED and
COMM_FULL_COM_READY_SLEEP.] ()

[SWS_ComM_00881] [The COMM_NO_COMMUNICATION state shall have two sub-states COMM_NO_COM_REQUEST_PENDING and
COMM_NO_COM_NO_PENDING_REQUEST] ()

Rationale for [SWS_ComM_00879](#) and [SWS_ComM_00880](#):

COMM_FULL_COM_READY_SLEEP and COMM_SILENT_COMMUNICATION are necessary to synchronize a communication shutdown on the bus. If only one ECU switches the communication off, the others store errors because this ECU stops sending application signals.

Comment: The main states present an abstracted status of communication capabilities per channel, which are in focus of the users' interests. The sub-states represent intermediate states, which perform activities to support a synchronized transition with external partners and managing protocols (e.g. NM)

[SWS_ComM_00485] [The default state for each ComM channel state machine shall be COMM_NO_COMMUNICATION.] ()

[SWS_ComM_00896] [Each ComM channel state machine shall only evaluate its corresponding communication status flag `CommunicationAllowed` according to [SWS_ComM_00884](#) in sub-state
COMM_NO_COM_REQUEST_PENDING.] ()

Rationale for [SWS_ComM_00896](#): A

`ComM_CommunicationAllowed(<channel>, FALSE)`
([SWS_ComM_00871](#)) indication has no visible effect if the channel is not in sub-state COMM_NO_COM_REQUEST_PENDING, i.e. ComM channel state machine will not immediately change to state COMM_NO_COMMUNICATION if in another state as e.g. COMM_FULL_COMMUNICATION

[SWS_ComM_00472] [Main state changes (see [SWS_ComM_00879](#)) shall be indicated to the users with the corresponding notifications (see section 8.6.1.5 and 8.6.1.6). Exception: Default state after initialization, see [SWS_ComM_00313](#).] ()

Comment: If more than one user is related to the corresponding channel state machine, the ComM module has to perform a Fan-out to all users.

[SWS_ComM_00191] [The internal functionality of the ComM channel state machine(s) shall be invisible for the users. The user neither needs nor shall get any information about the internal mechanisms and rules (e.g. "highest wins" strategy) of the ComM channel state machine.] ()

An overview of the requested communication capabilities in the Corresponding Mode is shown in Table 2.

| Communication Mode | Message Transmission | Message Reception | NM (COMM_NM_VARIANT=FULL) | Wake-up/Restart capability |
|---------------------------|----------------------|-------------------|------------------------------|-----------------------------------------------------------------------------------------------------------|
| COMM_FULL_COMMUNICATION | On | On | Bus communication requested | N/A |
| COMM_SILENT_COMMUNICATION | Off | On | Bus communication released | <ul style="list-style-type: none"> • User/diagnostic request • Network indication |
| COMM_NO_COMMUNICATION | Off | Off | Bus communication released | <ul style="list-style-type: none"> • User/diagnostic request • Passive wake-up |

Table 2: Granted communication capabilities in the corresponding modes

Note for section 7.1.1 - 7.1.3: Each ComM channel state machine is responsible to handle one channel/network with a connected Bus State Manager ("corresponding" = the channel/network the ComM channel state machine is responsible for).

Note for section 7.1.1 - 7.1.3: The ComM module contains one or several ComM channel state machine(s). ComM channel state machine communicates directly with its connected Bus State Manager, other interfaces are handled by the ComM module.

7.2.1 Behavior in state COMM_NO_COMMUNICATION

[SWS_ComM_00898] [On entering state COMM_NO_COMMUNICATION the ComM channel state machine shall go to sub-state COMM_NO_COM_NO_PENDING_REQUEST.] ()

[SWS_ComM_00313] [On entering state COMM_NO_COMMUNICATION by default after initialization, ComM module shall not indicate the mode change to users via RTE or BswM.] ()

Rationale for [SWS_ComM_00313](#): The RTE is not yet initialized at this point in time.

[SWS_ComM_00073] [On entering state COMM_NO_COMMUNICATION the ComM channel state machine shall switch off the transmission and reception capability. This shall be performed by the ComM channel state machine requesting the corresponding Communication Mode from the Bus State Manager module (XXSM_RequestComMode(network:=<channel state machine's network>, mode:= COMM_NO_COMMUNICATION, see [SWS_ComM_00829](#)))./ ()

Rationale for [SWS ComM 00073](#): The `COMM_NO_COMMUNICATION` mode forbids sending and receiving of bus communication PDUs for the corresponding channels.

[SWS_ComM_00288] [On entering state `COMM_NO_COMMUNICATION` and configuration parameter `ComMNmVariant=FULL` (see [ECUC ComM 00568](#)) the ComM module shall request release of the network from the Network Management module, `Nm_NetworkRelease()./()`

Note: `Nm_NetworkRelease` is needed if ComM has requested the Nm (`Nm_NetworkRequest` or `Nm_PassiveStartup`) for that channel before and has not yet released it.

Rationale for [SWS ComM 00073](#), [SWS COMM 00288](#), [SWS ComM 00875](#) and [SWS ComM 00876](#): FlexRay shutdown cannot be interrupted to avoid partial networks.

Comment: In state `COMM_NO_COMMUNICATION` ComM channel state machine may not request bus communication for the configured channel from the Bus State Manager module.

Use Case for above Comment: The ECU is performing control functions locally without participation in bus communication.

Comment: The communication mode is local for one channel, thus the ECU may still communicate via other channels.

7.2.1.1 `COMM_NO_COM_NO_PENDING_REQUEST` sub-state

[SWS_ComM_00875] [In sub-state `COMM_NO_COM_NO_PENDING_REQUEST` and user requests `COMM_FULL_COMMUNICATION` and communication limitation is disabled (see Section 7.3.2), the ComM channel state machine shall immediately switch to sub-state `COMM_NO_COM_REQUEST_PENDING.`] ()

[SWS_ComM_00876] [In sub-state `COMM_NO_COM_NO_PENDING_REQUEST`, configuration parameter `ComMNmVariant=FULL|LIGHT|NONE` ([ECUC ComM 00568](#)) and DCM indicate `ComM_DCM_ActiveDiagnostic(SWS ComM 00873)`, the ComM channel state machine shall immediately switch to sub-state `COMM_NO_COM_REQUEST_PENDING.`] ()

Rationale for [SWS ComM 00876](#): A potential communication limitation (see Section 7.3.2) shall temporarily be inactive during an active diagnostic session, see [SWS ComM 00182](#)

[SWS_ComM_00893] [In sub-state `COMM_NO_COM_NO_PENDING_REQUEST` and a wake-up-indication is indicated by the EcuM module, `ComM_EcuM_WakeUpIndication()` [SWS ComM 00275](#), the ComM

channel state machine shall immediately switch to sub-state
COMM_NO_COM_REQUEST_PENDING.] (SRS_ModeMgm_09087)

[SWS_ComM_00894] [In sub-state COMM_NO_COM_NO_PENDING_REQUEST and the NM module indicates a restart, ComM_Nm_RestartIndication() [SWS_ComM_00792](#), the ComM channel state machine shall immediately switch to sub-state COMM_NO_COM_REQUEST_PENDING.
] (SRS_ModeMgm_09087)

Rationale for [SWS_ComM_00893](#) and [SWS_ComM_00894](#): It must be guaranteed that communication starts as soon as possible after a bus wake up.

Comment: The ComM channel state machine switches immediately to sub-state COMM_FULL_COM_NETWORK_REQUESTED after entering the COMM_FULL_COMMUNICATION state. If no user requests COMM_FULL_COMMUNICATION mode, the AUTOSAR NM resp. the ComM module timer for ComMTMinFullComModeDuration ([ECUC_ComM_00557](#)) prevent toggling between COMM_NO_COMMUNICATION and COMM_FULL_COMMUNICATION to overcome the init-/start-up time of the system, before possible user requests occur.

[SWS_ComM_00694] [In sub-state COMM_NO_COM_NO_PENDING_REQUEST and configuration parameter ComMSynchronousWakeUp=TRUE ([ECUC_ComM_00695](#)) and a wake-up-indication of a channel is indicated by the EcuM, the ComM module shall immediately switch all ComM channel state machines (resp. channels) to sub-state COMM_NO_COM_REQUEST_PENDING.] ()

7.2.1.2 COMM_NO_COM_REQUEST_PENDING sub-state

[SWS_ComM_00895] [In sub-state COMM_NO_COM_REQUEST_PENDING the ComM channel state machine shall evaluate its corresponding CommunicationAllowed flag, stored and set according to [SWS_ComM_00884](#) and [SWS_ComM_00885](#). If evaluated to CommunicationAllowed=TRUE, the ComM channel state machine shall immediately switch to state COMM_FULL_COMMUNICATION.] ()

[SWS_ComM_00897] [In sub-state COMM_NO_COM_REQUEST_PENDING and no longer any valid pending request for COMM_FULL_COMMUNICATION, the ComM channel state machine shall switch back to default sub-state COMM_NO_COM_NO_PENDING_REQUEST.] ()

Rationale for [SWS_ComM_00897](#): The possibility to switch back to default sub-state if communication for some reason was never allowed. E.g. transition to COMM_NO_COM_REQUEST_PENDING triggered by user request for ComM_RequestComMode(<user>, COMM_FULL_COMMUNICATION) ([SWS_ComM_00871](#)) or DCM indicated ComM_DCM_ActiveDiagnostic(<channel>) ([SWS_ComM_00873](#)), but now

canceled with

ComM_RequestComMode(<user>, COMM_NO_COMMUNICATION) ([SWS ComM_00871](#)) or DCM

ComM_DCM_InactiveDiagnostic(<channel>) ([SWS ComM_00874](#)).

Comment: EcuM –Fixed shall read and evaluate ComM channel state machine sub-states, with ComM_GetState() ([SWS ComM_00872](#)) before a sleep/shutdown.

7.2.2 Behaviour in state COMM_SILENT_COMMUNICATION

[SWS_ComM_00071] [On entering state COMM_SILENT_COMMUNICATION the ComM channel state machine shall switch off the transmission capability (and keep reception capability on). This shall be performed by the ComM channel state machine requesting the corresponding Communication Mode from the Bus State Manager module (XXSM_RequestComMode(network:=<channel state machine's network>, mode:= COMM_SILENT_COMMUNICATION) ([SWS ComM_00829](#)).] ()

Rationale for [SWS ComM_00071](#): The COMM_SILENT_COMMUNICATION mode permits receiving of bus communication PDUs and forbids sending of bus communication PDUs.

Comment: It may happen that nothing is received (e.g. during bus off) despite receiving capability is switched on.

Use Case: Shut down coordination with means of the NM module (prepare bus sleep state).

[SWS_ComM_00877] [In state COMM_SILENT_COMMUNICATION and user requests COMM_FULL_COMMUNICATION and communication limitation is disabled (see Section 7.3.2), the ComM channel state machine shall switch to state COMM_FULL_COMMUNICATION.] ()

[SWS_ComM_00878] [In state COMM_SILENT_COMMUNICATION ,configuration parameter ComMNmVariant=FULL|LIGHT|NONE ([ECUC ComM_00568](#)) and DCM indicate ComM_DCM_ActiveDiagnostic([SWS ComM_00873](#)), the ComM channel state machine shall switch to state COMM_FULL_COMMUNICATION.] ()

Rationale for [SWS ComM_00878](#): A potential communication limitation (see Section 7.3.2) shall temporarily be inactive during an active diagnostic session, see [SWS ComM_00182](#)

[SWS_ComM_00295] [In state COMM_SILENT_COMMUNICATION and the Network Manager module indicates

`ComM_Nm_BusSleepMode()` ([SWS ComM 00392](#)), the ComM channel state machine shall switch to state `COMM_NO_COMMUNICATION.`] ()

[SWS_ComM_00296] [In state `COMM_SILENT_COMMUNICATION` and the Network Manager module indicates `See ComM_Nm_NetworkMode()` [SWS ComM 00390](#), the ComM channel state machine shall switch to state `COMM_FULL_COMMUNICATION` and sub-state `COMM_FULL_COM_READY_SLEEP.`] ()

7.2.3 Behaviour in state `COMM_FULL_COMMUNICATION`

[SWS_ComM_00899] [On entering state `COMM_FULL_COMMUNICATION` the ComM channel state machine shall go to sub-state `COMM_FULL_COM_NETWORK_REQUESTED`, if not a specific sub-state is specified in the transition.] ()

Rationale for [SWS ComM 00899](#): When switching from `COMM_SILENT_COMMUNICATION`, the ComM channel state machine can switch directly to sub-state `COMM_FULL_COM_READY_SLEEP`, if specified in the transition, see [SWS ComM 00296](#).

[SWS_ComM_00069] [On entering state `COMM_FULL_COMMUNICATION` the ComM channel state machine shall switch on the transmission and reception capability. This shall be performed by the ComM channel state machine requesting the corresponding Communication Mode from the Bus State Manager module (`XXSM_RequestComMode(network:=<channel state machine's network>, mode:=
COMM_FULL_COMMUNICATION)` [SWS ComM 00829](#))./ ()

Rationale for [SWS ComM 00069](#): The `COMM_FULL_COMMUNICATION` mode permits sending and receiving of bus communication PDUs for the corresponding channels.

[SWS_ComM_00637] [In state `COMM_FULL_COMMUNICATION` and the Network Manager module indicates `ComM_Nm_BusSleepMode()` [SWS ComM 00392](#), the ComM channel state machine shall switch to state `COMM_NO_COMMUNICATION.`] ()

Rationale for [SWS ComM 00637](#): A user may request to keep the bus awake "too late" (NM is not able to send a vote to keep the bus awake because the cluster already agreed to shutdown).

[SWS_ComM_00826] [In `COMM_FULL_COMMUNICATION` and configuration parameter `ComMNmVariant=FULL|PASSIVE` ([ECUC ComM 00568](#)) and the Network Manager module indicates `ComM_Nm_PrepareBusSleepMode()` ([SWS ComM 00391](#)), the ComM state machine shall switch to state `COMM_SILENT_COMMUNICATION.`] ()

Rationale for [SWS ComM_00826](#): `ComM_Nm_PrepareBusSleepMode()` cannot be received before an active request is released via `Nm_NetworkRelease()`, and a `PASSIVE` channel cannot be woken up by an active wake-up, therefore it is safe to assume that the transition is always valid.

7.2.3.1 `COMM_FULL_COM_NETWORK_REQUESTED` sub-state

[SWS_ComM_00886] [On entering sub-state

`COMM_FULL_COM_NETWORK_REQUESTED` and configuration parameter `ComMNmVariant=LIGHT|NONE` ([ECUC ComM_00568](#)), the timer for `ComMTMinFullComModeDuration` ([ECUC ComM_00557](#)) shall be started.] ()

[SWS_ComM_00665] [On entering sub-state

`COMM_FULL_COM_NETWORK_REQUESTED` and `EcuM` module has indicated a wake-up, `ComM_EcuM_WakeUpIndication(<channel>)` ([SWS ComM_00275](#)), the `ComM` module shall request `Nm_PassiveStartup(<channel>)` from the Network Management.] ()

[SWS_ComM_00902] [On entering sub-state

`COMM_FULL_COM_NETWORK_REQUESTED` and `Nm` module has indicated a restart, `ComM_Nm_RestartIndication(<channel>)` ([SWS ComM_00792](#)), the `ComM` module shall request `Nm_PassiveStartup(<channel>)` from the Network Management] ()

[SWS_ComM_00903] [On entering sub-state

`COMM_FULL_COM_NETWORK_REQUESTED` and `Nm` module has indicated a Network start, `ComM_Nm_NetworkStartIndication(<channel>)` ([SWS ComM_00383](#)), the `ComM` module shall request `Nm_PassiveStartup(<channel>)` from the Network Management] ()

Comment for [SWS ComM_00903](#): This is not a “normal” transition to

`COMM_FULL_COMMUNICATION`, `ComM` handle

`ComM_Nm_NetworkStartIndication()` as “race condition” error, see section 7.6.1

[SWS_ComM_00869] [On entering sub-state

`COMM_FULL_COM_NETWORK_REQUESTED` from another state or substate, if configuration parameter `ComMNmVariant=FULL` ([ECUC ComM_00568](#)) and if a user has requested `ComM_RequestComMode(<user>, COMM_FULL_COMMUNICATION)` ([SWS ComM_00110](#)) the `ComM` module shall request `Nm_NetworkRequest(<channel>)` from the Network Management for the corresponding NM channel.] ([SRS_ModeMgm_00049](#))

Note: Additionally `Nm_NetworkRequest` may be invoked due to [SWS ComM_00980](#).

[SWS_ComM_00870] [On entering sub-state

`COMM_FULL_COM_NETWORK_REQUESTED`, if configuration parameter

ComMNmVariant=FULL ([ECUC ComM 00568](#)) and the DCM has indicated ComM_DCM_ActiveDiagnostic(<channel>) ([SWS ComM 00873](#)), the ComM module shall request Nm_NetworkRequest(<channel>) from the Network Management for the corresponding NM channel.] (SRS_ModeMgm_00049)

[SWS_ComM_00889] [In sub-state COMM_FULL_COM_NETWORK_REQUESTED and configuration parameter ComMNmVariant=LIGHT|NONE ([ECUC ComM 00568](#)) and timer for ComMTMinFullComModeDuration ([ECUC ComM 00557](#)) has expired and no user request ComM_RequestComMode(<user>, COMM_FULL_COMMUNICATION) and the DCM does not indicate ComM_DCM_ActiveDiagnostic(<channel>) ([SWS ComM 00873](#)), the ComM channel state machine shall switch to sub-state COMM_FULL_COM_READY_SLEEP.] ()

Rationale for [SWS ComM 00889](#): As long as timer for ComMTMinFullComModeDuration has not expired the sub-state shall be kept, to prevent toggling.

[SWS_ComM_00888] [In sub-state COMM_FULL_COM_NETWORK_REQUESTED and configuration parameter ComMNmVariant=FULL ([ECUC ComM 00568](#)) and no user request ComM_RequestComMode(<user>, COMM_FULL_COMMUNICATION) and the DCM does not indicate ComM_DCM_ActiveDiagnostic(<channel>) ([SWS ComM 00873](#)), the ComM channel state machine shall switch to sub-state COMM_FULL_COM_READY_SLEEP.] ()

Rationale for [SWS ComM 00888](#): No timer needed if AUTOSAR NM is used. This avoids redundant functionality because AUTOSAR NM also ensures this functionality

[SWS_ComM_00915] [In sub-state COMM_FULL_COM_NETWORK_REQUESTED and configuration parameter ComMNmVariant=PASSIVE ([ECUC ComM 00568](#)), the ComM channel state machine shall switch to sub-state COMM_FULL_COM_READY_SLEEP.] ()

[SWS_ComM_00890] [In sub-state COMM_FULL_COM_NETWORK_REQUESTED and the DCM does not indicate ComM_DCM_ActiveDiagnostic(<channel>) ([SWS ComM 00873](#)) and communication limitation is requested (see section 7.3.2), ComM channel state machine shall immediately switch to sub-state COMM_FULL_COM_READY_SLEEP.] ()

7.2.3.2 COMM_FULL_COM_READY_SLEEP sub-state

[SWS_ComM_00133] [On entering sub-state COMM_FULL_COM_READY_SLEEP and configuration parameter ComMNmVariant=FULL ([ECUC ComM 00568](#)), the ComM module shall request Nm_NetworkRelease() from the Network Management for the corresponding NM channels.] ()

[SWS_ComM_00891] [On entering sub-state COMM_FULL_COM_READY_SLEEP and configuration parameter ComMNmVariant=LIGHT ([ECUC ComM 00568](#)), the timer for ComMNmLightTimeout ([ECUC ComM 00606](#)) shall be started.] ()

[SWS_ComM_00610] [In sub-state COMM_FULL_COM_READY_SLEEP and configuration parameter ComMNmVariant=LIGHT ([ECUC ComM 00568](#)) and the timer for ComMNmLightTimeout ([ECUC ComM 00606](#)) has expired, the ComM channel state machine shall switch to state COMM_NO_COMMUNICATION.] ()

[SWS_ComM_00671] [In sub-state COMM_FULL_COM_READY_SLEEP and configuration parameter ComMBusType=COMM_BUS_TYPE_INTERNAL ([ECUC ComM 00567](#)), the ComM channel state machine shall immediately switch to state COMM_NO_COMMUNICATION.] ()

[SWS_ComM_00882] [In sub-state COMM_FULL_COM_READY_SLEEP and a user request COMM_FULL_COMMUNICATION and communication limitation is disabled (see Section 7.3.2), the ComM channel state machine shall immediately switch to sub-state COMM_FULL_COM_NETWORK_REQUESTED.] ()

[SWS_ComM_00883] [In sub-state COMM_FULL_COM_READY_SLEEP ,configuration parameter ComMNmVariant=FULL|LIGHT|NONE ([ECUC ComM 00568](#)) and DCM indicate ComM_DCM_ActiveDiagnostic([SWS ComM 00873](#)), the ComM channel state machine shall switch to sub-state COMM_FULL_COM_NETWORK_REQUESTED.] ()

Rationale for [SWS ComM 00883](#): A potential communication limitation (see Section 7.3.2) shall temporarily be inactive during an active diagnostic session, see [SWS ComM 00182](#)

[SWS_ComM_00892] [In sub-state COMM_FULL_COM_READY_SLEEP and configuration parameter ComMNmVariant=LIGHT ([ECUC ComM 00568](#)) and a switch to sub-state COMM_FULL_COM_NETWORK_REQUESTED, due to request for COMM_FULL_COMMUNICATION according to requirements in [SWS ComM 00882](#) or [SWS ComM 00883](#), the timer for ComMNmLightTimeout ([ECUC ComM 00606](#)) shall be canceled.] ()

7.3 Extended functionality

[SWS_ComM_00470] [The extended functionality described in this chapter shall be individually configurable during runtime per feature (e.g. enable wake up inhibition but disable limitation to no communication).] ()

Rationale for [SWS_ComM_00470](#): During runtime a change in the inhibition / limitation strategy is required in order to cope with changing conditions.

Use Case: Change the wakeup inhibition via diagnostics.

Comment: Configurable with parameter `ComMEcuGroupClassification` (see [ECUC_ComM_00563](#)).

7.3.1 State duration extensions

Comment: Obsolete section and can be removed. Requirement for "state duration extension" for NM variant *LIGHT* and *NONE*, moved to state-machine section.

7.3.2 Communication inhibition

Note: The purpose of mode inhibition is to limit the communication capabilities. For details see Section 7.3.2.1 and Section 7.3.2.2.

[SWS_ComM_00301] [The ComM module shall offer interfaces to request and release the corresponding mode inhibitions.] ()

Comment: The ComM module doesn't care about who requests the mode inhibition but it is not a "normal" SW-C. It is a privileged SW-C or an OEM specific BSW.

[SWS_ComM_00488] [It shall be possible to enable and disable the mode inhibition for each channel (channel state machine) independently. This functionality shall not be used by the ComM module itself.] ()

[SWS_ComM_00839] [The ComM module shall store the status of the user requests.] ()

Comment: SWS_ComM_00839 describes the desired behaviour during an active mode limitation.

[SWS_ComM_00840] [The ComM module shall store the updated status of the user requests if a user releases a request during an active mode inhibition.] ()

Rationale for [SWS ComM_00840](#): User requests shall be granted if the inhibition gets disabled.

Comment: Amount of active user requests from different users. SWS_ComM_00840 describes the desired behaviour during an active mode limitation.

[SWS_ComM_00182] [The communication inhibition shall get temporarily inactive during an active diagnostic session.] ()

Rationale for [SWS ComM_00182](#): ECUs must not fall asleep during an active diagnostic session.

Comment: The DCM indicates the start of an active diagnostic session with `ComM_DCM_ActiveDiagnostic(<channel>)` ([SWS ComM_00873](#)) and the end of a diagnostic session with `ComM_DCM_InactiveDiagnostic(<channel>)` ([SWS ComM_00874](#)).

7.3.2.1 Bus wake up inhibition

Information: Bus wake up inhibition in context of the ComM module means that the ComM module should take precautions against awaking other ECUs by starting the communication.

Rationale: Awaking other ECUs by communication should be avoided because it is assumed that the ECU wakes up the bus because of an error (e.g. broken sensor).

Use Case: An error was detected on signal path of an active wake up line and this non reliable wake-up-source should not be able to awake the whole system anymore. An SW-C that controls error-reactions could set the wake up inhibition-status of related communication channels that usually get communication-requests from SW-Cs as the consequence of this event. This corrupts the forwarding of communication system-wide, based on unreliable wake up events. Or in case of application-specific system control, there is an SW-C that should switch off forwarding system wide wakeup's by communication under conditions like e.g. transport mode.

[SWS_ComM_00302] [Bus wake up Inhibition shall be performed by ignoring user requests.] (SRS_ModeMgm_09089)

Comment: Ignoring user requests means accepting the requests but not executing them due to mode inhibition. The “highest win” strategy would apply immediately as soon as mode inhibition is switched off (see [SWS ComM_00839](#) and [SWS ComM_00840](#)).

[SWS_ComM_00218] [A communication request (`COMM_FULL_COMMUNICATION`) by a user shall be inhibited if the ComM Inhibition status is equal to `ComMNoWakeUp=TRUE` ([ECUC ComM_00569](#)) for the corresponding

channel and the current state of the channel is `COMM_NO_COMMUNICATION` or `COMM_SILENT_COMMUNICATION`] ()

Rationale for [SWS ComM 00218](#): The inhibition should not get active, if the inhibition-status is set but the communication channel is already active.

[SWS_ComM_00219] [The inhibition shall not get active if the current communication state is `COMM_FULL_COMMUNICATION` .] ()

Rationale for [SWS ComM 00219](#): The bus is already awake if the current communication state is `COMM_FULL_COMMUNICATION`.

[SWS_ComM_00066] [The ComM module shall never inhibit the “passive wake-up” capability.] ()

Rationale for [SWS ComM 00066](#): It must be always possible to react on bus wake ups indicated by the EcuM module.

Comment: Reception is switched off in `COMM_NO_COMMUNICATION` mode but the wake up capability is switched on.

[SWS_ComM_00157] [ComMNoWakeup status must be stored non volatile.] ()

Rationale for [SWS ComM 00157](#): Information must be available during start-up, before the communication is active (“Full Communication” mode entered). Changing or query is only possible after start-up with active communication (usually the "master", who decides if the inhibition is active or not, is not on the same ECU).

[SWS_ComM_00625] [The status of the user requests shall also be updated if a user releases a request.] ()

7.3.2.2 Limit to `COMM_NO_COMMUNICATION` mode

[SWS_ComM_00303] [The ComM module shall perform the limit to `COMM_NO_COMMUNICATION` mode by switching to `COMM_FULL_COM_READY_SLEEP` state to initiate a shutdown despite user requests for `COMM_FULL_COMMUNICATION` mode and ignoring new `COMM_FULL_COMMUNICATION` mode requests.] ([SRS_ModeMgm_09071](#))

Rationale for [SWS ComM 00303](#): Forcing into `COMM_NO_COMMUNICATION` mode is needed to shut down software components, which keeps the bus awake.

[SWS_ComM_00355] [ComM shall force an ECU reset by invoking `BswM_ComM_InitiateReset()` after entering "No Communication" mode if configured (`ComMResetAfterForcingNoComm=TRUE`).] ()

Rationale: It is assumed that a faulty user will not release his "Full Communication" request without a re-initialization. Keeping the "Full Communication"

request active leads to a toggling between network shutdown and network startup.

Use Case: It is assumed that a faulty ECU keeps the bus awake. As a consequence a "network master" decides to force all ECUs to go to sleep.

[SWS_ComM_00841] [The ComM module shall only perform the limit to
COMM_NO_COMMUNICATION mode if the current state is
COMM_FULL_COM_NETWORK_REQUESTED.] ()

[SWS_ComM_00842] [The ComM module shall ignore requests in other states
than COMM_FULL_COM_NETWORK_REQUESTED.] ()

[SWS_ComM_00215] [All active user requests for communication channel X shall
be ignored if the ComM Inhibition ComMNoCom=TRUE (see
[ComM561_ConfECUC_ComM_00571](#)) for the corresponding channel to
guarantee entering the COMM_NO_COMMUNICATION state for channel X.] ()

[SWS_ComM_00582] [The ComM module shall clear the user requests after all the
channels that belong to the corresponding user enter
COMM_NO_COMMUNICATION mode.] ()

Rationale for [SWS_ComM_00582](#): Stored (faulty) user requests, which are assumed
to keep the bus awake, must be cleared.

Description: The ComM module shall reload the default value of the ComM inhibition
status from ComMNoCom (see [ECUC_ComM_00571](#)) during initialization.

Comment: The current ComMNoCom status for each channel shall not be stored
persistently. SWS_ComM_00582 describes the desired behaviour after an executed
mode limitation.

7.4 Bus communication management

[SWS_ComM_00402] [The ComM module shall use the corresponding interfaces
of the Bus State Manager modules to control the communication
capabilities.] ()

[SWS_ComM_00664] [The ComM module shall omit calls to control the
communication capabilities if configuration parameter
ComMBusType=COMM_BUS_TYPE_INTERNAL
([ECUC_ComM_00567](#)).] (SRS_ModeMgm_09168)

Rationale for [SWS_ComM_00664](#): Internal communication has no corresponding bus
interface.

7.5 Network management dependencies

[SWS_ComM_00599] [The ComM module shall support the shutdown synchronization variants (configured with `ComMNmVariant`, see [ECUC ComM 00568](#)) `LIGHT`, `PASSIVE` and `FULL` described in Table 3.] ()

Comment: Only variant `FULL` and `PASSIVE` guarantees a synchronized shutdown between all nodes of a network. Note that since the Nmlf cannot start the synchronized shutdown of coordinated networks before all networks are ready to go to sleep, requests from ComM to Nmlf to release network communication on such a coordinated bus will be considered, but not always acted on directly. The Nmlf will still answer with `NM_E_OK`, but network will not be released until all coordinated networks are ready to go to sleep.

| NM variant | Keep bus awake capability | Shutdown synchronization |
|------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| NONE | | No shutdown synchronization by ComM. Shutdown by switching off the power of the ECU. |
| LIGHT | | Shutdown synchronization by ComM with means of a timeout (configured with <code>ComMNmLightTimeout</code> , ECUC ComM 00606) |
| PASSIVE | ECU is not allowed to keep the bus awake | Shutdown synchronization by ComM with means of AUTOSAR NM. |
| FULL | ECU is allowed to keep the bus awake. | Shutdown synchronization by ComM with means of AUTOSAR NM. |

Table 3: Network management variants supported by the Communication Manager Module

Comment: A synchronized shutdown is not possible with the `LIGHT` variant thus the ECU may continuously restart ("toggle") because of a message from a node shutting down later.

[SWS_ComM_00501] [If `ComMNmPassiveModeEnable` is set to `ENABLED` the parameter `ComMNmVariant` shall be limited to the values `LIGHT`, `NONE`, and `PASSIVE`.] ()

[SWS_ComM_00502] [If `ComMNmPassiveModeEnable` is set to `DISABLED` the `ComMNmVariant` shall be limited to the values `LIGHT`, `NONE`, and `FULL`.] ()

[SWS_ComM_00602] [The ComM module shall omit calls of NM services if configuration parameter `ComMNmVariant=LIGHT|NONE` (see [ECUC ComM 00568](#)).] ()

Rationale for [SWS ComM 00602](#): NM services are not available if no NM is available.

[SWS_ComM_00667] [The ComM module shall omit to call
Nm_NetworkRequest() from NM if configuration parameter
ComMNmVariant=PASSIVE (see [ECUC ComM 00568](#)).] ()

Rationale for [SWS ComM 00667](#): Service Nm_NetworkRequest() is not available.

7.6 Bus error management

7.6.1 Network Start Indication

[SWS_ComM_00583] [The ComM module shall switch channel X to
COMM_FULL_COMMUNICATION if NM indicates
ComM_Nm_NetworkStartIndication(<channel X>) and
CommunicationAllowed flag is set to TRUE.] ()

Use Case for [SWS ComM 00583](#): A node sends an NM message in "Prepare Bus Sleep" state but other nodes are already in "Bus Sleep" state because of "race conditions".

7.7 Test support requirements

7.7.1 Inhibited Full Communication Request Counter

[SWS_ComM_00138] [The ComM module shall provide one Inhibit counter for all
rejected COMM_FULL_COMMUNICATION mode requests. It shall count user
requests, which cannot be fulfilled because the system has inhibited
communication modes.] (SRS_ModeMgm_09155)

Rationale for [SWS ComM 00138](#): The counter is used for detecting latent software problems related to unmotivated communication bus wake ups.

[SWS_ComM_00140] [The Inhibit counter ([SWS ComM 00138](#)) for all rejected
COMM_FULL_COMMUNICATION mode requests shall be stored in non-
volatile memory.] ()

[SWS_ComM_00141] [The range of the Inhibit counter ([SWS ComM 00138](#)) for
all rejected COMM_FULL_COMMUNICATION mode requests shall be 0 to
65535.] ()

[SWS_ComM_00142] [The Inhibit counter ([SWS ComM 00138](#)) for all rejected
COMM_FULL_COMMUNICATION mode requests shall stop to increment if the
maximum counter value is reached.] ()

[SWS_ComM_00143] [It shall be possible to read out and reset the Inhibit counter ([SWS_ComM_00138](#)) for all rejected `COMM_FULL_COMMUNICATION` mode requests value by a ComM module API call.] ()

Use Case for [SWS_ComM_00143](#): It shall be possible to read out and reset the current status of the counter by a diagnostic service.

7.8 Error classification

7.8.1 Development Errors

[SWS_ComM_00234] [The ComM module shall use the error codes of table 4 to report errors.

| Type or error | Relevance | Related error code | Value [hex] |
|------------------------------------------------|-------------|--------------------------------------|-------------|
| API service used without module initialization | Development | <code>COMM_E_NOT_INITED</code> | 0x1 |
| API service used with wrong parameters | Development | <code>COMM_E_WRONG_PARAMETERS</code> | 0x2 |
| API Service used with a null pointer | Development | <code>COMM_E_PARAM_POINTER</code> | 0x3 |
| Initialization failed | Development | <code>COMM_E_INIT_FAILED</code> | 0x4 |

Table 4: Error classification] (SRS_BSW_00323, SRS_BSW_00327, SRS_BSW_00337, SRS_BSW_00385, SRS_BSW_00386)

[SWS_ComM_00612] [If ComM is not initialized, all ComM module all API service other than `ComM_Init()` (see [SWS_ComM_00146](#)), `ComM_GetVersionInfo()` (see [SWS_COMM_00370](#)) and `ComM_GetStatus()` (see [SWS_COMM_00242](#)); shall:

- not execute their normal operation,
- and return `E_NOT_OK`, if it has a standard return type.] (SRS_BSW_00406)

[SWS_ComM_00858] [If ComM is not initialized and default error detection has been switched on by `ComMDevErrorDetect` (see [ECUC_ComM_00555](#)), the ComM module shall report a development error `COMM_E_NOT_INITED` (by using the `Det_ReportError` service of the Default Error Tracer module) for all ComM module API services other than `ComM_Init()` and `ComM_GetVersionInfo()`, and `ComM_GetStatus()`.] (SRS_BSW_00406)

7.8.2 Runtime Errors

There are no runtime errors.

7.8.3 Transient Faults

There are no transient faults.

7.9 Non functional requirements

[SWS_ComM_00459] [It shall be possible to integrate the ComM module delivered as source or object code into the AUTOSAR stack.

Rationale:

- Allow IP protection and guaranteed test coverage: object code
- Allow high efficiency and configurability at system generation time (by integrator): source code.] (SRS_BSW_00342)

7.10 Communication Manager Module Services

This section defines the AUTOSAR Interfaces of the Communication Manager Module Service (ComM).

7.10.1 Architecture

The overall architecture of the Communication Manager Module service is depicted in Figure 5:

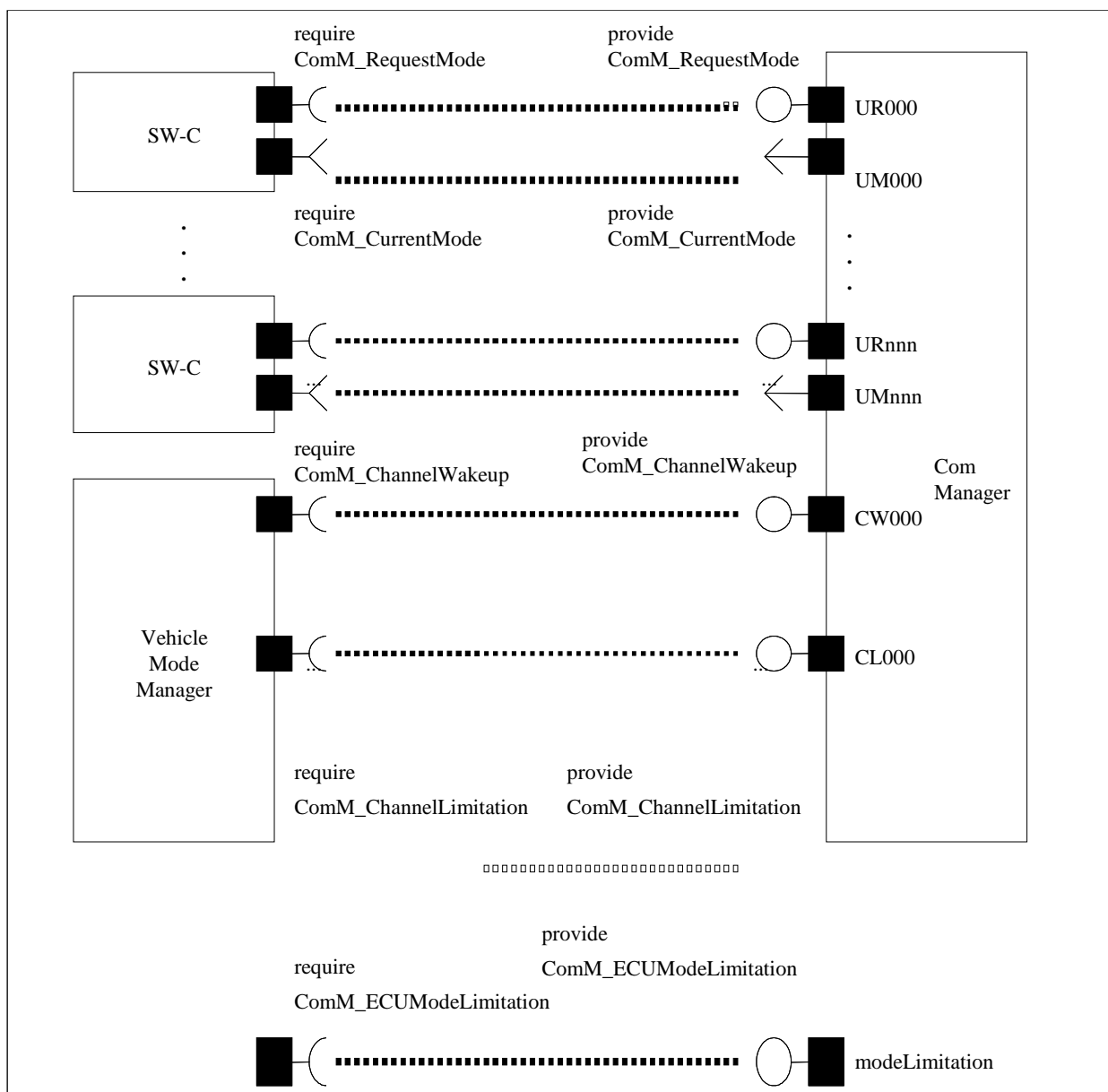


Figure 5: ARPackage of the Communication Manager Module

7.10.2 Use Cases

7.10.2.1 SW-Cs does not care about the ComM module at all

A SW-C that does not care about the Communication Manager Module will not require any of the interfaces defined in the ARPackage of the Communication Manager Module.

7.10.2.2 SW-Cs only cares about the state of its communication system

In this use case, a SW-C wants to know what communication capabilities it has (expressed by a communication mode 'none', 'silent' or 'full' - see ComM_ModeType). The SW-C finds out about that by defining a port requiring the Interface ComM_GetCurrentComMode. Depending on the available communication capabilities, the SW-C can specify that certain runnables of the SW-C should be executed or not. The Communication Manager Module must be configured correctly

(with e.g. the physical channels that this SW-C uses for its logical communication) such that it has a port that provides this information about the current communication mode to the SW-C.

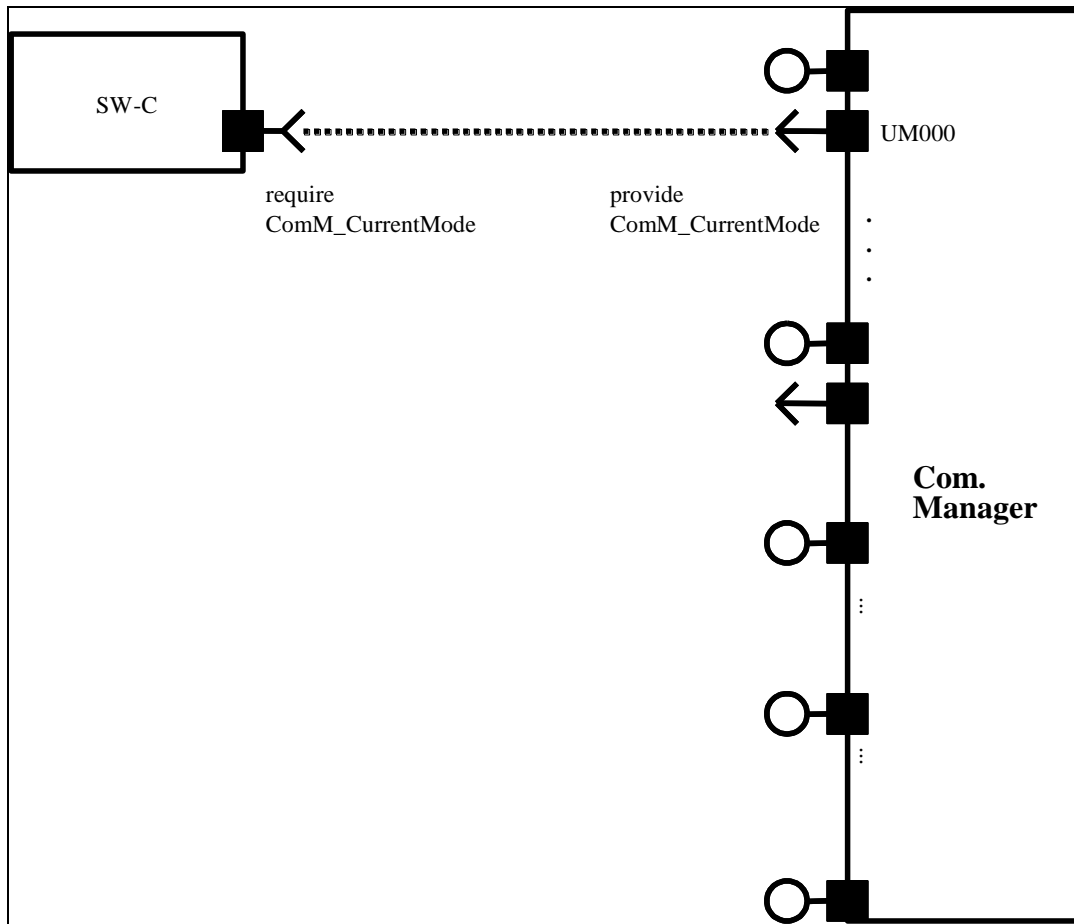


Figure 6: SW-C requests state changes to the Communication Manager Module

7.10.2.3 SW-Cs explicitly wants to take influence on its communication state

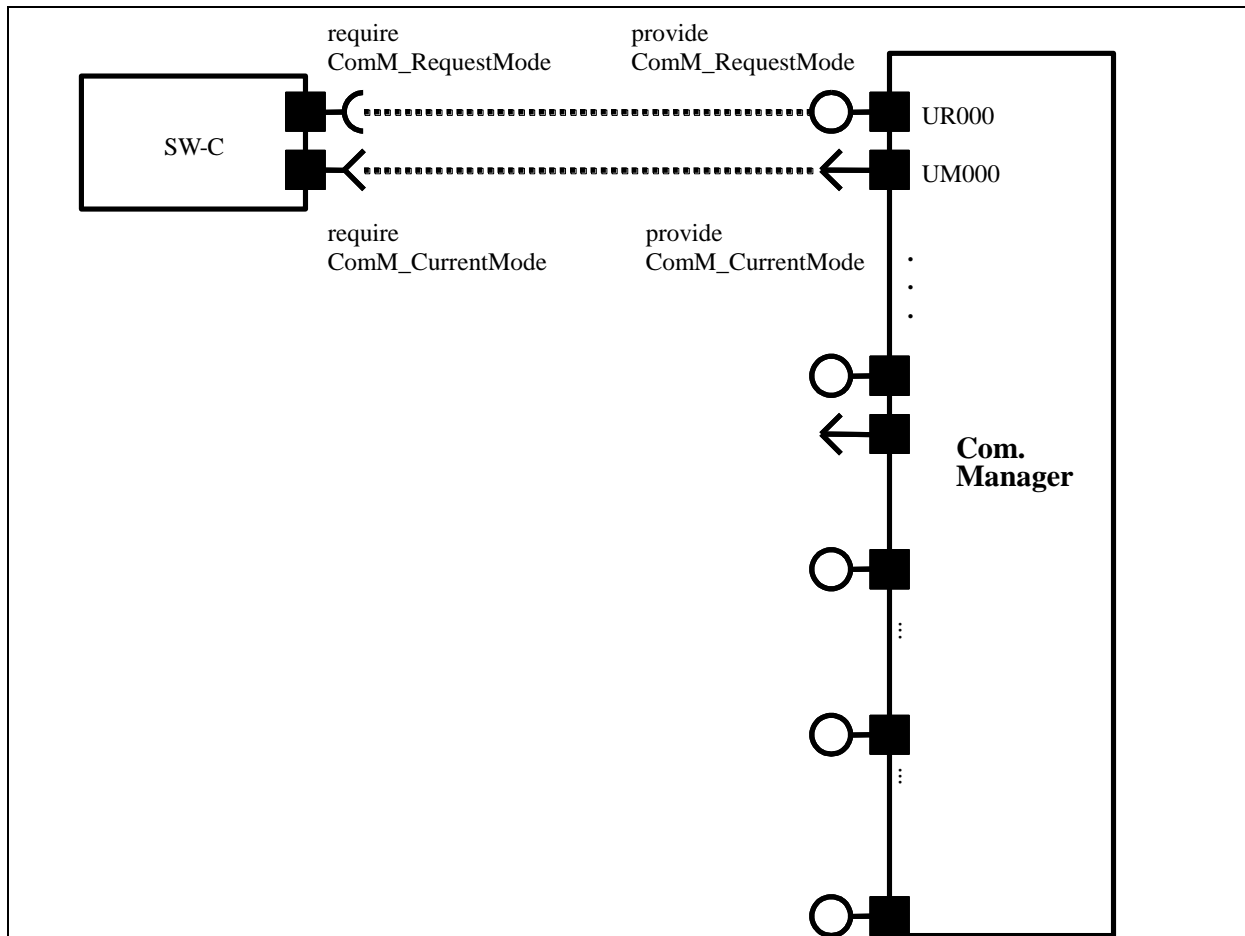


Figure 7: SW-C requires state changes within the Communication Manager Module and reads out current communication state

In this use case, the SW-C wants to explicitly take influence on the communication-state of the physical channels it needs. The SW-C indicates this by a specific port. Through this port, the SW-C can then request the Communication Manager Module mode “No Communication” or “Full Communication”. The Communication Manager Module will use these calls to request the corresponding communication mode from the corresponding Bus State Manager module.

[SWS_ComM_00848] [The Communication Manager Module shall provide an AUTOSAR port to allow the request of an communication mode by calling ‘ComM_RequestComMode’ (see [SWS_ComM_00110](#)).] ()

For a SW-C using the “direct API” of the RTE, the SW-C could for example do the following:

```
MySW-C_Runnable_Init(self)
{
    // SW-C wants to send and receive data
    e = Rte_Call_comRequest_RequestComMode(COMM_FULL_COMMUNICATION);
    if (e == RTE_E_OK)
    {
        // successfully requested the Com Manager Module to move to
```

```

        // full communication mode
    }
    else
    {
        // an error occurred when
        // interacting with the Com Manager module
        if (e == E_MODE_LIMITATION)
        {
            // a current ComMMode limitation forbids going into
            // that mode;
            // let's ask what the maximal allowed ComMMode is
            Rte_Call_comRequest_GetMaxComMode(&max);
            if (max==COMM_NO_COMMUNICATION)
            {
                ...
            };
        }
        else
        {
            // a more serious error occurred ...
        };
    };
    ...
};

MySW-C_Runnable_Loop(self)
{
    if (status == ready_to_sleep)
    {
        //no need to send; ready for shutdown communication
        Rte_Call_comRequest_RequestComMode(COMM_NO_COMMUNICATION);
        ...
    };
};

```

Comment: Note that these APIs do not require that the SW-C has knowledge of the channels that it needs.

7.10.2.4 SW-C wants to interact directly with physical channels activate ECU Mode Limitation

The SW-C shall request mode from BswM. BswM will handle the direct communication with ComM.

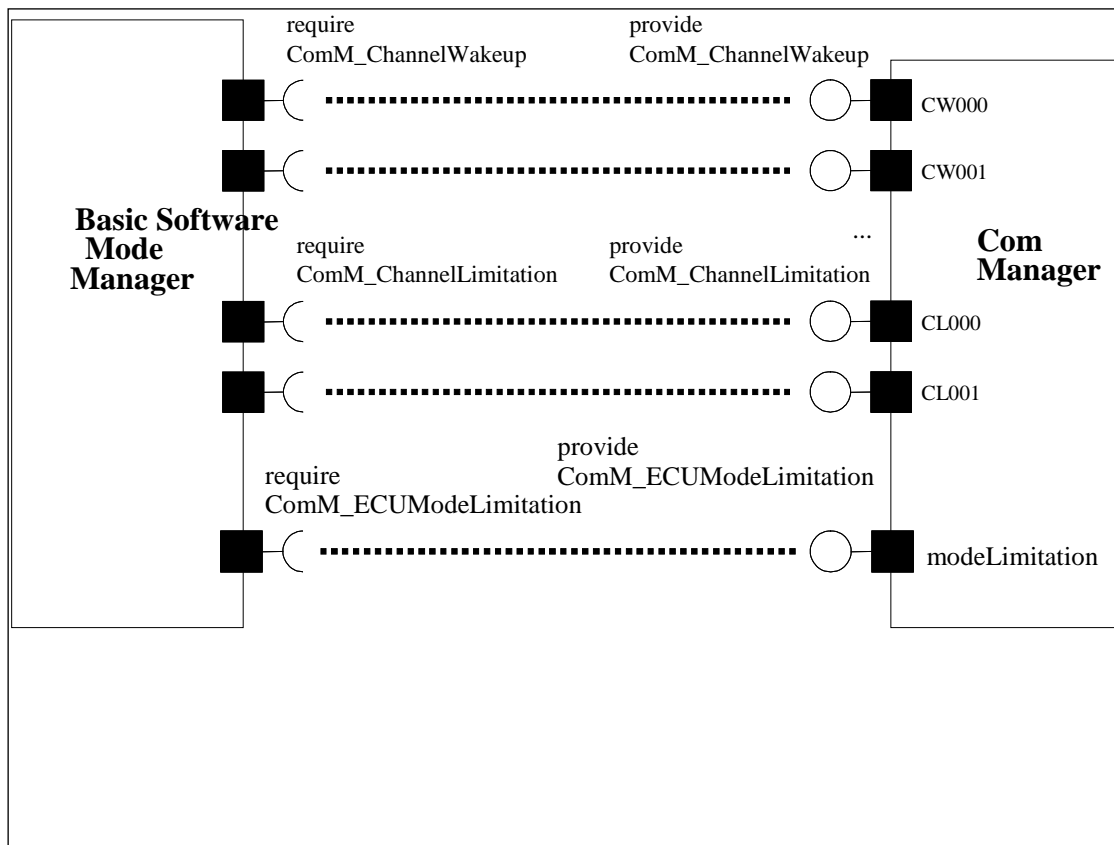


Figure 8: Interaction between BswM and the ComM module

7.10.3 Specification of Ports and Port Interfaces

This section specifies the Port Interfaces that are needed to operate the Communication Manager Module functionality over the RTE.

7.10.3.1 Types used by the interfaces

See 8.7.4 [Implementation Data Types](#).

7.10.3.2 Ports and Port Interface for User Requests

7.10.3.2.1 General Approach

A SW-C that wants to explicitly direct the local Communication Manager Module of the ECU towards a certain state requires the client-server interface `ComM_UserRequest`. Through this interface the SW-C can set the desired state of all communication channels that are relevant for that component, to “No Communication” or “Full Communication”. In order to keep the SW-Cs code independent from the values of the handles that are used to identify the user towards the Communication Manager Module, these handles are not passed from the SW-C to the Communication Manager Module. Rather they are modeled as “port defined argument values” of the Provide Ports on the Communication Manager Module’s side. As a consequence, these handles do not show up as arguments in the operations of the client-server interface `ComM_UserRequest`. As a further consequence of this approach, the Communication Manager Module has a separate port for each user.

7.10.3.2.2 Data Types

No data types are needed for this interface.

7.10.3.2.3 Port interface ComM_UserRequest

See 8.7.2.4 [ComM_UserRequest](#).

7.10.3.3 Ports and Port Interfaces for the current mode of the Communication Manager Module

7.10.3.3.1 General approach

[SWS_ComM_00847] [The Communication Manager Module shall have an AUTOSAR port providing the ModeSwitchInterface interface 'ComM_CurrentMode'.] ()

[SWS_ComM_00733] [The Communication Manager Module shall have a separate port providing the ModeSwitchInterface interface 'ComM_CurrentMode' for each configured user, to which a SW-C is connected.] ()

A SW-C that wants to get informed about its current Communication Manager Module Mode requires the ModeSwitchInterface interface ComM_CurrentMode.

7.10.3.3.2 Port interface ComM_CurrentMode

See 8.7.3.1 [ComM_CurrentMode](#).

7.10.3.4 Ports and Port Interfaces for the ComM users currently requesting FULL_COMM

7.10.3.4.1 General approach

[SWS_ComM_00734] [The Communication Manager Module shall have an optional (see **ECUC_ComM_00787**) separate port providing the sender-receiver interface 'ComM_CurrentChannelRequest' for each configured ComM channel.] ()

Rationale for SWS_ComM_00734: A SW-C that wants to get informed about, which users are currently requesting FULL_COMM requires the sender-receiver interface ComM_CurrentChannelRequest'.

[SWS_ComM_00736] [Whenever the set of ComM users currently requesting FULL_COMM for a channel changes, the Communication Manager Module shall update the data element `fullComRequestors`. A change shall update the data element only, when the Communication Manager Module accepts the communication request of the ComM user.] ()

Rationale for Com736: Requests rejected because of active ModeLimitations will not lead to an update of the data element.

7.10.3.4.2 Data Types

See 8.7.4.4 [ComM_UserHandleArrayType](#).

7.10.3.4.3 Port Interface ComM_CurrentChannelRequest

See 8.7.1.1 [ComM_CurrentChannelRequest](#).

7.10.3.5 Ports and Port Interface for ECU Mode Limitation

7.10.3.5.1 General approach

[SWS_ComM_00740] [The Communication Manager Module can be configured to have an AUTOSAR port providing the client-server interface ComM_ECUModeLimitation.] ()

A SW-C, which plays the role of a “Mode Manager”, can use this interface to change the behaviour of the entire ECU.

7.10.3.5.2 Port interface ComM_ECUModeLimitation

See 8.7.2.3 ComM_ECUModeLimitation.

7.10.3.6 Ports and Port Interface for Channel Wake up

7.10.3.6.1 General approach

[SWS_ComM_00747] [The Communication Manager Module can be configured to have an AUTOSAR port providing the Client-Server Interface ComM_ChannelWakeup.] ()

A SW-C playing the role of a “Mode Manager” can use this interface to configure the Communication Manager Module to take precautions against awaking other ECU's by starting the communication. In order to keep the SW-Cs code independent from the values of the handles that are used to identify a specific handle towards the Communication Manager Module, these handles are **not** passed from the SW-C to the Communication Manager Module. Rather they are modeled as “port defined argument values” of the Provide Ports on the Communication Manager Module's side. As a consequence, these handles do not show up as arguments in the operations of the client-server interface ComM_ChannelWakeup. As a further consequence of this approach, the Communication Manager Module has separate ports for each channel.

7.10.3.6.2 Port interface ComM_ChannelWakeup

See 8.7.2.2 ComM_ChannelWakeup.

7.10.3.7 Ports and Port Interface for interface Channel Limitation

7.10.3.7.1 General approach

[SWS_ComM_00752] [The Communication Manager Module can be configured to have an AUTOSAR port providing the Client-Server Interface ComM_ChannelLimitation.] ()

A SW-C playing the role of a “Mode Manager” can use this interface to configure the Communication Manager Module to inhibit communication mode for a given channel. In order to keep the SW-Cs code independent from the values of the handles that are used to identify a specific handle towards the Communication Manager Module, these handles are **not** passed from the SW-C to the Communication Manager Module. Rather they are modelled as “port defined argument values” of the Provide Ports on the Communication Manager Module side. As a consequence, these handles do not show up as arguments in the operations of the client-server interface ComM_ChannelLimitation. As a further consequence of this approach, the Communication Manager Module has separate ports for each channel.

7.10.3.7.2 Port interface ComM_ChannelLimitation

See 8.7.2.1 ComM_ChannelLimitation.

7.10.3.8 Definition of the Service of the Communication Manager Module

This section provides guidance on the definition of the Communication Manager Module service. There are ports on both sides of the RTE. This description of the Communication Manager Module service defines the ports below the RTE. Each SW-C, which uses the Service, must contain “service ports” in its own SW-C description which will be connected to the ports of the COM Manager module, so that the RTE can be generated.

Comment: Note that these definitions can only be completed during ECU configuration (because it depends on certain configuration parameters of the Communication Manager Module, which determine the number of ports provided by the Communication Manager Module service). Also note that the implementation of an SW-C does *not* depend on these definitions.

[SWS_ComM_00744]

```
[
/* This is the definition of the Communication Manager Module as a service.
This is the 'outside-view' of the Communication Manager Module */
Service ComM
{
    // port present if ComMModeLimitationEnabled (see ECUC ComM 00560)
    ProvidePort ComM_ECUModeLimitation modeLimitation;

    // port present for each channel
    // if ComMModeLimitationEnabled (see ECUC ComM 00560);
    // there are NC channels;
    ProvidePort ComM_ChannelLimitation CL000;
    ...
    ProvidePort ComM_ChannelLimitation CL<NC-1>;

    // port present for each channel
    // if COMM_WAKEUP_INHIBITION_ENABLED (see ECUC ComM 00559)
    ProvidePort ComM_ChannelWakeup CW000;
    ...
    ProvidePort ComM_ChannelWakeup CW<NC-1>;

    // For each user the Communication Manager Module provides 2 ports.
    // To facilitate configuration, the index of this user shall
    // correspond to the index in the array COMM_USER_LIST used for the
    // configuration of the Communication Manager Module (see ComM562).
    // The number of users must correspond to the size of this array.
    ProvidePort ComM_UserRequest UR000;    // (see 7.10.3.2.2)
    ProvidePort ComM_CurrentMode UM000;
    ProvidePort ComM_UserRequest UR001;    //(see 7.10.3.2.2)
    ProvidePort ComM_CurrentMode UM001;
    ...
    ProvidePort ComM_UserRequest UR<COMM_USER_LIST.size-1>;
    ProvidePort ComM_CurrentMode UM<COMM_USER_LIST.size-1>;

    // port present for each channel if configured
    // (see ECUC_ComM_00787)
    // there are NC channels;
    ProvidePort ComM_CurrentChannelRequest CR000;
    ...
    ProvidePort ComM_CurrentChannelRequest CR<NC-1>;
}; ] ()
```

7.10.4 Runnables and Entry points

7.10.4.1 Internal behaviour

This is the inside description of the Communication Manager Module. This detailed description is only needed for the configuration of the local RTE.

[SWS_ComM_00745]

```
[
InternalBehavior of the Communication Manager Module
{
    // Runnable entities of the Communication Manager Module
    RunnableEntity LimitECUToNoComMode
        symbol "ComM_LimitECUToNoComMode" /* see SWS ComM 00124 */
        canbeInvokedConcurrently = FALSE

    RunnableEntity ReadInhibitCounter
        symbol "ComM_ReadInhibitCounter" /* see SWS ComM 00224 */
        canbeInvokedConcurrently = FALSE

    RunnableEntity ResetInhibitCounter
        symbol "ComM_ResetInhibitCounter" /* see SWS ComM 00108 */
        canbeInvokedConcurrently = FALSE

    RunnableEntity SetECUGroupClassification
        symbol "ComM_SetECUGroupClassification" /* see SWS ComM 00552 */
        canbeInvokedConcurrently = FALSE

    RunnableEntity LimitChannelToNoComMode
        symbol "ComM_LimitChannelToNoComMode" /* see SWS ComM 00163 */
        canbeInvokedConcurrently = FALSE

    RunnableEntity GetInhibitionStatus
        symbol "ComM_GetInhibitionStatus" /*see SWS ComM 00619 */
        canbeInvokedConcurrently = FALSE

    RunnableEntity PreventWakeup
        symbol "ComM_PreventWakeup"
        canbeInvokedConcurrently = FALSE

    RunnableEntity RequestComMode
        symbol "ComM_RequestComMode" /* see SWS ComM 00110 */
        canbeInvokedConcurrently = TRUE

    RunnableEntity GetMaxComMode
        symbol "ComM_GetMaxComMode" /* see SWS ComM 00085 */
        canbeInvokedConcurrently = TRUE

    RunnableEntity GetRequestedComMode
        symbol "ComM_GetRequestedComMode"
        canbeInvokedConcurrently = TRUE

    RunnableEntity GetCurrentComMode
        symbol "ComM_GetCurrentComMode" /*see SWS ComM 00083 */
        canbeInvokedConcurrently = TRUE

    // the following applies if ComMModeLimitationEnabled
    // (see ECUC ComM 00560)
    modeLimitation.LimitECUToNoComMode -> LimitECUToNoComMode
    modeLimitation.ReadInhibitCounter -> ReadInhibitCounter
    modeLimitation.ResetInhibitCounter -> ResetInhibitCounter
    modeLimitation.SetECUGroupClassification -> SetECUGroupClassification

    // per-channel behaviour only present
    // if ComMModeLimitationEnabled (see ECUC ComM 00560)
    // there are NC channels
    // To facilitate configuration, the names of the channels correspond
    // to the index of the channel in the "Channel" container used to
    // configure the Communication Manager Module
}
```



```

CL000.LimitChannelToNoComMode -> LimitChannelToNoComMode
CL000.GetInhibitionStatus -> GetInhibitionStatus
PortArgument {port=CL000,
               value.type=NetworkHandleType,
               value.value=Channel[0].COMM_CHANNEL_ID}
...
CLnnn.LimitChannelToNoComMode -> LimitChannelToNoComMode
CLnnn.GetInhibitionStatus -> GetInhibitionStatus
PortArgument {port=CLnnn,
               value.type=NetworkHandleType,
               value.value=Channel[nnn].COMM_CHANNEL_ID}

// per-channel behaviour only present
// if COMM_WAKEUP_INHIBITION_ENABLED (see ECUC ComM 00559)
CW000.preventWakeUp -> PreventWakeUp
PortArgument {port=CW000,
               value.type=NetworkHandleType,
               value.value=Channel[0].COMM_CHANNEL_ID}
...
CWnnn.preventWakeUp -> PreventWakeUp
PortArgument {port=CWnnn,
               value.type=NetworkHandleType,
               value.value=Channel[nnn].COMM_CHANNEL_ID}

// per-user behaviour
// Note that the port-argument value must be consistent with the
// value in the configuration COMM_USER_LIST
// Note that the exact data-type of the UserHandleType must of course
// be defined BEFORE RTE_configuration, but does NOT affect the
// API seen by the SW-Cs that use the service
UR000.RequestComMode -> RequestComMode
UR000.GetMaxComMode -> GetMaxComMode
UR000.GetRequestedComMode -> GetRequestedComMode
UR000.GetCurrentComMode -> GetCurrentComMode
PortArgument {port=UR000,
               value.type= ComM_UserhandleType,
               value.value=COMM_USER_LIST[0]}
...
URnnn.RequestComMode -> RequestComMode
URnnn.GetMaxComMode -> GetMaxComMode
URnnn.GetRequestedComMode -> GetRequestedComMode
URnnn.GetCurrentComMode -> GetCurrentComMode
PortArgument {port=URnnn,
               value.type= ComM_UserhandleType,
               value.value=COMM_USER_LIST[n]}
};] ()

```

Comment: 'modeLimitation.LimitECUToNoComMode -> LimitECUToNoComMode' is supposed to define an OperationInvokedEvent that links the OperationPrototype to the runnable entity that is supposed to be executed.

7.10.4.2 Header file to be included by the Communication Manager Module

The RTE deals with the Communication Manager Module as with any normal SW-C. The RTE will be able to generate a header-file based on the internal-behaviour description of the Communication Manager Module which contains for instance a definition of the API's (like `Rte_Ports_CurrentMode_P`) which are available to the Communication Manager Module. This implies that an implementation of the Communication Manager Module must include this generated header-file.

8 API specification

8.1 Imported types

8.1.1 Standard types

In this chapter all types included from the following files are listed:

[SWS_ComM_00820] [

| Header file | Imported Type |
|------------------|---------------------|
| Std_Types.h | Std_VersionInfoType |
| | Std_ReturnType |
| ComStack_Types.h | NetworkHandleType |
| | PNCHandleType |
| NvM_Types.h | NvM_BlockIdType |

] (SRS_BSW_00348, SRS_BSW_00357)

[SWS_ComM_00649] [The Std_ReturnType shall be extended with the following #define values:

| #define | Value | Description |
|------------------------|-------|---------------------------------------------------------------------------------------------|
| COMM_E_MODE_LIMITATION | 0x02 | Function call has been successfully but mode can not be granted because of mode inhibition. |

] (SRS_BSW_00331, SRS_BSW_00369, SRS_BSW_00377, SRS_BSW_00441)

8.2 Type definitions

[SWS_ComM_00863] [The following Data Types shall be used for the functions defined in this Specification.] (SRS_BSW_00441)

8.2.1 ComM_InitStatusType

[SWS_ComM_00668][

| | | |
|---------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Name: | ComM_InitStatusType | |
| Type: | Enumeration | |
| Range: | COMM_UNINIT | The COM Manager is not initialized or not usable. This shall be the default value after reset. This status shall have the value 0. |
| | COMM_INIT | The COM Manager is initialized and usable. |
| Description: | Initialization status of ComM. | |

] ()

8.2.2 ComM_InhibitionStatusType

[SWS_ComM_00669][

| | | | |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------|
| Name: | ComM_InhibitionStatusType | | |
| Type: | uint8 | | |
| Range: | WakeupInhibitionActive | 0x01 | Bit 0 (LSB): Wake Up inhibition active |
| | LimitedToNoCom | 0x02 | Bit 1: Limit to COMM_NO_COMMUNICATION mode |
| Description: | <p>Defines whether a mode inhibition is active or not.</p> <p>Inhibition status of ComM.</p> <p>e.g. status=00000011 -> Wake up inhibition and limitation to COMM_NO_COMMUNICATION mode active</p> | | |

] ()

8.2.3 ComM_UserHandleType

[SWS_ComM_00670]

| | | | |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Name: | ComM_UserHandleType | | |
| Type: | uint8 | | |
| Description: | <p>Handle to identify a user.</p> <p>For each user, a unique value must be defined at system generation time.</p> <p>Maximum number of users is 255. Legal user IDs are in the range 0 .. 254; user ID 255 is reserved and shall have the symbolic representation COMM_NOT_USED_USER_ID.</p> | | |

] ()

Comment: This handle has local scope for only one ECU.

8.2.4 ComM_ModeType

[SWS_ComM_00672]

| | | | |
|---------------------|------------------------------------------------------------------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------|
| Name: | ComM_ModeType | | |
| Type: | uint8 | | |
| Range: | COMM_NO_COMMUNICATION | 0 | ComM state machine is in "No Communication" mode. Configured channel shall have no transmission or reception capability. |
| | COMM_SILENT_COMMUNICATION | 1 | ComM state machine is in "Silent Communication" mode. Configured channel shall have only reception capability, no transmission capability. |
| | COMM_FULL_COMMUNICATION | 2 | ComM state machine is in "Full Communication" mode. Configured channel shall have both transmission and reception capability. |
| Description: | Current mode of the Communication Manager (main state of the state machine). | | |

] ()

8.2.5 ComM_PncModeType

[SWS_ComM_00673]

| | | | |
|---------------|--------------------|---------------------------------------|--|
| Name: | ComM_PncModeType | | |
| Type: | Enumeration | | |
| Range: | COMM_PNC_REQUESTED | PNC is requested by a local ComM user | |

| | | |
|---------------------|---------------------------|-------------------------------------------|
| | COMM_PNC_READY_SLEEP | PNC is requested by a remote ComM user |
| | COMM_PNC_PREPARE_SLEEP | PNC is active with no deadline monitoring |
| | COMM_PNC_NO_COMMUNICATION | PNC does not communicate |
| Description: | Current mode of a PNC | |

| ()

8.2.6 ComM_StateType

[SWS_ComM_00674]

| | | | |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|
| Name: | ComM_StateType | | |
| Type: | uint8 | | |
| Range: | COMM_NO_COM_NO_PENDING_REQUEST | 0 | -- |
| | COMM_NO_COM_REQUEST_PENDING | 1 | -- |
| | COMM_FULL_COM_NETWORK_REQUESTED | 2 | -- |
| | COMM_FULL_COM_READY_SLEEP | 3 | -- |
| | COMM_SILENT_COM | 4 | -- |
| Description: | State and sub-state of ComM state machine ComM states vs. Communication Modes: COMM_NO_COM* : Communication Mode='No Communication' COMM_FULL_COM*: Communication Mode='Full Communication' COMM_SILENT_COM: Communicatio Mode='Silent Communication' | | |

| ()

8.2.7 ComM_ConfigType

[SWS_ComM_00162]

| | | |
|---------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Name: | ComM_ConfigType | |
| Type: | Structure | |
| Range: | implementation specific | The contents of the initialization data structure are implementation specific |
| Description: | This type contains the implementation-specific post build configuration structure. | |

| ()

8.3 Function definitions

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

8.3.1 ComM_Init

[SWS_ComM_00146]

| | |
|-------------------------|-------------------------------------------------------------------|
| Service name: | ComM_Init |
| Syntax: | <pre>void ComM_Init(const ComM_ConfigType* ConfigPtr)</pre> |
| Service ID[hex]: | 0x01 |
| Sync/Async: | Synchronous |

| | |
|----------------------------|-----------------------------------------------------------------------------------------|
| Reentrancy: | Non Reentrant |
| Parameters (in): | ConfigPtr Pointer to post-build configuration data |
| Parameters (inout): | None |
| Parameters (out): | None |
| Return value: | None |
| Description: | Initializes the AUTOSAR Communication Manager and restarts the internal state machines. |

] (SRS_BSW_00101, SRS_BSW_00358, SRS_BSW_00414)

[SWS_ComM_00793] | Caveats of `ComM_Init()`: The NVRAM Manager module has to be initialized to have the possibility to "direct" access the ComM module's parameters.] ()

[SWS_ComM_00864] | In `ComM_Init()` ComM shall read non-volatile parameters specified in [SWS_ComM_00103](#) from NVRAM. If no parameters are available, ComM shall use the default values in the ComM configuration.] ()

8.3.2 ComM_DeInit

[SWS_ComM_00147]

| | |
|----------------------------|------------------------------------------------------------|
| Service name: | ComM_DeInit |
| Syntax: | <pre>void ComM_DeInit(void)</pre> |
| Service ID[hex]: | 0x02 |
| Sync/Async: | Synchronous |
| Reentrancy: | Non Reentrant |
| Parameters (in): | None |
| Parameters (inout): | None |
| Parameters (out): | None |
| Return value: | None |
| Description: | This API de-initializes the AUTOSAR Communication Manager. |

] (SRS_BSW_00336)

[SWS_ComM_00794] | De-initialization in `ComM_DeInit()` shall only be performed if all channels controlled by the ComM module are in `COMM_NO_COMMUNICATION` mode.

Rationale for [SWS_ComM_00794](#): Since the `ComM_DeInit()` API cannot return an error message, it must be assured that all channels are in `COMM_NO_COMMUNICATION` mode and `COMM_NO_COM_NO_PENDING_REQUEST` sub-state before `ComM_DeInit()` is called. E.g. the state should be checked with `ComM_GetState(Channel, ...)` and `ComM_CommunicationAllowed(Channel, TRUE)` cannot be called before `ComM_DeInit()` has been called.] ()

[SWS_ComM_00865] [In ComM_DeInit ComM shall store non-volatile parameters specified in [SWS_ComM_00103](#) to NVRAM.] ()

8.3.3 ComM_GetState

[SWS_ComM_00872]

| | | |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_GetState | |
| Syntax: | <pre>Std_ReturnType ComM_GetState(NetworkHandleType Channel, ComM_StateType* State)</pre> | |
| Service ID[hex]: | 0x34 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | Channel | The Network Channel for the requested state of ComM state machine. |
| Parameters (inout): | None | |
| Parameters (out): | State | State of the ComM channel state machine: COMM_NO_COM_NO_PENDING_REQUEST COMM_NO_COM_REQUEST_PENDING COMM_FULL_COM_NETWORK_REQUESTED COMM_FULL_COM_READY_SLEEP COMM_SILENT_COM |
| Return value: | Std_ReturnType | E_OK: Successfully return current state of ComM state machine E_NOT_OK: Return of current state of ComM state machine failed |
| Description: | Return current state, including sub-state, of the ComM channel state machine. Usage of function only valid if EcuM/Fixed is used: To leave RUN: state/sub-state need to be COMM_NO_COM_NO_PENDING_REQUEST (No communication and no pending request to start communication) In POST RUN to return to RUN: state/sub-state need to be in COMM_NO_COM_REQUEST_PENDING (No communication, but a pending request to start communication) If EcuM/Flex and BswM is used, BswM instead use received mode indications from ComM (BswM_ComM_RequestedMode(..)). | |

] ()

8.3.4 ComM_GetStatus

[SWS_ComM_00242]

| | | |
|----------------------|-----------------------------------------------------------------------------|--|
| Service name: | ComM_GetStatus | |
| Syntax: | <pre>Std_ReturnType ComM_GetStatus(ComM_InitStatusType* Status)</pre> | |

| | | |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| |) | |
| Service ID[hex]: | 0x03 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | None | |
| Parameters (inout): | None | |
| Parameters (out): | Status | COMM_UNINIT: The ComM is not initialized or not usable. Default value after startup or after ComM_Delnit() is called. COMM_INIT: The ComM is initialized and usable. |
| Return value: | Std_ReturnType | E_OK: Successfully return of initialization status E_NOT_OK: Return of initialization status failed |
| Description: | Returns the initialization status of the AUTOSAR Communication Manager. After a call to ComM_Delnit() ComM should have status COMM_UNINIT, and a new call to ComM_Init needed to make sure ComM restart internal state machines to default values. | |

] (SRS_BSW_00406)

8.3.5 ComM_GetInhibitionStatus

[SWS_ComM_00619]

| | | |
|----------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Service name: | ComM_GetInhibitionStatus | |
| Syntax: | Std_ReturnType ComM_GetInhibitionStatus(NetworkHandleType Channel, ComM_InhibitionStatusType* Status) | |
| Service ID[hex]: | 0x04 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | Channel | See NetworkHandleType |
| Parameters (inout): | None | |
| Parameters (out): | Status | See ComM_InhibitionStatusType |
| Return value: | Std_ReturnType | E_OK: Successfully returned Inhibition Status E_NOT_OK: Return of Inhibition Status failed |
| Description: | Returns the inhibition status of a ComM channel. | |

] ()

8.3.6 ComM_RequestComMode

[SWS_ComM_00110]

| | | |
|-------------------------|------------------------------------------------------------------------------------------------|----------------------------------------|
| Service name: | ComM_RequestComMode | |
| Syntax: | Std_ReturnType ComM_RequestComMode(ComM_UserHandleType User, ComM_ModeType ComMode) | |
| Service ID[hex]: | 0x05 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | User | Handle of the user who requests a mode |

| | | |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | ComMode | COMM_FULL_COMMUNICATION COMM_NO_COMMUNICATION |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | Std_ReturnType | E_OK: Successfully changed to the new mode E_NOT_OK: Changing to the new mode failed COMM_E_MODE_LIMITATION: Mode can not be granted because of mode inhibition. |
| Description: | Requesting of a Communication Mode by a user. Note: Internally mode COMM_SILENT_COMMUNICATION is not a valid request for a user, mode used for synchronization at shutdown. Valid modes are COMM_NO_COMMUNICATION and COMM_FULL_COMMUNICATION | |

] (SRS_ModeMgm_09081)

[SWS_ComM_00795] | Configuration of ComM_RequestComMode: Relationship between users and channels. A user is statically mapped to one or more channels.] ()

8.3.7 ComM_GetMaxComMode

[SWS_ComM_00085]

| | | |
|----------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_GetMaxComMode | |
| Syntax: | <pre>Std_ReturnType ComM_GetMaxComMode(ComM_UserHandleType User, ComM_ModeType* ComMode)</pre> | |
| Service ID[hex]: | 0x06 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | User | Handle of the user who requests a mode |
| Parameters (inout): | None | |
| Parameters (out): | ComMode | See ComM_ModeType |
| Return value: | Std_ReturnType | E_OK: Successfully returned maximum allowed Communication Mode E_NOT_OK: Return of maximum allowed Communication Mode failed |
| Description: | Function to query the maximum allowed Communication Mode of the corresponding user. | |

] ()

Use Case: This function provides the possibility to request the maximum possible mode (e.g. user wants to check if it is possible to get "Full Communication" mode or if a limitation/inhibition is active). This is needed for diagnosis/debugging..

[SWS_ComM_00374] [If more than one channel is linked to one user request and the maximum allowed modes of the channels are different, then the function ComM_GetMaxComMode shall return the lowest mode (see [SWS_ComM_00867](#) and [SWS_ComM_00868](#)).] ()

[SWS_ComM_00796] [Configuration of ComM_GetMaxComMode: Relationship between users and channels. A user is statically mapped to one or more channels.] ()

8.3.8 ComM_GetRequestedComMode

[SWS_ComM_00079]

| | | |
|----------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_GetRequestedComMode | |
| Syntax: | <pre>Std_ReturnType ComM_GetRequestedComMode(ComM_UserHandleType User, ComM_ModeType* ComMode)</pre> | |
| Service ID[hex]: | 0x07 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | User | Handle of the user who requests a mode |
| Parameters (inout): | None | |
| Parameters (out): | ComMode | Name of the requested mode |
| Return value: | Std_ReturnType | E_OK: Successfully returned requested Communication Mode E_NOT_OK: Return of requested Communication Mode failed |
| Description: | Function to query the currently requested Communication Mode of the corresponding user. | |

] (SRS_ModeMgm_09149)

Rationale for [SWS_ComM_00079](#): The requested user "Communication Mode" has to be stored volatile within the Communication Manager Module itself, to prevent redundant storage of status information by the users.

Comment: If the Communication Manager Module would not have this service every user has to store the status on its own --> redundant and possibly inconsistent storage of the same data.

ComM797: Configuration of ComM_GetRequestedComMode: Relationship between users and channels. A user is statically mapped to one or more channels.

8.3.9 ComM_GetCurrentComMode

[SWS_ComM_00083]

| | | |
|----------------------|--------------------------------------------------------------------------------------------------------------|--|
| Service name: | ComM_GetCurrentComMode | |
| Syntax: | <pre>Std_ReturnType ComM_GetCurrentComMode(ComM_UserHandleType User, ComM_ModeType* ComMode)</pre> | |

| | | |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Service ID[hex]: | 0x08 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | User | Handle of the user who requests a mode |
| Parameters (inout): | None | |
| Parameters (out): | ComMode | See ComM_ModeType |
| Return value: | Std_ReturnType | E_OK: Successfully returned Communication Mode from Bus State Manager E_NOT_OK: Return of Communication Mode from Bus State Manager failed |
| Description: | Function to query the current Communication Mode. ComM shall use the corresponding interfaces of the Bus State Managers to get the current Communication Mode of the network. (Call to Bus State Manager API: XXXSM_GetCurrentComMode(...)) | |

] (SRS_ModeMgm_09084)

[SWS_ComM_00176] | If more than one channel is linked to one user request and the modes of the channels are different, the function ComM_GetCurrentComMode shall return the lowest mode (see [SWS_ComM_00867](#) and [SWS_ComM_00868](#)).] (SRS_ModeMgm_09172)

[SWS_ComM_00798] | Configuration of ComM_GetCurrentComMode: Relationship between users and channels. A user is statically mapped to one or more channels.] ()

8.3.10 ComM_PreventWakeUp

[SWS_ComM_00156]

| | | |
|----------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_PreventWakeUp | |
| Syntax: | Std_ReturnType ComM_PreventWakeUp(NetworkHandleType Channel, boolean Status) | |
| Service ID[hex]: | 0x09 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | Channel | See NetworkHandleType |
| | Status | FALSE: Wake up inhibition is switched off TRUE: Wake up inhibition is switched on |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | Std_ReturnType | E_OK: Successfully changed wake up status for the channel E_NOT_OK: Changed of wake up status for the channel failed |
| Description: | Changes the inhibition status COMM_NO_WAKEUP for the corresponding channel. | |

] (SRS_ModeMgm_09157)

[SWS_ComM_00799] | Configuration of ComM_PreventWakeUp: Configurable with COMM_WAKEUP_INHIBITION_ENABLED (see [ECUC_ComM_00559](#)).] ()

8.3.11 ComM_LimitChannelToNoComMode

[SWS_ComM_00163]

| | | |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_LimitChannelToNoComMode | |
| Syntax: | <pre>Std_ReturnType ComM_LimitChannelToNoComMode (NetworkHandleType Channel, boolean Status)</pre> | |
| Service ID[hex]: | 0x0b | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | Channel | See NetworkHandleType |
| | Status | FALSE: Limit channel to COMM_NO_COMMUNICATION disabled TRUE: Limit channel to COMM_NO_COMMUNICATION enabled |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | Std_ReturnType | E_OK: Successfully changed inhibition status for the channel E_NOT_OK: Changed of inhibition status for the channel failed |
| Description: | Changes the inhibition status for the channel for changing from COMM_NO_COMMUNICATION to a higher Communication Mode. (See also ComM_LimitECUToNoComMode, same functionality but for all channels) | |

] (SRS_ModeMgm_09157)

[SWS_ComM_00800] | Configuration of ComM_LimitChannelToNoComMode: Configurable with ComMMModeLimitationEnabled (see [ECUC_ComM_00560](#)) and COMM_RESET_AFTER_FORCING_NO_COMM (see [ComM558 Conf](#)).] ()

8.3.12 ComM_LimitECUToNoComMode

[SWS_ComM_00124]

| | | |
|----------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Service name: | ComM_LimitECUToNoComMode | |
| Syntax: | <pre>Std_ReturnType ComM_LimitECUToNoComMode (boolean Status)</pre> | |
| Service ID[hex]: | 0x0c | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | Status | FALSE: Limit ECU to COMM_NO_COMMUNICATION disabled TRUE: Limit ECU to COMM_NO_COMMUNICATION enabled |
| | | |
| Parameters (inout): | None | |

| | | |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Parameters (out): | None | |
| Return value: | Std_ReturnType | E_OK: Successfully changed inhibition status for the ECU E_NOT_OK: Changed of inhibition status for the ECU failed |
| Description: | Changes the inhibition status for the ECU (=all channels) for changing from COMM_NO_COMMUNICATION to a higher Communication Mode. (See also ComM_LimitChannelToNoComMode, same functionality but for a specific channels) | |

] (SRS_ModeMgm_09157)

[SWS_ComM_00801] | Configuration of ComM_LimitECUToNoComMode: Configurable with ComMModeLimitationEnabled (see [ECUC_ComM_00560](#)) and COMM_RESET_AFTER_FORCING_NO_COMM (see [ComM558_Conf](#)).] ()

8.3.13 ComM_ReadInhibitCounter

[SWS_ComM_00224]

| | | |
|----------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Service name: | ComM_ReadInhibitCounter | |
| Syntax: | Std_ReturnType ComM_ReadInhibitCounter(uint16* CounterValue) | |
| Service ID[hex]: | 0x0d | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | None | |
| Parameters (inout): | None | |
| Parameters (out): | CounterValue | Amount of rejected COMM_FULL_COMMUNICATION user requests. |
| Return value: | Std_ReturnType | E_OK: Successfully returned Inhibition Counter E_NOT_OK: Return of Inhibition Counter failed |
| Description: | This function returns the amount of rejected COMM_FULL_COMMUNICATION user requests. | |

] (SRS_ModeMgm_09156)

[SWS_ComM_00802] | Configuration of ComM_ReadInhibitCounter: Configurable with ComMModeLimitationEnabled (see [ECUC_ComM_00560](#)). Function will only be available if ComMModeLimitationEnabled (see [ECUC_ComM_00560](#)) is enabled and ComMGlobalNvMBlockDescriptor is configured.] ()

8.3.14 ComM_ResetInhibitCounter

[SWS_ComM_00108]

| | | |
|-------------------------|-------------------------------------------------------|--|
| Service name: | ComM_ResetInhibitCounter | |
| Syntax: | Std_ReturnType ComM_ResetInhibitCounter(void) | |
| Service ID[hex]: | 0x0e | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | None | |

| | | |
|----------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | Std_ReturnType | E_OK: Successfully reset of Inhibit COMM_FULL_COMMUNICATION Counter E_NOT_OK: Reset of Inhibit COMM_FULL_COMMUNICATION Counter failed |
| Description: | This function resets the Inhibited COMM_FULL_COMMUNICATION request Counter. | |

] (SRS_ModeMgm_09156)

[SWS_ComM_00803] [Configuration of ComM_ResetInhibitCounter: Configurable with ComMModeLimitationEnabled (see [ECUC_ComM_00560](#)). Function will only be available if ComMModeLimitationEnabled (see [ECUC_ComM_00560](#)) is enabled and ComMGlobalNvMBlockDescriptor is configured.] ()

8.3.15 ComM_SetECUGroupClassification

[SWS_ComM_00552]

| | | |
|----------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_SetECUGroupClassification | |
| Syntax: | Std_ReturnType ComM_SetECUGroupClassification(ComM_InhibitionStatusType Status) | |
| Service ID[hex]: | 0x0f | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | Status | See ComM_InhibitionStatusType |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | Std_ReturnType | E_OK: Successfully change the ECU Group Classification Status E_NOT_OK: Change of the ECU Group Classification Status failed |
| Description: | Changes the ECU Group Classification status (see chapter 10.2.2) | |

] ()

8.3.16 ComM_GetVersionInfo

[SWS_ComM_00370]

| | | |
|----------------------------|--------------------------------------------------------------------|-------------------------|
| Service name: | ComM_GetVersionInfo | |
| Syntax: | void ComM_GetVersionInfo(Std_VersionInfoType* Versioninfo) | |
| Service ID[hex]: | 0x10 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | None | |
| Parameters (inout): | None | |
| Parameters (out): | Versioninfo | See Std_VersionInfoType |

| | |
|----------------------|-----------------------------------------------------------------------------------|
| Return value: | None |
| Description: | This function returns the published information (for details refer to table 10.3) |

] (SRS_BSW_00407)

8.4 Callback notifications

This is a list of functions provided for other modules. The function prototypes of the callback functions shall be provided in the header files `ComM_Nm.h`, `ComM_EcuMBswM.h`, `ComM_Dcm.h`, `ComM_BusSM.h` and `ComM_Com.h`.

[SWS_ComM_00620] [All the provided indication functions shall be implemented pre-compile time.] (SRS_BSW_00387)

8.4.1 AUTOSAR Network Management Interface

8.4.1.1 ComM_Nm_NetworkStartIndication

[SWS_ComM_00383]

| | | |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Service name: | ComM_Nm_NetworkStartIndication | |
| Syntax: | <pre>void ComM_Nm_NetworkStartIndication(NetworkHandleType Channel)</pre> | |
| Service ID[hex]: | 0x15 | |
| Sync/Async: | Asynchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | Channel | See NetworkHandleType |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | None | |
| Description: | Indication that a NM-message has been received in the Bus Sleep Mode, what indicates that some nodes in the network have already entered the Network Mode. | |

] ()

[SWS_ComM_00805] [Caveats of `ComM_Nm_NetworkStartIndication`: The ComM module is initialized correctly.] ()

8.4.1.2 ComM_Nm_NetworkMode

[SWS_ComM_00390]

| | |
|----------------------------|--------------------------------------------------------------------|
| Service name: | ComM_Nm_NetworkMode |
| Syntax: | void ComM_Nm_NetworkMode(NetworkHandleType Channel) |
| Service ID[hex]: | 0x18 |
| Sync/Async: | Asynchronous |
| Reentrancy: | Reentrant |
| Parameters (in): | Channel Channel |
| Parameters (inout): | None |
| Parameters (out): | None |
| Return value: | None |
| Description: | Notification that the network management has entered Network Mode. |

] ()

[SWS_ComM_00806] [Caveats of ComM_Nm_NetworkMode: The Communication Manager Module is initialized correctly.] ()

8.4.1.3 ComM_Nm_PrepareBusSleepMode

[SWS_ComM_00391]

| | |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_Nm_PrepareBusSleepMode |
| Syntax: | void ComM_Nm_PrepareBusSleepMode(NetworkHandleType Channel) |
| Service ID[hex]: | 0x19 |
| Sync/Async: | Asynchronous |
| Reentrancy: | Reentrant |
| Parameters (in): | Channel Channel |
| Parameters (inout): | None |
| Parameters (out): | None |
| Return value: | None |
| Description: | Notification that the network management has entered Prepare Bus-Sleep Mode. Reentrancy: Reentrant (but not for the same NM-Channel) |

] ()

[SWS_ComM_00808] [Caveats of ComM_Nm_PrepareBusSleepMode: The Communication Manager Module is initialized correctly.] ()

8.4.1.4 ComM_Nm_BusSleepMode

[SWS_ComM_00392]

| | |
|-------------------------|--------------------------------------------------------------|
| Service name: | ComM_Nm_BusSleepMode |
| Syntax: | void ComM_Nm_BusSleepMode(NetworkHandleType Channel) |
| Service ID[hex]: | 0x1a |

| | | |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Sync/Async: | Asynchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | Channel | Channel |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | None | |
| Description: | Notification that the network management has entered Bus-Sleep Mode. This callback function should perform a transition of the hardware and transceiver to bus-sleep mode. | |

] ()

[SWS_ComM_00810] [Caveats of ComM_Nm_BusSleepMode: The Communication Manager Module is initialized correctly.] ()

8.4.1.5 ComM_Nm_RestartIndication

[SWS_ComM_00792]

| | | |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Service name: | ComM_Nm_RestartIndication | |
| Syntax: | void ComM_Nm_RestartIndication(NetworkHandleType Channel) | |
| Service ID[hex]: | 0x1b | |
| Sync/Async: | Asynchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | Channel | Channel |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | None | |
| Description: | If NmIf has started to shut down the coordinated busses, AND not all coordinated busses have indicated bus sleep state, AND on at least on one of the coordinated busses NM is restarted, THEN the NM Interface shall call the callback function ComM_Nm_RestartIndication with the nmNetworkHandle of the channels which have already indicated bus sleep state. | |

] ()

[SWS_ComM_00812] [Caveats of ComM_Nm_RestartIndication: The ComM module is initialized correctly.] ()

8.4.2 AUTOSAR Diagnostic Communication Manager Interface

8.4.2.1 ComM_DCM_ActiveDiagnostic

[SWS_ComM_00873]

| | |
|-------------------------|-------------------------------------------------------------------|
| Service name: | ComM_DCM_ActiveDiagnostic |
| Syntax: | void ComM_DCM_ActiveDiagnostic(NetworkHandleType Channel) |
| Service ID[hex]: | 0x1f |
| Sync/Async: | Synchronous |

| | |
|----------------------------|-------------------------------------------------------|
| Reentrancy: | Reentrant |
| Parameters (in): | Channel Channel needed for Diagnostic communication |
| Parameters (inout): | None |
| Parameters (out): | None |
| Return value: | None |
| Description: | Indication of active diagnostic by the DCM. |

] ()

8.4.2.2 ComM_DCM_InactiveDiagnostic

[SWS_ComM_00874]

[

| | |
|----------------------------|---------------------------------------------------------------------|
| Service name: | ComM_DCM_InactiveDiagnostic |
| Syntax: | void ComM_DCM_InactiveDiagnostic(NetworkHandleType Channel) |
| Service ID[hex]: | 0x20 |
| Sync/Async: | Synchronous |
| Reentrancy: | Reentrant |
| Parameters (in): | Channel Channel no longer needed for Diagnostic communication |
| Parameters (inout): | None |
| Parameters (out): | None |
| Return value: | None |
| Description: | Indication of inactive diagnostic by the DCM. |

] ()

8.4.3 AUTOSAR ECU State Manager Interface

8.4.3.1 ComM_EcuM_WakeUpIndication

[SWS_ComM_00275]

[

| | |
|----------------------------|--------------------------------------------------------------------|
| Service name: | ComM_EcuM_WakeUpIndication |
| Syntax: | void ComM_EcuM_WakeUpIndication(NetworkHandleType Channel) |
| Service ID[hex]: | 0x2a |
| Sync/Async: | Synchronous |
| Reentrancy: | Reentrant |
| Parameters (in): | Channel Channel |
| Parameters (inout): | None |
| Parameters (out): | None |
| Return value: | None |
| Description: | Notification of a wake up on the corresponding channel. |

] ()

[SWS_ComM_00814] [Caveats of ComM_EcuM_WakeUpIndication: The Communication Manager Module is initialized correctly.] ()

8.4.4 AUTOSAR ECU State Manager and Basic Software Mode Manager Interface

8.4.4.1 ComM_CommunicationAllowed

[SWS_ComM_00871]

| | | |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Service name: | ComM_CommunicationAllowed | |
| Syntax: | <pre>void ComM_CommunicationAllowed(NetworkHandleType Channel, boolean Allowed)</pre> | |
| Service ID[hex]: | 0x35 | |
| Sync/Async: | Synchronous | |
| Reentrancy: | Non Reentrant | |
| Parameters (in): | Channel | Channel |
| | Allowed | TRUE: Communication is allowed FALSE: Communication is not allowed |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | None | |
| Description: | EcuM or BswM shall indicate to ComM when communication is allowed. If EcuM/Fixed is used: EcuM/Fixed. If EcuM/Flex is used: BswM | |

] ()

8.4.5 Bus State Manager Interface

8.4.5.1 ComM_BusSM_ModeIndication

[SWS_ComM_00675]

| | | |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Service name: | ComM_BusSM_ModeIndication | |
| Syntax: | <pre>void ComM_BusSM_ModeIndication(NetworkHandleType Channel, ComM_ModeType* ComMode)</pre> | |
| Service ID[hex]: | 0x33 | |
| Sync/Async: | Asynchronous | |
| Reentrancy: | Reentrant | |
| Parameters (in): | Channel | See NetworkHandleType |
| | ComMode | See ComM_ModeType |
| Parameters (inout): | None | |
| Parameters (out): | None | |
| Return value: | None | |
| Description: | Indication of the actual bus mode by the corresponding Bus State Manager. ComM shall propagate the indicated state to the users with means of the RTE and BswM. | |

] ()

[SWS_ComM_00816] [Caveats of `ComM_BusSM_ModeIndication(...)`: The Communication Manager Module is initialized correctly.] ()

8.4.6 COM Interface

[SWS_ComM_00819]

[

| | |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_COMCbk_<sn> |
| Syntax: | void ComM_COMCbk_<sn>(void) |
| Service ID[hex]: | 0x36 |
| Sync/Async: | Synchronous |
| Reentrancy: | Non Reentrant |
| Parameters (in): | None |
| Parameters (inout): | None |
| Parameters (out): | None |
| Return value: | None |
| Description: | This callback is called when the EIRA or ERA was updated in COM. The call only informs the ComM about ERA and EIRA changes. The actual handling is done in the next call to ComM_MainFunction_<Channel_Id> with changing the corresponding PN State machine. |

] ()

8.5 Scheduled functions

These functions are directly called by Basic Software Scheduler. The following functions shall have no return value and no parameter. All functions shall be non reentrant.

8.5.1 ComM_MainFunction

[SWS_ComM_00429]

[

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service name: | ComM_MainFunction_<Channel_Id> |
| Syntax: | void ComM_MainFunction_<Channel_Id>(void) |
| Service ID[hex]: | 0x60 |
| Description: | This function shall perform the processing of the AUTOSAR ComM activities that are not directly initiated by the calls e.g. from the RTE. There shall be one dedicated Main Function for each channel of ComM. Precondition: ComM shall be initialized |

] (SRS_BSW_00373, SRS_BSW_00376)

[SWS_ComM_00818] [Configuration of ComM_MainFunction_<Channel_Id>:
See section 10.2.2.] ()

8.6 Expected interfaces

In this chapter all interfaces required from other modules are shown. An overview of the required interfaces is shown in Figure 1.

8.6.1 Mandatory Interfaces

This chapter defines all interfaces which are required to fulfil the core functionality of the module.

[SWS_ComM_00828] [

| API function | Module | Description |
|-------------------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nm_PassiveStartUp | Nm | This function calls the <BusNm>_PassiveStartUp function (e.g. CanNm_PassiveStartUp function is called if channel is configured as CAN). |
| Nm_NetworkRequest | Nm | This function calls the <BusNm>_NetworkRequest (e.g. CanNm_NetworkRequest function is called if channel is configured as CAN). |
| Nm_NetworkRelease | Nm | This function calls the <BusNm>_NetworkRelease bus specific function (e.g. CanNm_NetworkRelease function is called if channel is configured as CAN). |
| Dcm_ComM_NoComModeEntered | Dcm | This call informs the Dcm module about a ComM mode change to COMM_NO_COMMUNICATION. |
| Dcm_ComM_SilentComModeEntered | Dcm | This call informs the Dcm module about a ComM mode change to COMM_SILENT_COMMUNICATION. |
| Dcm_ComM_FullComModeEntered | Dcm | This call informs the Dcm module about a ComM mode change to COMM_FULL_COMMUNICATION. |
| Rte_Ports_UserMode_P()[n].Switch_currentMode(RTE_MODE_ComMMode_COMM_NO_COMMUNICATION) | Rte | Indicate COMM_NO_COMMUNICATION mode to RTE |
| Rte_Ports_UserMode_P()[n].Switch_currentMode(RTE_MODE_ComMMode_COMM_SILENT_COMMUNICATION) | Rte | Indicate COMM_SILENT_COMMUNICATION mode to RTE |
| Rte_Ports_UserMode_P()[n].Switch_currentMode(RTE_MODE_ComMMode_COMM_FULL_COMMUNICATION) | Rte | Indicate COMM_FULL_COMMUNICATION mode to RTE |
| BswM_ComM_CurrentMode | BswM | Indicate Communication Mode to BswM |
| NvM_ReadBlock | NvM | NVRAM manager API for Read block |
| NvM_WriteBlock | NvM | NVRAM manager API for Write block |
| NvM_GetErrorStatus | NvM | NVRAM manager API for Get status |
| <BusSM>_GetCurrentComMode | <BusSM> | Function to query the actual communication mode from the <Bus> State Manager. |
| <BusSM>_RequestComMode | <BusSM> | Function to request a communication mode from the <Bus> State Manager. |

] ()

8.6.1.1 AUTOSAR NVRAM Manager module

[SWS_ComM_00103] [The ComM module shall use the corresponding standardized services of the NVRAM Manager module (see [SWS_ComM_00828](#)) for storing and reading non-volatile configuration data `ComMNoWakeup` (see [ECUC_ComM_00569](#)), `ComMEcuGroupClassification` (see [ECUC_ComM_00563](#)), inhibition status (see [SWS_ComM_00157](#)) and the Inhibit counter (see [SWS_ComM_00140](#)).] ()

Comment: See [SWS_ComM_00864](#) and [SWS_ComM_00865](#) when configuration data shall be read and stored

For details refer to the AUTOSAR NVRAM Manager module Specification [7].

8.6.1.2 AUTOSAR Bus State Manager

[SWS_ComM_00962] [The prefix for the StateManager APIs ("`<BusSm>`") shall be `CanSM`, `LinSM`, `FrSM`, `EthSM` if the Parameter `ComMBusType` is `COMM_BUS_TYPE_CAN`, `COMM_BUS_TYPE_LIN`, `COMM_BUS_TYPE_FR` or `COMM_BUS_TYPE_ETH` accordingly.] ()

[SWS_ComM_00957] [If `ComMBusType` = "`COMM_BUS_TYPE_CDD`" the API prefix ("`<BusSm>`") shall be configured in the Parameter "`ComMCDDBusPrefix`".] ()

[SWS_ComM_00963] [The Communication Manager module shall use `<BusSm>_GetCurrentComMode()` from the State Manager to query the current communication mode if necessary.] ()

[SWS_ComM_00958] [The Communication Manager module shall use `<BusSm>_RequestComMode()` from the State Manager to request a dedicated communication mode.] ()

When it is necessary to request a dedicated communication mode depends on the current status of each instance of the channel state machine (see above).

For details of the functionality of the Bus State Manager modules refer to their Specification [\[23\]](#), [\[24\]](#), [\[25\]](#), [\[28\]](#).

Comment: Those APIs can be called re-entrant, as long as different channel & controller numbers are used.

8.6.1.3 AUTOSAR Network Management Interface

[SWS_ComM_00261] [The ComM module shall use the corresponding functions to synchronize the bus start-up and shutdown of the Network Management (see [SWS_ComM_00828](#)).

For details refer to the AUTOSAR NM Interface Specification [\[9\]](#).] ()

8.6.1.4 AUTOSAR Diagnostic Communication Manager Module

[SWS_ComM_00266] [The ComM module shall use the corresponding functions provided by DCM (see [SWS_ComM_00828](#)) to control the communication capabilities of the DCM module.] ()

Comment: DCM provides no functions to start/stop transmission and reception. DCM ensures to control communication according the indicated Communication Manager Module states.

For details refer to the AUTOSAR DCM Specification [11].

8.6.1.5 AUTOSAR RTE interface provided by RTE to ComM for the SW-C

[SWS_ComM_00091] [The ComM module shall use the corresponding function provided by RTE to indicate modes to the users. There shall be one indication per user. Fan-out in case of a mode indication related to more than one user shall be done by the Communication Manager Module.] (SRS_ModeMgm_09085)

[SWS_ComM_00663] [If more than one channel is linked to one user request and the modes of the channels are different, the ComM module shall indicate the lowest mode to the user.] ()

[SWS_ComM_00662] [The sequence of users shall start with user 0 up to user N and the name of the mode ports shall be UM000, UM001, ... UM<N>.] ()

Rationale for [SWS_ComM_00662](#): It shall be possible to use the port based API also to address specific users directly.

Comment: Within the array of ports, the ports are named alphabetically.

[SWS_ComM_00778] [The ComM module shall explicitly indicate changes in modes to each individual user, to which a SW-C is connected. The ComM module shall do this by calling the right API on the RTE through the ports “UMnnn”.] ()

Comment: There is one such port per configured user to which a SW-C is connected. For users not used by SW-Cs (e.g. the users created due to **ECUC_ComM_00840** :) no mode port will be created.

Implementation Hint: An implementation of the ComM module could use any of the normal RTE-mechanisms to signal changes in the mode to the users. Given the specific configurability of the Communication Manager Module, using the RTE “Indirect API” seems most appropriate. This works as follows (consult the RTE specification for details).

An implementation of the Communication Manager Module can use the “Rte_Ports” API to obtain an array of the “UMnnn” ports at run-time.

```
/* Return an array of all ports that provide the interface ComM_CurrentMode.
Because of the specific naming conventions chosen, the element n in this
array of ports will reference to the port UM<nnn>. For example
userModePorts[1] will be a handle on port UM001 */
userModePorts = Rte_Ports_ComM_CurrentMode_P();
```

The number of such userModePorts can be obtained through the call
Rte_NPorts_ComM_CurrentMode_P. This value corresponds to the size of
the COMM_USER_LIST array.

To signal that a user n is in a new mode, the Communication Manager Module
should: userModePorts[n].Switch_currentMode(newMode)

For details refer to the AUTOSAR RTE specification [8] and AUTOSAR Services
Mode Management specification [21].

8.6.1.6 Basic Software Mode Manager (BswM)

[SWS_ComM_00861] [The ComM module shall use the corresponding function
provided by BswM to report the states of Communication Manager Module channels
(see [SWS_ComM_00828](#)).] ()

For details refer to AUTOSAR Basic Software Mode Manager module [29] .

8.6.2 Optional Interfaces

This chapter defines all interfaces which are required to fulfill an optional functionality
of the module.

[SWS_ComM_00829] [

| API function | Module | Description |
|--------------------------|--------|-----------------------------------------------------------------|
| Det_ReportError | Det | Service to report default errors |
| BswM_ComM_CurrentPNCMode | BswM | Function called by ComM to indicate the current mode of the PNC |

] ()

8.6.2.1 AUTOSAR DET

The Communication Manager module shall use Det_ReportError from the Default
Error Tracer Module to report default errors.

8.6.3 Configurable Interfaces

None.

8.6.4 AUTOSAR COM

| | | |
|-------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Service name: | Com_SendSignal | |
| Syntax: | <pre>uint8 Com_SendSignal(Com_SignalIdType SignalId, const void* SignalDataPtr)</pre> | |
| Service ID[hex]: | 0x0a | |
| Sync/Async: | Asynchronous | |
| Reentrancy: | Non Reentrant for the same signal. Reentrant for different signals. | |
| Parameters (in): | SignalId | Id of signal to be sent. |
| | SignalDataPtr | Reference to the signal data to be transmitted. |
| Parameters | None | |

| | |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (inout): | |
| Parameters (out): | None |
| Return value: | uint8 E_OK: service has been accepted COM_SERVICE_NOT_AVAILABLE: corresponding I-PDU group was stopped (or service failed due to development error) COM_BUSY: in case the TP-Buffer is locked for large data types handling |
| Description: | The service Com_SendSignal updates the signal object identified by SignalId with the signal referenced by the SignalDataPtr parameter. |

| | |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service name: | Com_ReceiveSignal |
| Syntax: | uint8 Com_ReceiveSignal(Com_SignalIdType SignalId, void* SignalDataPtr) |
| Service ID[hex]: | 0x0b |
| Sync/Async: | Synchronous |
| Reentrancy: | Non Reentrant for the same signal. Reentrant for different signals. |
| Parameters (in): | SignalId Id of signal to be received. |
| Parameters (inout): | None |
| Parameters (out): | SignalDataPtr Reference to the location where the received signal data shall be stored |
| Return value: | uint8 E_OK: service has been accepted COM_SERVICE_NOT_AVAILABLE: corresponding I-PDU group was stopped (or service failed due to development error) COM_BUSY: in case the TP-Buffer is locked for large data types handling |
| Description: | Com_ReceiveSignal copies the data of the signal identified by SignalId to the location specified by SignalDataPtr. |

8.7 Service Interfaces

8.7.1 Sender-Receiver-interfaces

8.7.1.1 ComM_CurrentChannelRequest [SWS_ComM_00904]

| | |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name | ComM_CurrentChannelRequest_{channel_name} |
| Comment | Array of ComMUserIdentifier, that currently hold FULL_COM requests for this channel. The size of the attribute fullComRequestors.handleArray is NUM_COMM_USER_PER_CHANNEL |
| IsService | true |
| Variation | {ecuc(ComM/ComMConfigSet/ComMChannel/ComMFullCommRequestNotificationEnabled)} == true channel_name = {ecuc(ComM/ComMConfigSet/ComMChannel.SHORT-NAME)} |
| Data | fullComRequestors |

| | | |
|----------|-----------|------------------------------------------------------------------|
| Elements | Type | ComM_UserHandleArrayType_{channel_name} |
| | Variation | channel_name = {ecuc(ComM/ComMConfigSet/ComMChannel.SHORT-NAME)} |

] ()

8.7.2 Client-Server-interfaces

8.7.2.1 ComM_ChannelLimitation

[SWS_ComM_00743]

| | | |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Name | ComM_ChannelLimitation | |
| Comment | A SW-C playing the role of a "Mode Manager" can use this interface to configure the Communication Manager Module to inhibit communication mode for a given channel. | |
| IsService | true | |
| Variation | {ecuc(ComM/ComMGeneral.ComMModelLimitationEnabled)} == true | |
| Possible Errors | 0 | E_OK |
| | 1 | E_NOT_OK |

Operations

| | | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| GetInhibitionStatus | | |
| Comments | returns the inhibition status of a channel | |
| Variation | -- | |
| Parameters | Status | |
| | Comment | -- |
| | Type | ComM_InhibitionStatusType |
| | Variation | -- |
| | Direction | OUT |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |
| | | |
| LimitChannelToNoComMode | | |
| Comments | Changes the inhibition status for the channel for changing from COMM_NO_COMMUNICATION to a higher Communication Mode. (See also ComM_LimitECUToNoComMode, same functionality but for all channels) | |
| Variation | -- | |

| | | |
|-----------------|-----------|----------------------------------------------------------------------------------------------------------------|
| Parameters | Status | |
| | Comment | FALSE: Limit channel to COMM_NO_COMMUNICATION disabled TRUE: Limit channel to COMM_NO_COMMUNICATION enabled |
| | Type | boolean |
| | Variation | -- |
| | Direction | IN |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |

] ()

8.7.2.2 ComM_ChannelWakeup [SWS_ComM_00742]

| | | |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Name | ComM_ChannelWakeup | |
| Comment | A SW-C playing the role of a "Mode Manager" can use this interface to configure the Communication Manager Module to take precautions against awakening other ECU's by starting the communication. | |
| IsService | true | |
| Variation | {ecuc(ComM/ComMGeneral.ComMWakeupInhibitionEnabled)} == true | |
| Possible Errors | 0 | E_OK |
| | 1 | E_NOT_OK |

Operations

| | | |
|---------------------|--------------------------------------------|---------------------------|
| GetInhibitionStatus | | |
| Comments | returns the inhibition status of a channel | |
| Variation | -- | |
| Parameters | Status | |
| | Comment | -- |
| | Type | ComM_InhibitionStatusType |
| | Variation | -- |
| | Direction | OUT |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |

| | | |
|-----------------|-----------------------------------------------------------------------------|----------------------|
| PreventWakeUp | | |
| Comments | Changes the inhibition status COMM_NO_WAKEUP for the corresponding channel. | |
| Variation | -- | |
| Parameters | Status | |
| | Comment | -- |
| | Type | boolean |
| | Variation | -- |
| | Direction | IN |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |

] ()

8.7.2.3 ComM_ECUModeLimitation [SWS_ComM_00741]

| | | |
|-----------------|------------------------------------------------------------------------------------------------------------------|----------|
| Name | ComM_ECUModeLimitation | |
| Comment | A SW-C which plays the role of a "Mode Manager" can use this interface to change the behavior of the entire ECU. | |
| IsService | true | |
| Variation | {ecuc(ComM/ComMGeneral.ComMModeLimitationEnabled)} == true | |
| Possible Errors | 0 | E_OK |
| | 1 | E_NOT_OK |

Operations

| | | |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| LimitECUToNoComMode | | |
| Comments | Changes the inhibition status for the ECU (=all channels) for changing from COMM_NO_COMMUNICATION to a higher Communication Mode. (See also ComM_LimitChannelToNoComMode, same functionality but for a specific channels) | |
| Variation | -- | |
| Parameters | Status | |
| | Comment | FALSE: Limit ECU to COMM_NO_COMMUNICATION disabled TRUE: Limit ECU to COMM_NO_COMMUNICATION enabled |

| | | |
|---------------------------|-------------------------------------------------------------------------|---------------------------|
| | Type | boolean |
| | Variation | -- |
| | Direction | IN |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |
| | | |
| ReadInhibitCounter | | |
| Comments | returns the value of the 'inhibited full communication request counter' | |
| Variation | {ecuc(ComM/ComMGeneral.ComMGlobalNvMBlockDescriptor)} != NULL | |
| Parameters | CounterValue | |
| | Comment | -- |
| | Type | uint16 |
| | Variation | -- |
| | Direction | OUT |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |
| | | |
| ResetInhibitCounter | | |
| Comments | reset the "inhibited full communication request counter" | |
| Variation | {ecuc(ComM/ComMGeneral.ComMGlobalNvMBlockDescriptor)} != NULL | |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |
| | | |
| SetECUGroupClassification | | |
| Comments | changes the ECU group classification status | |
| Variation | -- | |
| Parameters | Status | |
| | Comment | -- |
| | Type | ComM_InhibitionStatusType |
| | Variation | -- |
| | Direction | IN |

| | | |
|-----------------|----------|----------------------|
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |

] ()

8.7.2.4 ComM_UserRequest

[SWS_ComM_01000]

| | | |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Name | ComM_UserRequest | |
| Comment | A SW-C that wants to explicitly direct the local Communication Manager Module of the ECU towards a certain state requires the client-server interface ComM_UserRequest. Through this interface the SW-C can set the desired state of all communication channels that are relevant for that component to "No Communication" or "Full Communication". | |
| IsService | true | |
| Variation | -- | |
| Possible Errors | 0 | E_OK |
| | 1 | E_NOT_OK |
| | 2 | E_MODE_LIMITATION |

Operations

| | | |
|-------------------|--------------------------------------------------------------------|----------------------|
| GetCurrentComMode | | |
| Comments | Returns the current Communication Manager Module mode for the SW-C | |
| Variation | -- | |
| Parameters | ComMode | |
| | Comment | -- |
| | Type | ComM_ModeType |
| | Variation | -- |
| | Direction | OUT |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |
| | | |
| GetMaxComMode | | |
| Comments | Returns the current Communication Manager Module mode for the SW-C | |
| Variation | -- | |
| Parameters | ComMode | |

| | | |
|---------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| | Comment | -- |
| | Type | ComM_ModeType |
| | Variation | -- |
| | Direction | OUT |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |
| | | |
| GetRequestedComMode | | |
| Comments | Returns that last Communication Manager Module Mode requested by the SW-C | |
| Variation | -- | |
| Parameters | ComMode | |
| | Comment | -- |
| | Type | ComM_ModeType |
| | Variation | -- |
| | Direction | OUT |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |
| | | |
| RequestComMode | | |
| Comments | The SW-C requests that all communication channels it needs are in the provided Communication Manager Module mode | |
| Variation | -- | |
| Parameters | ComMode | |
| | Comment | -- |
| | Type | ComM_ModeType |
| | Variation | -- |
| | Direction | IN |
| Possible Errors | E_OK | Operation successful |
| | E_NOT_OK | -- |
| | E_MODE_LIMITATION | ComMMMode cannot be granted because of ComMMMode inhibition |

] ()

8.7.3 Mode-Switch-Interfaces

8.7.3.1 ComM_CurrentMode

[SWS_ComM_01001]

| | | | |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------|----------|--|
| Name | ComM_CurrentMode | | |
| Comment | A SW-C that wants to get informed about its current Communication Manager Module Mode requires the ModeSwitchInterface ComM_CurrentMode. | | |
| IsService | true | | |
| Variation | -- | | |
| ModeGroup | currentMode | ComMMode | |

] ()

8.7.4 Implementation Data Types

8.7.4.1 ComM_InhibitionStatusType

[SWS_ComM_01002]

| | | | | |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|--------------------------------------------|
| Name | ComM_InhibitionStatusType | | | |
| Kind | Structure (Bitfield) | | | |
| Derived from | uint8 | | | |
| Elements | Kind | Name | Mask | Description |
| | bit | WakeupInhibitionActive | 0x01 | Bit 0 (LSB): Wake Up inhibition active |
| | bit | LimitedToNoCom | 0x02 | Bit 1: Limit to COMM_NO_COMMUNICATION mode |
| Description | <p>Defines whether a mode inhibition is active or not.</p> <p>Inhibition status of ComM.</p> <p>e.g. status=00000011 -> Wake up inhibition and limitation to COMM_NO_COMMUNICATION mode active</p> | | | |

] ()

8.7.4.2 ComM_ModeType

[SWS_ComM_01003]

| | |
|--------------|------------------------------------------------------------------------------|
| Name | ComM_ModeType |
| Kind | Type |
| Derived from | uint8 |
| Description | Current mode of the Communication Manager (main state of the state machine). |

| | | | |
|-----------|---------------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------|
| Range | COMM_NO_COMMUNICATION | 0 | ComM state machine is in "No Communication" mode. Configured channel shall have no transmission or reception capability. |
| | COMM_SILENT_COMMUNICATION | 1 | ComM state machine is in "Silent Communication" mode. Configured channel shall have only reception capability, no transmission capability. |
| | COMM_FULL_COMMUNICATION | 2 | ComM state machine is in "Full Communication" mode. Configured channel shall have both transmission and reception capability. |
| Variation | -- | | |

] ()

8.7.4.3 ComM_UserHandleType [SWS_ComM_01004]

| | | | |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Name | ComM_UserHandleType | | |
| Kind | Type | | |
| Derived from | uint8 | | |
| Description | Handle to identify a user. For each user, a unique value must be defined at system generation time. Maximum number of users is 255. Legal user IDs are in the range 0 .. 254; user ID 255 is reserved and shall have the symbolic representation COMM_NOT_USED_USER_ID. | | |
| Variation | -- | | |

] ()

8.7.4.4 ComM_UserHandleArrayType [SWS_ComM_00906]

| | | | |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----|
| Name | ComM_UserHandleArrayType_{channel_name} | | |
| Kind | Structure | | |
| Elements | numberOfRequesters | uint8 | -- |
| | handleArray | ComM_UserHandleSubArrayType_{channel_name} | -- |
| | Variation | channel_name = {ecuc(ComM/ComMConfigSet/ComMChannel.SHORT-NAME)} | |
| Description | numberOfRequesters contains the number of valid user handle entries in the "handleArray" member. If no user keeps the channel requested, this is zero {LOWER-LIMIT=0, UPPER-LIMIT= MAX_CHANNEL_REQUESTER } | | |
| Variation | channel_name = {ecuc(ComM/ComMConfigSet/ComMChannel.SHORT-NAME)} | | |

] ()

8.7.4.5 ComM_UserHandleSubArrayType

[SWS_ComM_01005][

| | | | |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------|
| Name | ComM_UserHandleSubArrayType_{channel_name} | | |
| Kind | Array | Element type | ComM_UserHandleType |
| Size | COUNT{ecuc(ComM/ComMConfigSet/ComMChannel/ComMUserPerChannel)} Elements | | |
| Description | This element contains the user handles of the users which keep the channel requested (if any), starting in its first entries. The size of the array MAX_CHANNEL_REQUESTERS is the maximum of the number of users requesting a channel. | | |
| Variation | channel_name = {ecuc(ComM/ComMConfigSet/ComMChannel.SHORT-NAME)} | | |

] ()

8.7.5 Ports

8.7.5.1 ComM_CL

[SWS_ComM_01006][

| | | | |
|-------------|---------------------------------------------------------------------------------------------------------------------|-----------|------------------------|
| Name | CL_{channel_name} | | |
| Kind | ProvidedPort | Interface | ComM_ChannelLimitation |
| Description | The numeric value for the port defined argument for ComMChannelId shall be derived from Configuration. | | |
| Variation | {ecuc(ComM/ComMGeneral.ComMModeLimitationEnabled)} == true channel_name = {ecuc(ComM/ComMConfigSet/ComMChannel)} | | |

] ()

8.7.5.2 ComM_CR

[SWS_ComM_01007][

| | | | |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------|
| Name | CR_{channel_name} | | |
| Kind | ProvidedPort | Interface | ComM_CurrentChannelRequest_{channel_name} |
| Description | The numeric value for the port defined argument for ComMChannelId shall be derived from Configuration. | | |
| Variation | {ecuc(ComM/ComMConfigSet/ComMChannel/ComMFullCommRequestNotificationEnabled)} == true channel_name = {ecuc(ComM/ComMConfigSet/ComMChannel.SHORT-NAME)} | | |

] ()

8.7.5.3 ComM_CW

[SWS_ComM_01008][

| | | | |
|------|-------------------|--|--|
| Name | CW_{channel_name} | | |
|------|-------------------|--|--|

| | | | |
|-------------|-----------------------------------------------------------------------------------------------------------------------|-----------|--------------------|
| Kind | ProvidedPort | Interface | ComM_ChannelWakeup |
| Description | The numeric value for the port defined argument for ComMChannelId shall be derived from Configuration. | | |
| Variation | {ecuc(ComM/ComMGeneral.ComMWakeupInhibitionEnabled)} == true channel_name = {ecuc(ComM/ComMConfigSet/ComMChannel)} | | |

] ()

8.7.5.4 ComM_modeLimitation

[SWS_ComM_01009]

| | | | |
|-------------|------------------------------------------------------------|-----------|------------------------|
| Name | modeLimitation | | |
| Kind | ProvidedPort | Interface | ComM_ECUModeLimitation |
| Description | -- | | |
| Variation | {ecuc(ComM/ComMGeneral.ComMModeLimitationEnabled)} == true | | |

] ()

8.7.5.5 ComM_UM

[SWS_ComM_01010]

| | | | |
|-------------|-------------------------------------------------------------------------------------------------------------|-----------|------------------|
| Name | UM_{user_name} | | |
| Kind | ProvidedPort | Interface | ComM_CurrentMode |
| Description | The numeric value for the port defined argument for ComMUserIdentifier shall be derived from Configuration. | | |
| Variation | user_name = {ecuc(ComM/ComMConfigSet/ComMUser.SHORT-NAME)} | | |

] ()

8.7.5.6 ComM_UR

[SWS_ComM_01011]

| | | | |
|-------------|-------------------------------------------------------------------------------------------------------------|-----------|------------------|
| Name | UR_{user_name} | | |
| Kind | ProvidedPort | Interface | ComM_UserRequest |
| Description | The numeric value for the port defined argument for ComMUserIdentifier shall be derived from Configuration. | | |
| Variation | user_name = {ecuc(ComM/ComMConfigSet/ComMUser.SHORT-NAME)} | | |

] ()

8.7.6 ModeDeclarationGroups

8.7.6.1 ComMMode

[SWS_ComM_01012]

| | |
|------|----------|
| Name | ComMMode |
|------|----------|

| | | |
|---------------------|---------------------------|----|
| Kind | ModeDeclarationGroup | |
| Category | ALPHABETIC_ORDER | |
| Initial mode | COMM_NO_COMMUNICATION | |
| On transition value | -- | |
| Modes | COMM_FULL_COMMUNICATION | -- |
| | COMM_NO_COMMUNICATION | -- |
| | COMM_SILENT_COMMUNICATION | -- |
| Description | -- | |

] ()

9 Sequence diagrams

9.1 Transmission and Reception start (CAN)

Figure 9 shows the sequence for starting transmission and reception on CAN. The behaviour is equal for LIN, FlexRay and Ethernet just with different API names.

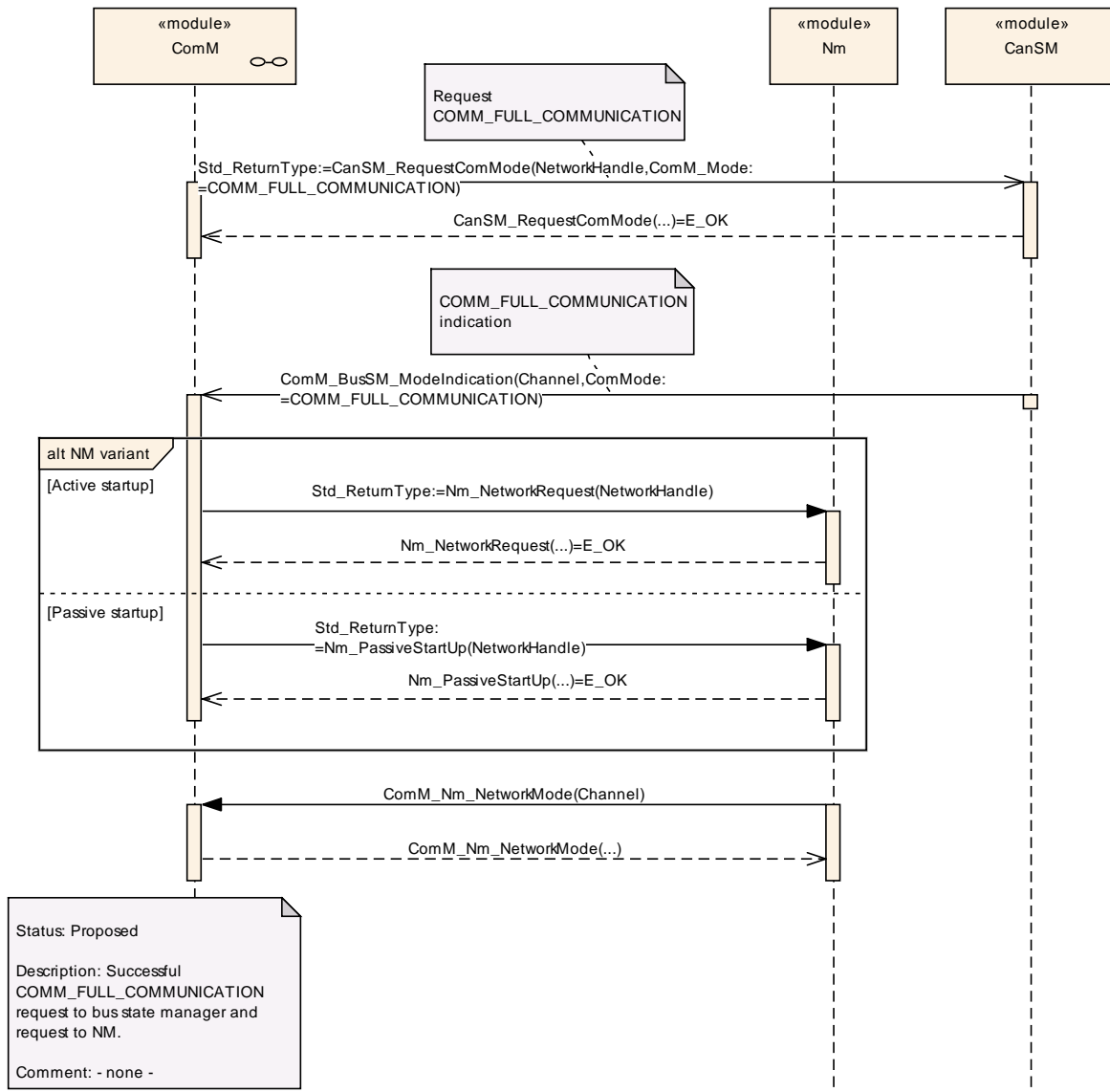


Figure 9: Starting transmission and reception on CAN

9.2 Passive Wake-up (CAN)

Figure 10 shows the behaviour after a wake-up indicated by the ECU State Manager module, or the Nm module for a CAN channel. The behaviour is equal for LIN, FlexRay and Ethernet just with different API names.

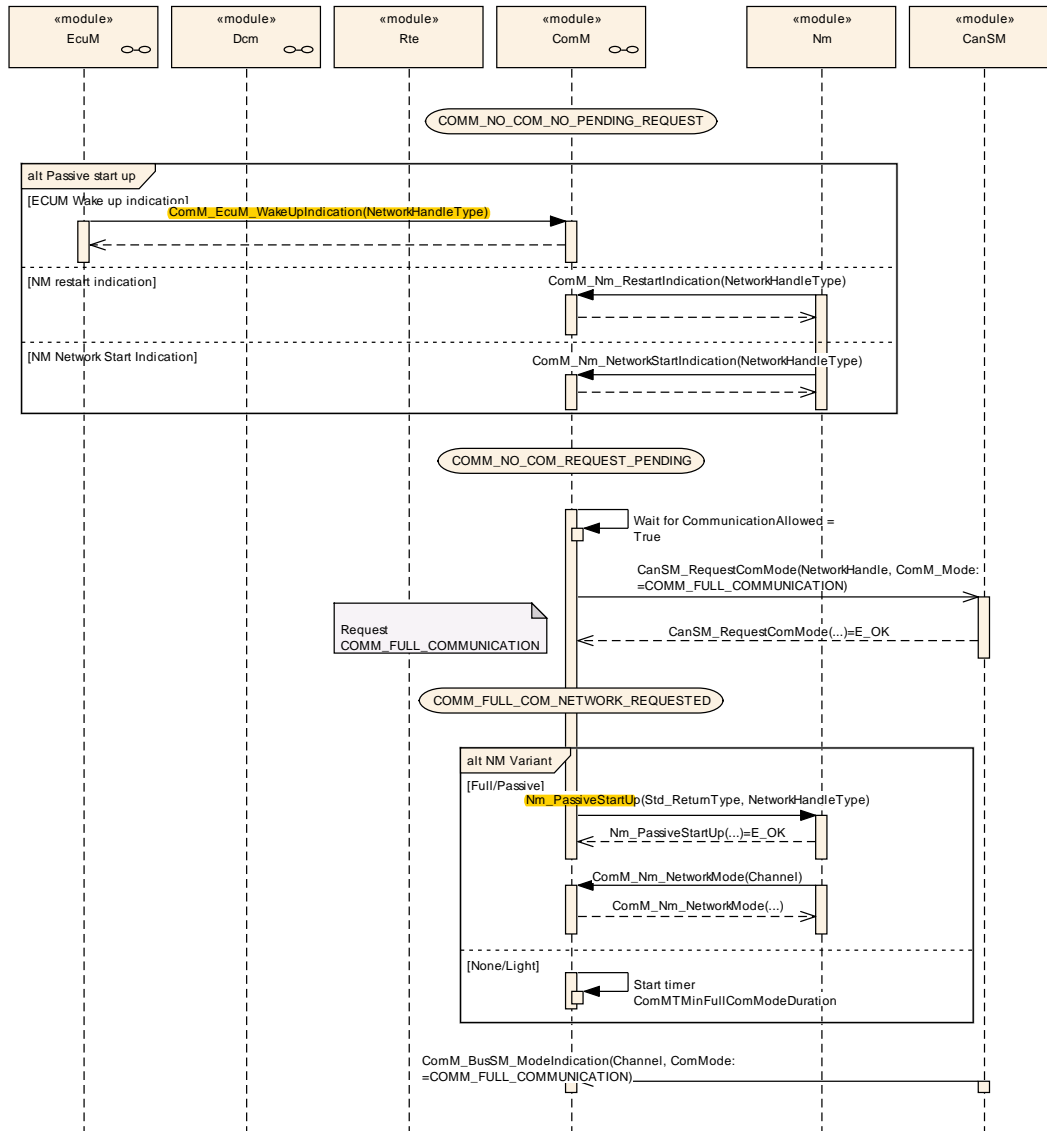


Figure 10: Reaction on a wake-up indicated by the ECU State Manager module

9.3 Network shutdown (CAN)

Figure 11 shows the possibilities to shutdown the CAN network. It can be either initiated if the last user releases his `COMM_FULL_COMMUNICATION` request or `ComM_LimitChannelToNoComMode(...)` (see [SWS ComM_00163](#)) is called. The behaviour is equal for LIN, FlexRay and Ethernet just with different API names.

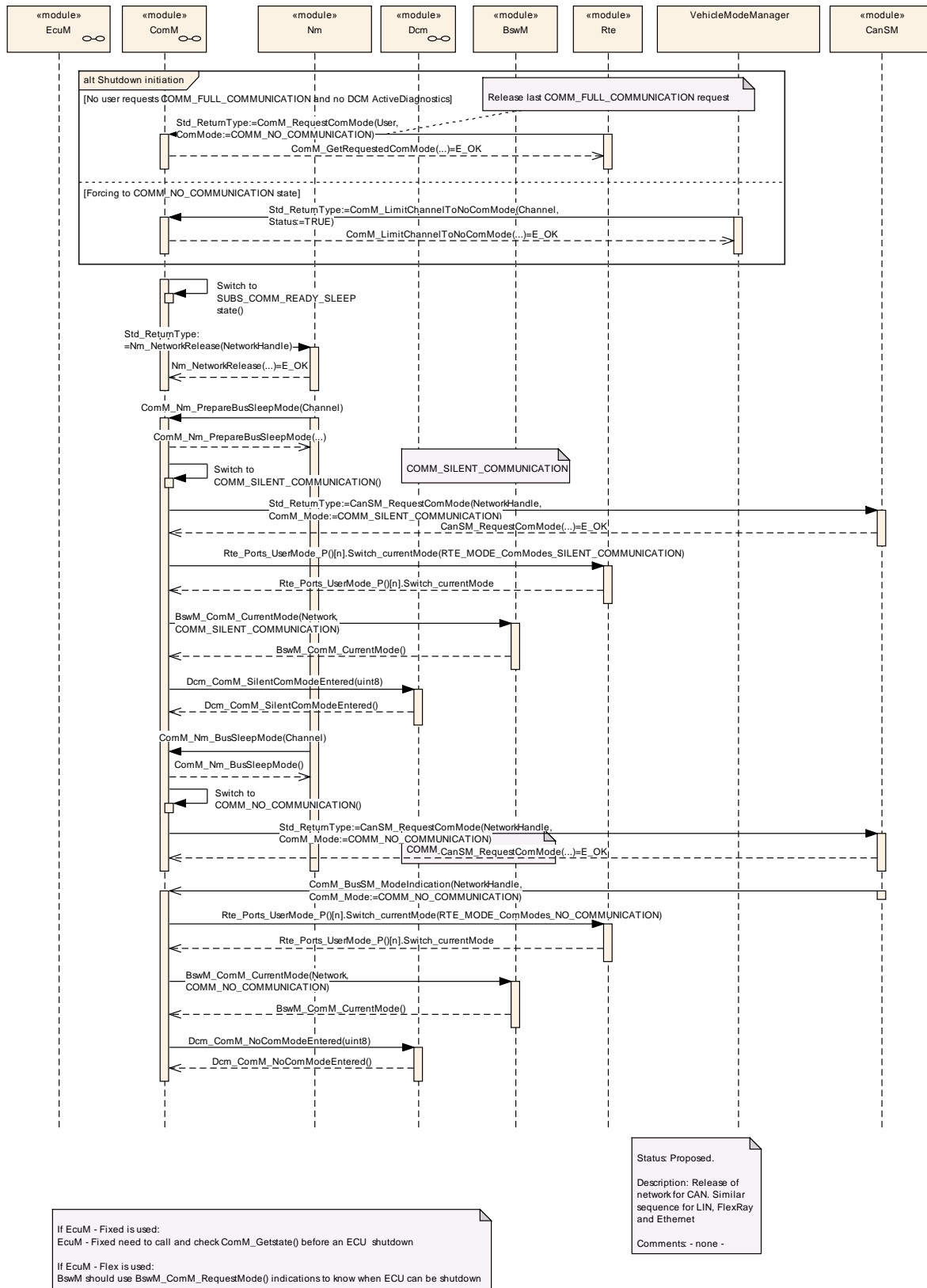


Figure 11: Network shutdown (CAN)

9.4 Communication request

Figure 12 shows the possibilities to start `COMM_FULL_COMMUNICATION` on CAN. It can be either initiated if a user requests `COMM_FULL_COMMUNICATION` request or DCM indicates *ComM_DCM_ActiveDiagnostic* (see [SWS ComM 00873](#)). The behaviour is equal for LIN, FlexRay and Ethernet just with different API names.

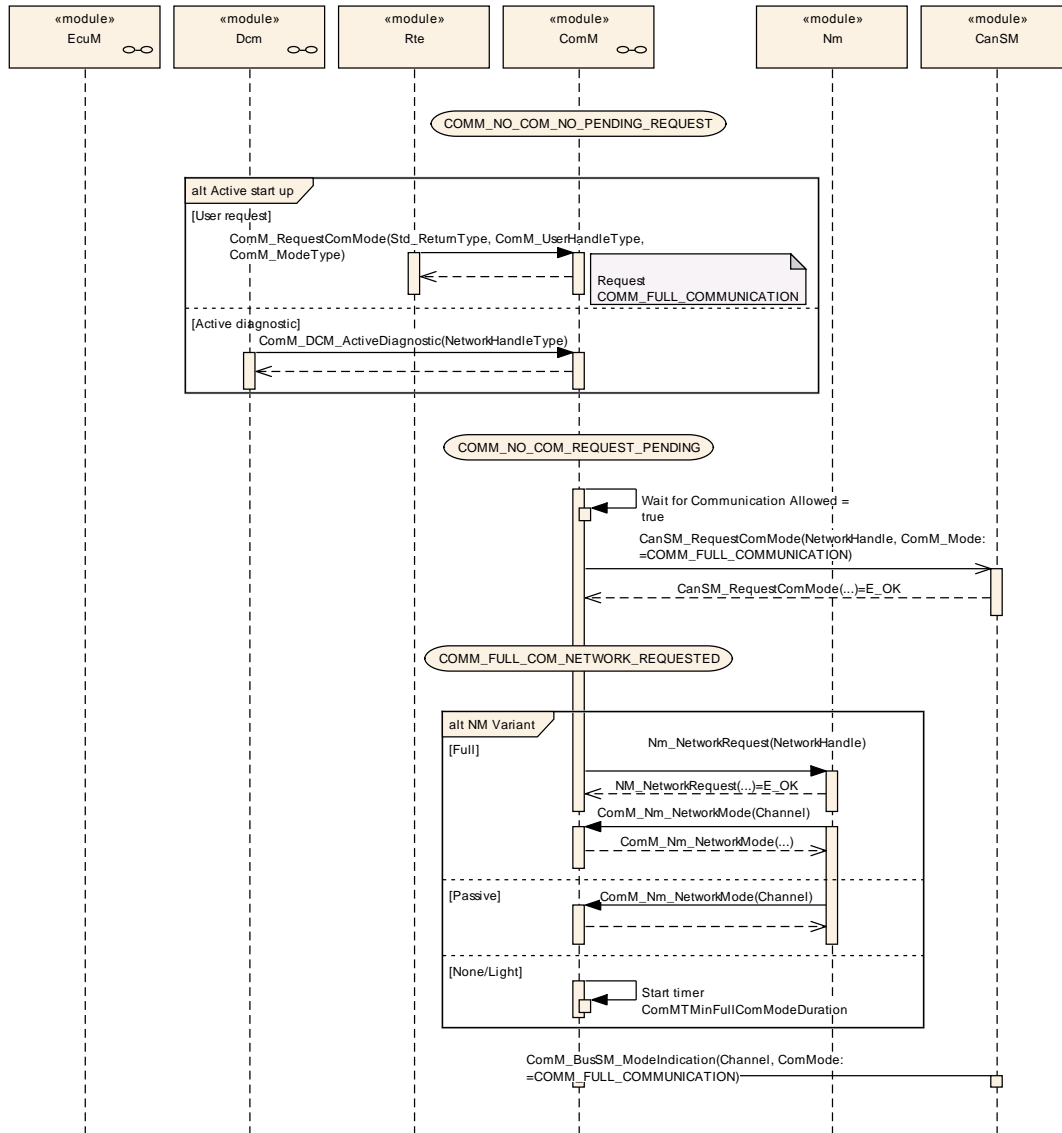


Figure 12: Request Communication

10 Configuration specification

In general, this chapter defines configuration parameters and their clustering into containers. In order to support the specification Chapter 10.1 describes fundamentals.

Chapter 10.2 specifies the structure (containers) and the parameters of the module Communication Manager Module.

Chapter 10.3 specifies published information of the Communication Manager Module.

10.1 How to read this chapter

For details refer to the chapter 10.1 “Introduction to configuration specification” in *SWS_BSWGeneral*.

10.2 Containers and configuration parameters

[SWS_ComM_00419] [The ComM module pre-compile time and link time configuration parameters shall be checked statically (at the latest during link time) for correctness.] (SRS_BSW_00167)

[SWS_ComM_00327] [The ComM module configuration shall support the possibility to assign communication-channels to users by static configuration.] (SRS_ModeMgm_09133)

[SWS_ComM_00159] [The ComM module configuration shall support to configure several communication channels to a user.] (SRS_ModeMgm_09090)

Rationale for [SWS ComM 00159](#): In a multi channel system each user can be assigned to one or more channels. If the user requests a mode, all channels assigned to this user, shall switch to the corresponding mode. All other channels shall not be affected.

[SWS_ComM_00160] [ComMUsers shall be assignable to ComMChannels in combination with all ComMNmVariants except ComMNmVariant = PASSIVE.] ()

[SWS_ComM_00161] [ComMUsers shall be assignable to PNCs, which refer to ComMChannels in combination with all ComMNmVariants except ComMNmVariant = PASSIVE.] ()

[SWS_ComM_00322] [The ComM module configuration shall support configuration of bus type for each channel.] ()

Rationale for [SWS ComM 00322](#): Interfaces for controlling the communication stack depends on the bus type.

[SWS_ComM_00464] [The ComM module shall strictly separate configuration from implementation.] (SRS_BSW_00158)

Rationale for [SWS ComM 00464](#): Easy and clear configuration.

[SWS_ComM_00456] [The ComM module pre-compile time and published configuration data, shall group and export the configuration data to a static configuration interface. The name of the interface shall be ComM_Cfg.h.] (SRS_BSW_00345)

10.2.1 VARIANT POST-BUILD

[SWS_ComM_00998] [ComM shall support a variant called VARIANT POST-BUILD. The supported parameter shall be:

1. ComMPncEnabled
-] ()

10.2.2 VARIANT-PRE-COMPILE

[SWS_ComM_00549] [The ComM module shall support a variant called VARIANT-PRE-COMPILE.] (SRS_BSW_00388)

10.2.3 ComM

| | |
|-----------------------------------|------------------------------------------------------------|
| Module Name | <i>ComM</i> |
| Module Description | Configuration of the ComM (Communications Manager) module. |
| Post-Build Variant Support | true |

| Included Containers | | |
|----------------------------|---------------------|-----------------------------------------------------------------------------------------------------|
| Container Name | Multiplicity | Scope / Dependency |
| ComMConfigSet | 1 | This container contains the configuration parameters and sub containers of the AUTOSAR ComM module. |
| ComMGeneral | 1 | General configuration parameters of the Communication Manager. |

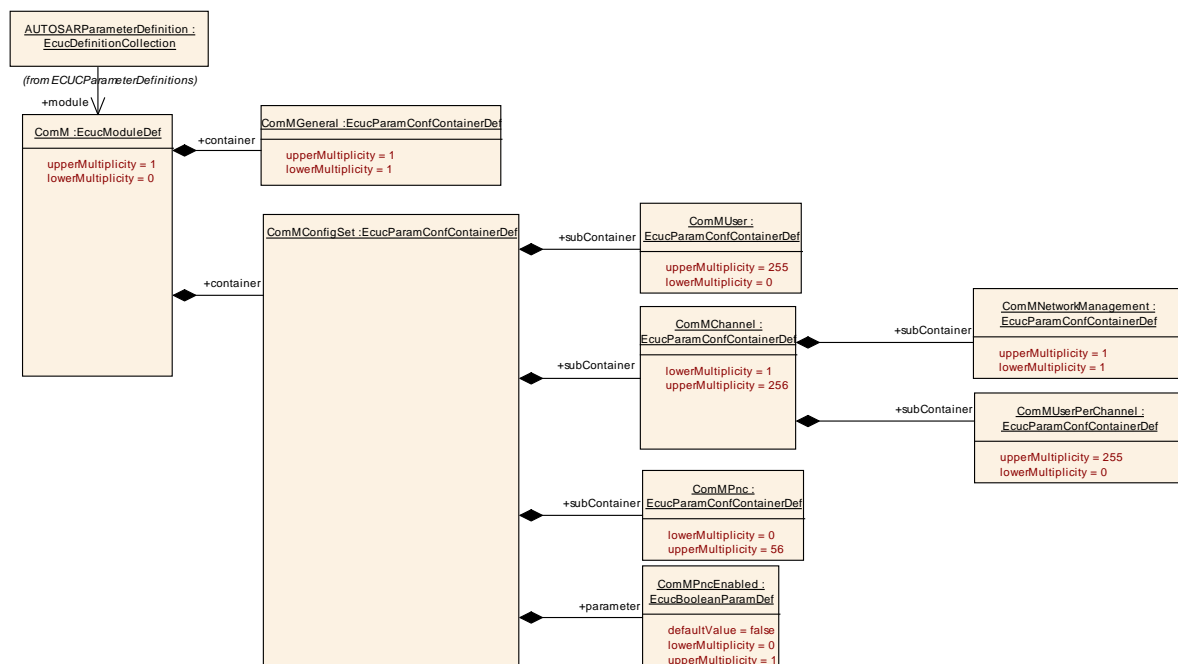


Figure 13: Configuration ComM

10.2.4 ComMGeneral

| | |
|---------------------------------|----------------------------------------------------------------|
| SWS Item | ECUC_ComM_00554 : |
| Container Name | ComMGeneral |
| Description | General configuration parameters of the Communication Manager. |
| Configuration Parameters | |

| | | | |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00555 : | | |
| Name | ComMDevErrorDetect | | |
| Description | Switches the Default Error Tracer (Det) detection and notification ON or OFF. <ul style="list-style-type: none"> true: enabled (ON). false: disabled (OFF). | | |
| 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 | | |

| | | | |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00840 : | | |
| Name | ComMDirectUserMapping | | |
| Description | If this parameter is set to true the configuration tool shall automatically create a ComMPnc per ComMPnc and a ComMPnc per ComMChannel. The shortName of the generated ComMPncs shall follow the following naming convention: PNCUser_ComMPncId, e.g. PNCUser_13 ChannelUser_ComMChannelId, e.g. ChannelUser_25 Restriction: ComMPnc, which are created due to this configuration parameter, shall not be used by SWCs (only available for BswM). | | |
| Multiplicity | 0..1 | | |
| Type | EcucBooleanParamDef | | |
| Default value | false | | |
| 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 | | |

| | | | |
|--------------------|--------------------------------------------------------------------------------------------------------------------|--|--|
| SWS Item | ECUC_ComM_00563 : | | |
| Name | ComMEcuGroupClassification | | |
| Description | Defines whether a mode inhibition affects the ECU or not. Examples: 000: No mode inhibition can be activated | | |

| | | | |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| | 001: Wake up inhibition can be enabled | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef | | |
| Range | 0 .. 255 | | |
| Default value | 3 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: local dependency: Shall be stored non volatile (value must be kept during a reset) at least if Wake up inhibition is enabled/allowed. Can be changed during runtime with ComM_SetECUGroupClassification() thus the default values shall be set only once (first ECU initialization). | | |

| | | | |
|----------------------------------|------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00560 : | | |
| Name | ComMModeLimitationEnabled | | |
| Description | true if mode limitation functionality shall be enabled. true: Enabled false: 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 | | |

| | | | |
|-----------------------------------------|----------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00889 : | | |
| Name | ComMNmPassiveModeEnable | | |
| Description | Enables support of Passive Mode. | | |
| Multiplicity | 0..1 | | |
| Type | EcucBooleanParamDef | | |
| Default value | -- | | |
| 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 | | |

| | | | |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| SWS Item | ECUC_ComM_00887 : | | |
| Name | ComMPncGatewayEnabled | | |
| Description | Enables or disables support of Partial Network Gateway. False: Partial Networking Gateway is disabled True: Partial Networking Gateway is enabled | | |
| Multiplicity | 0..1 | | |
| Type | EcucBooleanParamDef | | |
| Default value | false | | |
| 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 | | |

| | | | |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00841 : | | |
| Name | ComMPncPrepareSleepTimer | | |
| Description | Time in seconds the PNC state machine shall wait in PNC_PREPARE_SLEEP. | | |
| Multiplicity | 0..1 | | |
| Type | EcucFloatParamDef | | |
| Range | 0 .. 63 | | |
| Default value | -- | | |
| 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 dependency: #CanNm: (CanNmPnResetTime + ComMPncPrepareSleepTimer) < CanNmTimeoutTime # FrNm: (FrNmPnResetTime + ComMPncPrepareSleepTimer) < ((FrNmReadySleepCnt + 1) * FrNmRepetitionCycle * "Duration of one FlexRay Cycle") # UdpNm: (UdpNmPnResetTime + ComMPncPrepareSleepTimer) < UdpNmTimeoutTime | | |

| | | | |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00839 : | | |
| Name | ComMPncSupport | | |
| Description | Enables or disables support of partial networking. False: Partial Networking is disabled True: Partial Networking is enabled | | |
| 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 | | |

| | | | |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| SWS Item | ECUC_ComM_00558 : | | |
| Name | ComMResetAfterForcingNoComm | | |
| Description | ComM shall perform a reset after entering "No Communication" mode because of an active mode limitation to "No Communication" mode. true: Enabled false: 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 | | |

| | | | |
|----------------------------------|----------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00695 : | | |
| Name | ComMSynchronousWakeUp | | |
| Description | Wake up of one channel shall lead to a wake up of all channels if true. true: Enabled false: Disabled | | |
| Multiplicity | 1 | | |
| Type | EcucBooleanParamDef | | |
| Default value | true | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00557 : | | |
| Name | ComMTMinFullComModeDuration | | |
| Description | Minimum time duration in seconds, spent in the COMM_FULL_COMMUNICATION sub-state COMM_FULL_COM_NETWORK_REQUESTED. | | |
| Multiplicity | 1 | | |
| Type | EcucFloatParamDef | | |
| Range | 0.001 .. 65 | | |
| Default value | 5 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00622 : | | |
| Name | ComMVersionInfoApi | | |
| Description | Switches the possibility to read the published information with the service ComM_GetPublishedInformation(). true: Enabled false: Disabled | | |
| Multiplicity | 1 | | |
| Type | EcucBooleanParamDef | | |
| Default value | true | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: local | | |

| | | | |
|----------------------------------|------------------------------------------------------------------------------------|---|--------------|
| SWS Item | ECUC_ComM_00559 : | | |
| Name | ComMWakeupInhibitionEnabled | | |
| Description | true if wake up inhibition functionality enabled. true: Enabled false: 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 | | |

| | | | |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00783 : | | |
| Name | ComMGlobalNvMBlockDescriptor | | |
| Description | Reference to NVRAM block containing the none volatile data. If this parameter is not configured it means that no NVRam is used at all. | | |
| Multiplicity | 0..1 | | |
| Type | Symbolic name reference to [NvMBlockDescriptor] | | |
| 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: ECU dependency: Derived from NvM configuration | | |

No Included Containers

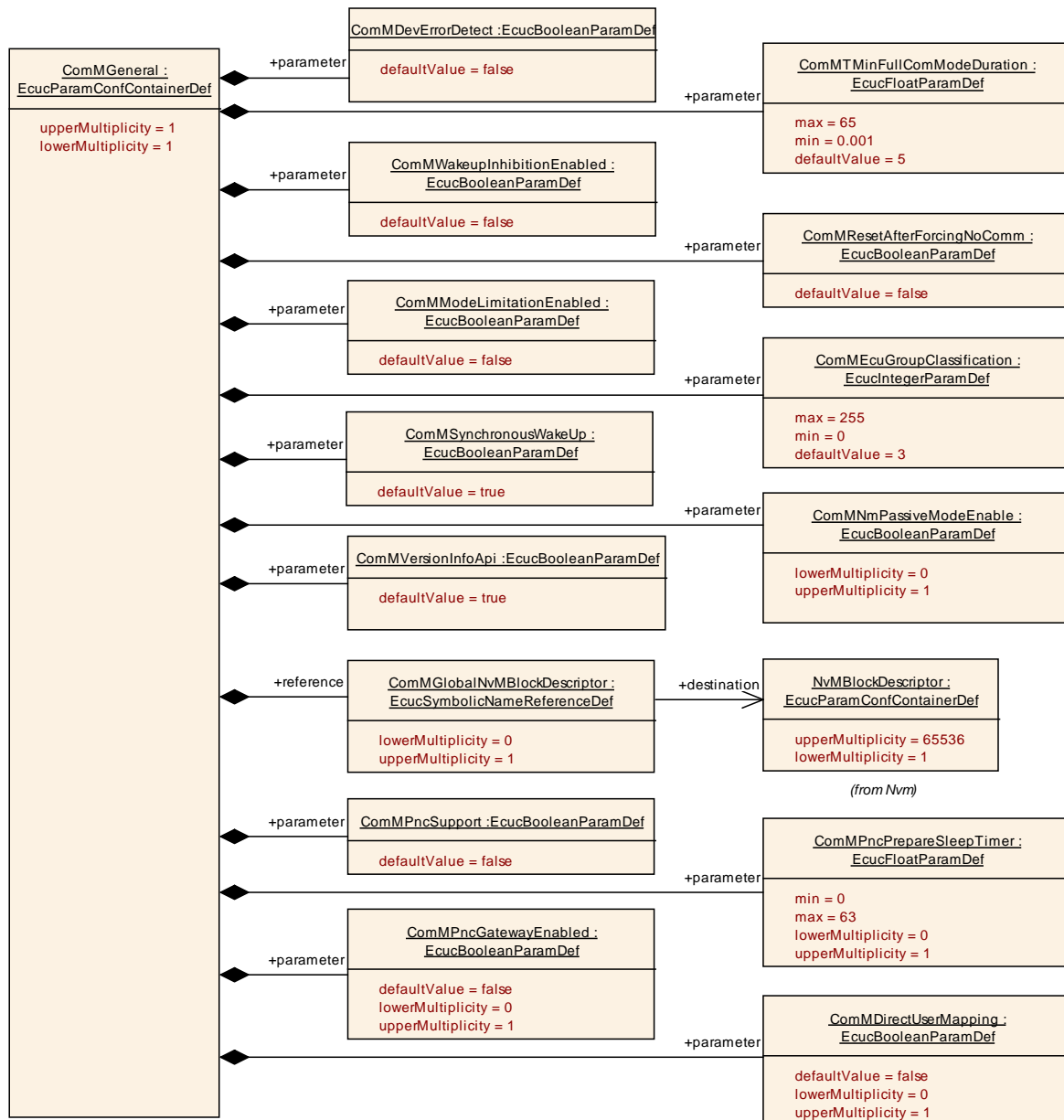


Figure 14: Configuration ComMGeneral

10.2.5 ComMConfigSet

| | |
|---------------------------------|---------------------------------------------------------------------------------------------------------------|
| SWS Item | ECUC_ComM_00879 : |
| Container Name | ComMConfigSet |
| Description | This container contains the configuration parameters and sub containers of the AUTOSAR ComM module. |
| Configuration Parameters | |
| SWS Item | ECUC_ComM_00878 : |
| Name | ComMPncEnabled |
| Description | Defines whether in this configuration set the partial networking is enabled. true: Enabled false: Disabled |

| | | | |
|-----------------------------------------|------------------------------------------|----|---------------------|
| Multiplicity | 0..1 | | |
| Type | EcucBooleanParamDef | | |
| Default value | false | | |
| Post-Build Variant Multiplicity | true | | |
| Post-Build Variant Value | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | -- | |
| | Post-build time | X | VARIANT-POST-BUILD |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | -- | |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: ECU dependency: ComMPncSupport | | |

| Included Containers | | |
|----------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Container Name | Multiplicity | Scope / Dependency |
| ComMChannel | 1..256 | This container contains the configuration (parameters) of the bus channel(s). The channel parameters shall be harmonized within the whole communication stack. |
| ComMPnc | 0..56 | This container contains the configuration of the partial network cluster (PNC). |
| ComMUser | 0..255 | This container contains a list of identifiers that are needed to refer to a user in the system which is designated to request Communication modes. |

10.2.6 ComMUser

| | |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| SWS Item | ECUC_ComM_00653 : |
| Container Name | ComMUser |
| Description | This container contains a list of identifiers that are needed to refer to a user in the system which is designated to request Communication modes. |
| Configuration Parameters | |

| | | | |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00654 : | | |
| Name | ComMUserIdentifier | | |
| Description | An identifier that is needed to refer to a user in the system which is designated to request Communication Modes. ImplementationType: ComM_UserHandleType | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 254 | | |
| Default value | -- | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: local dependency: EcuMUser: The concept of users is very similar to the concept of requestors in the ECU State Manager specification. These two parameters shall be harmonized during the configuration process. | | |

| | | | |
|-----------------|--------------------------|--|--|
| SWS Item | ECUC_ComM_00786 : | | |
|-----------------|--------------------------|--|--|

| | | | |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| Name | ComMUserEcucPartitionRef | | |
| Description | Denotes in which "EcucPartition" the requester is executed. When the partition is stopped, the communication request shall be cancelled in the ComM to avoid a stay-awake situation of the bus due to a stopped partition. | | |
| 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: ECU | | |

No Included Containers

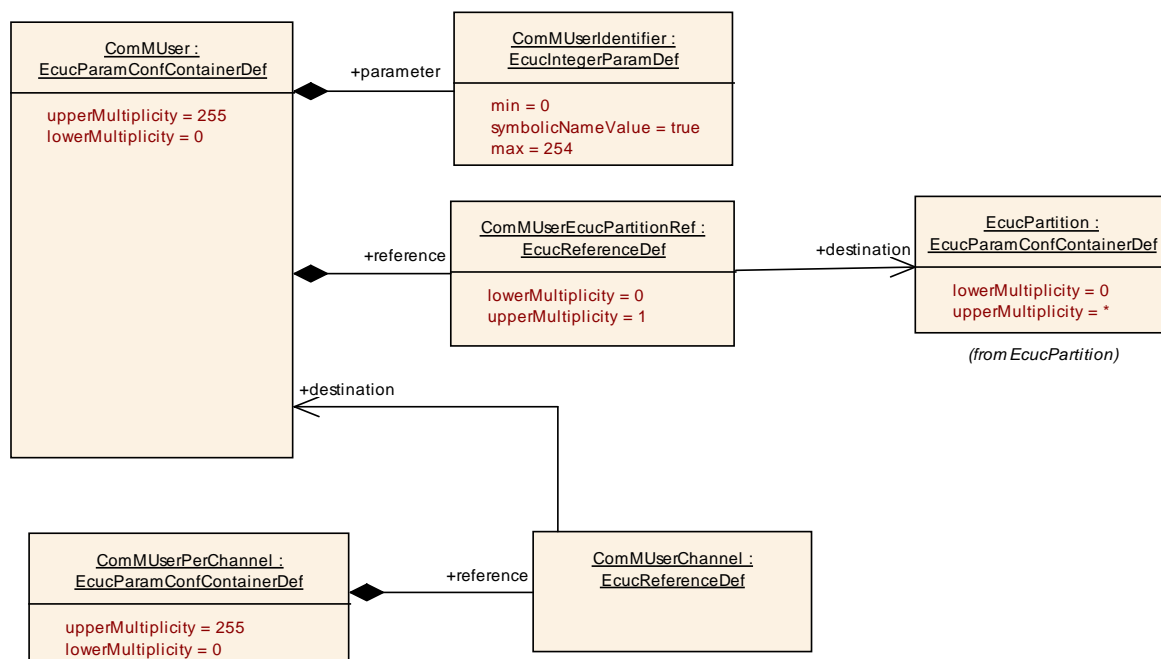


Figure 15: Configuration ComMUser

10.2.7 ComMChannel

| | |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| SWS Item | ECUC_ComM_00565 : |
| Container Name | ComMChannel |
| Description | This container contains the configuration (parameters) of the bus channel(s). The channel parameters shall be harmonized within the whole |

| | |
|---------------------------------|----------------------|
| | communication stack. |
| Configuration Parameters | |

| | | | |
|----------------------------------|-----------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00567 : | | |
| Name | ComMBusType | | |
| Description | Identifies the bus type of the channel. | | |
| Multiplicity | 1 | | |
| Type | EcucEnumerationParamDef | | |
| Range | COMM_BUS_TYPE_CAN | -- | |
| | COMM_BUS_TYPE_CDD | -- | |
| | COMM_BUS_TYPE_ETH | -- | |
| | COMM_BUS_TYPE_FR | -- | |
| | COMM_BUS_TYPE_INTERNAL | -- | |
| | COMM_BUS_TYPE_LIN | -- | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: ECU | | |

| | | | |
|-----------------------------------------|--------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00888 : | | |
| Name | ComMCDDBusPrefix | | |
| Description | Prefix to be used for API calls to CDD. | | |
| Multiplicity | 0..1 | | |
| Type | EcucStringParamDef | | |
| Default value | -- | | |
| maxLength | -- | | |
| minLength | -- | | |
| regularExpression | -- | | |
| 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 dependency: Only applicable if ComMBusType equals COMM_BUS_TYPE_CDD. | | |

| | | | |
|---------------------------|------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00635 : | | |
| Name | ComMChannelId | | |
| Description | Channel identification number of the corresponding channel. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 0 .. 255 | | |
| 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 | | |

| | |
|--|-----------------------------------------------------------------------------------------------|
| | dependency: Shall be harmonized with channel IDs of networkmanagement and the bus interfaces. |
|--|-----------------------------------------------------------------------------------------------|

| | | | |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00787 : | | |
| Name | ComMFullCommRequestNotificationEnabled | | |
| Description | Defines if the optional SenderReceiver Port of Interface ComM_CurrentChannelRequest will be provided for this channel. True means enabled. False means 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 dependency: Shall be stored none volatile (value must be kept during a reset). | | |

| | | | |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00556 : | | |
| Name | ComMMainFunctionPeriod | | |
| Description | Specifies the period in seconds that the MainFunction has to be triggered with. Comment: ComM scheduling shall be at least as fast as the communication stack and a schedule longer than 100ms makes no sense for communication. | | |
| Multiplicity | 1 | | |
| Type | EcucFloatParamDef | | |
| Range | 0.001 .. 0.1 | | |
| Default value | 0.02 | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: ECU | | |

| | | | |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00571 : | | |
| Name | ComMNoCom | | |
| Description | Not allowed to change state of ComM channel to COMM_SILENT_COMMUNICATION or COMM_FULL_COMMUNICATION. true: Enabled - Not allowed to switch to Communication Modes above. false: Disabled - Allowed to switch Communication Modes above. Shall be possible to change parameter during runtime with ComM API's. ECU/All channels: ComM_LimitECUToNoComMode(). Separate channels: ComM_LimitChannelToNoComMode(). | | |
| 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 dependency: ComMModeLimitationEnabled | | |

| | | | |
|-----------------|--------------------------|--|--|
| SWS Item | ECUC_ComM_00789 : | | |
|-----------------|--------------------------|--|--|

| | | | |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| Name | ComMNoWakeUpInhibitionNvmStorage | | |
| Description | If this parameter is set to "true", the NoWakeUp inhibition state of the channel shall be stored (in some implementation specific way) in the block pointed to by ComMGlobalNvmBlockDescriptor. | | |
| Multiplicity | 1 | | |
| Type | EcucBooleanParamDef | | |
| Default value | -- | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: local dependency: If the parameter is set to true, a valid Nvm block reference must be given in the (existing, i.e. multiplicity 1) ComMGlobalNvmBlockDescriptor pointing to a sufficiently big Nvm block. | | |

| | | | |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00569 : | | |
| Name | ComMNoWakeUp | | |
| Description | Defines if an ECU is not allowed to wake-up the channel. true: Enabled (not allowed to wake-up) false: Disabled This is the default/init value of a runtime variable that can be changed during runtime using ComM_PreventWakeUp(). | | |
| 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 dependency: Shall be stored none volatile (value must be kept during a reset). | | |

| | | | |
|----------------------------------|--------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00842 : | | |
| Name | ComMPncGatewayType | | |
| Description | Identifies the Partial Network Gateway behaviour of a ComMChannel. | | |
| Multiplicity | 0..1 | | |
| Type | EcucEnumerationParamDef | | |
| Range | COMM_GATEWAY_TYPE_ACTIVE | -- | |
| | COMM_GATEWAY_TYPE_PASSIVE | -- | |
| 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: ECU | | |

| Included Containers | | |
|----------------------------|---------------------|--------------------------------------------------------------------------------|
| Container Name | Multiplicity | Scope / Dependency |
| ComMNetworkManagement | 1 | This container contains the configuration parameters of the networkmanagement. |

| | | |
|--------------------|--------|------------------------------------------------------------------------------------------------------------------------------|
| ComMUserPerChannel | 0..255 | This container contains a list of identifiers that are needed to refer to a user in the system which is linked to a channel. |
|--------------------|--------|------------------------------------------------------------------------------------------------------------------------------|

[SWS_ComM_00690] [Configuration parameter `ComMNoCom` (see [ECUC_ComM_00571](#)) need not to be evaluated in case `ComMModeLimitationEnabled = FALSE = Disabled` (see [ECUC_ComM_00560](#)) thus it can be removed in that case to reduce/optimize the configuration.] ()

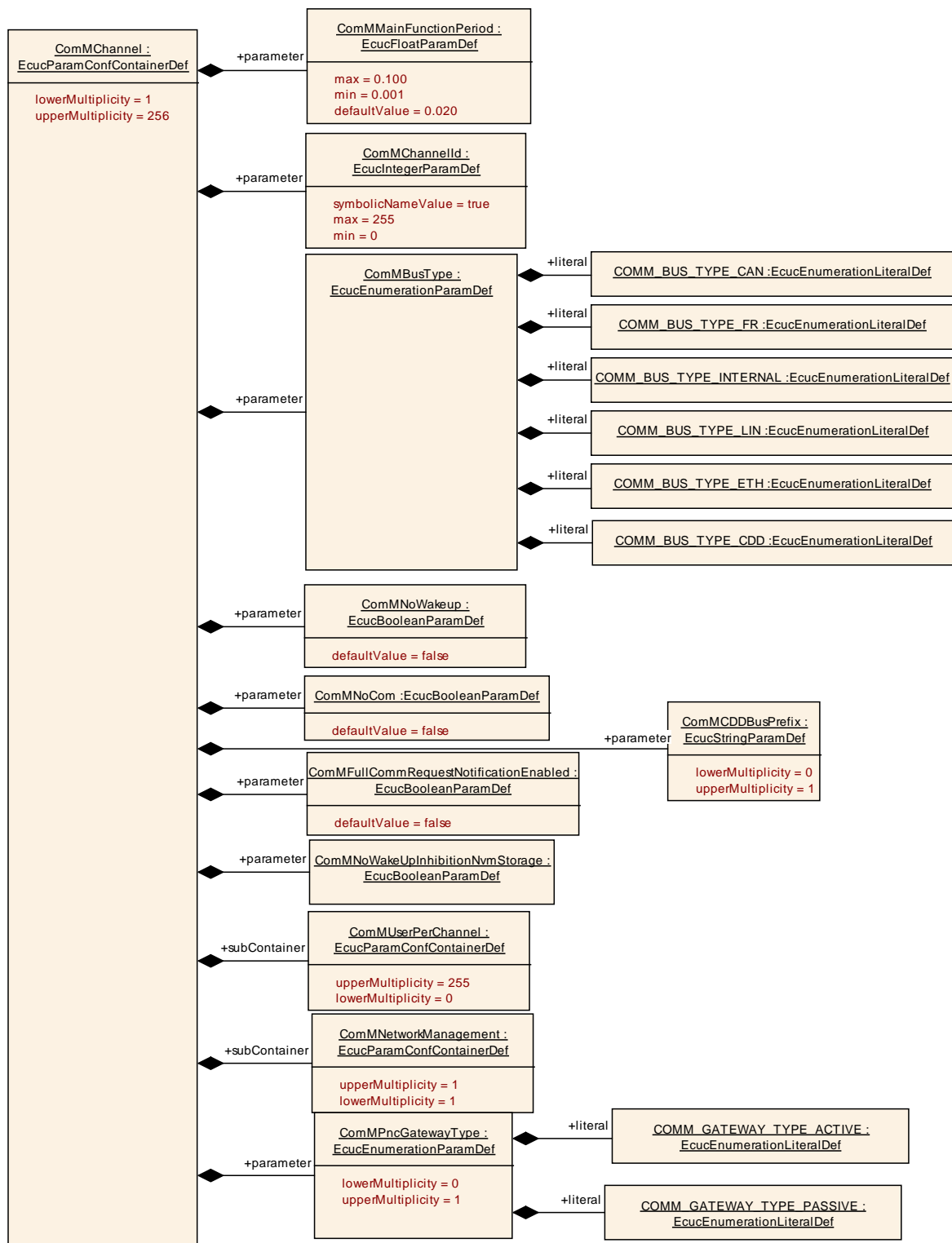


Figure 16: Configuration ComMChannel

10.2.8 ComMNetworkManagement

| | |
|---------------------------------|--------------------------------------------------------------------------------|
| SWS Item | ECUC_ComM_00607 : |
| Container Name | ComMNetworkManagement |
| Description | This container contains the configuration parameters of the networkmanagement. |
| Configuration Parameters | |

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|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00606 : | | |
| Name | ComMNmLightTimeout | | |
| Description | Defines the timeout (in seconds) after COMM_FULL_COMMUNICATION sub-state COMM_FULL_COM_READY_SLEEP is left. The range shall be greater than 0.0 and less or equal to 255.0. | | |
| Multiplicity | 0..1 | | |
| Type | EcucFloatParamDef | | |
| Range | 0 .. 255 | | |
| Default value | 10 | | |
| 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 dependency: Only used if ComMNmVariant is configured as ComMLight | | |

| | | | |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------------------------------------------------------------------|
| SWS Item | ECUC_ComM_00568 : | | |
| Name | ComMNmVariant | | |
| Description | Defines the functionality of the networkmanagement. Shall be harmonized with NM configuration. | | |
| Multiplicity | 1 | | |
| Type | EcucEnumerationParamDef | | |
| Range | FULL | | AUTOSAR NM available (default). |
| | LIGHT | | No AUTOSAR NM available but functionality to shut down a channel. |
| | NONE | | No NM available |
| | PASSIVE | | AUTOSAR NM running in passive mode available. |
| Default value | FULL | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: local dependency: If ComMNmPassiveModeEnable is enabled the values are limited to LIGHT, NONE, PASSIVE; If ComMNmPassiveModeEnable is disabled the values are limited to LIGHT, NONE, FULL.; ComMNmVariant shall be NONE if ComMBusType = COMM_BUS_TYPE_INTERNAL | | |

| | | | |
|--------------------|-----------------------------------------------------------------------|--|--|
| SWS Item | ECUC_ComM_00886 : | | |
| Name | ComMPncNmRequest | | |
| Description | If this parameter equals true then every time a FULL Communication is | | |

| | | | |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------|----|--------------|
| | requested due to a change in the PNC state machine to PNC_REQUESTED Nm shall be called using the API Nm_NetworkRequest. | | |
| 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 dependency: It shall only be possible to set ComMPncNmRequest to TRUE, if ComMNmVariant is FULL. | | |

No Included Containers

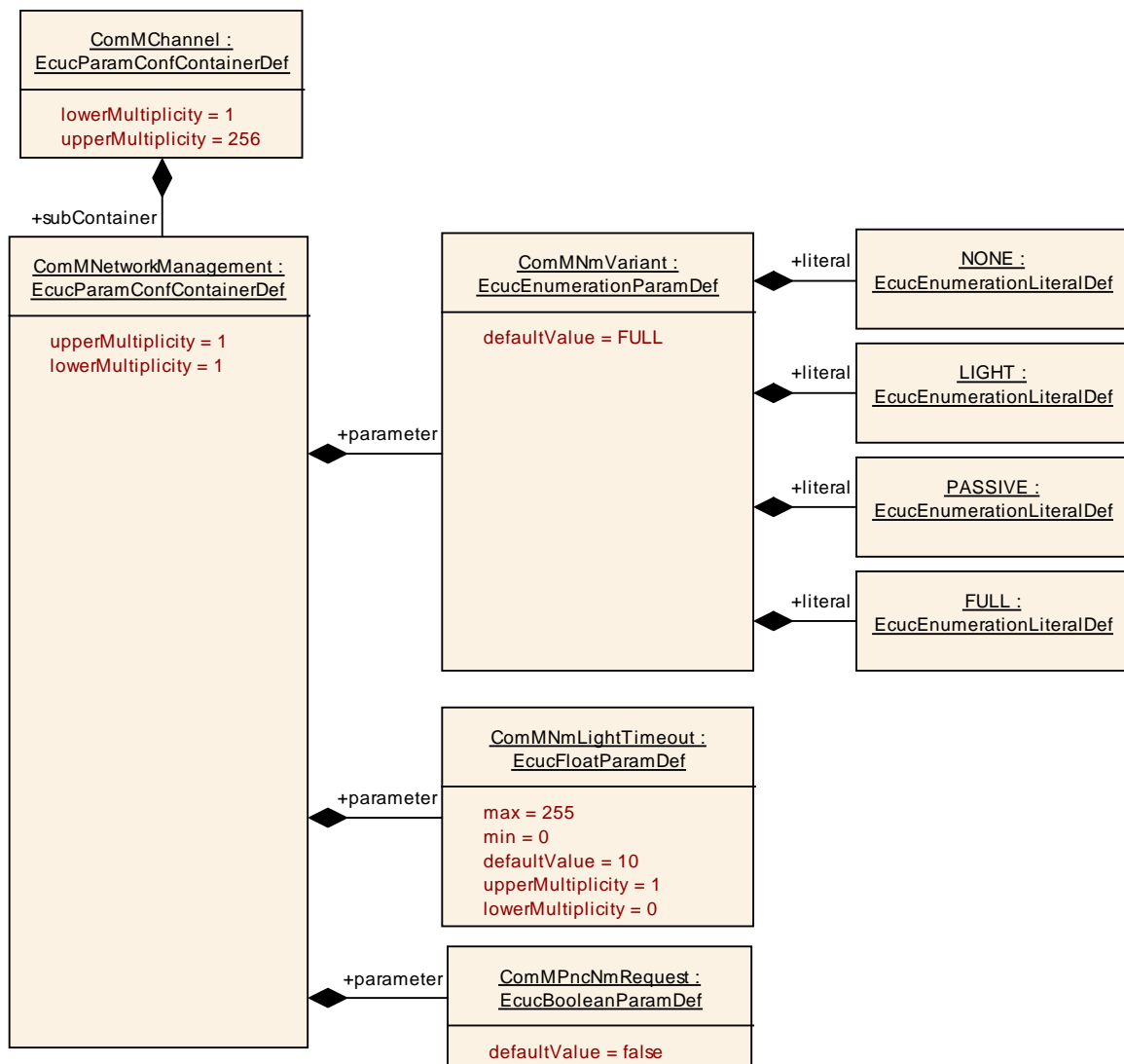


Figure 17: Configuration ComMNetworkManagement

10.2.9 ComMUserPerChannel

| | |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| SWS Item | ECUC_ComM_00657 : |
| Container Name | ComMUserPerChannel |
| Description | This container contains a list of identifiers that are needed to refer to a user in the system which is linked to a channel. |
| Configuration Parameters | |

| | | | |
|----------------------------------|-------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00658 : | | |
| Name | ComMUserChannel | | |
| Description | Reference to the ComMUser that corresponds to this channel user. ImplementationType: COMM_UserHandleType | | |
| Multiplicity | 1 | | |
| Type | Reference to [ComMUser] | | |
| 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

10.2.10 ComMPnc

| | |
|---------------------------------|---------------------------------------------------------------------------------|
| SWS Item | ECUC_ComM_00843 : |
| Container Name | ComMPnc |
| Description | This container contains the configuration of the partial network cluster (PNC). |
| Configuration Parameters | |

| | | | |
|----------------------------------|------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00874 : | | |
| Name | ComMPncId | | |
| Description | Partial network cluster identification number. | | |
| Multiplicity | 1 | | |
| Type | EcucIntegerParamDef (Symbolic Name generated for this parameter) | | |
| Range | 8 .. 63 | | |
| 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 | | |

| | | | |
|-----------------------------------------|------------------------------------------------------------------------------------------------------|----|---------------------|
| SWS Item | ECUC_ComM_00880 : | | |
| Name | ComMChannelPerPnc | | |
| Description | Reference to the ComMChannel that is required for this PNC. ImplementationType: NetworkHandleType | | |
| Multiplicity | 1..256 | | |
| Type | Reference to [ComMChannel] | | |
| Post-Build Variant Multiplicity | true | | |
| Post-Build Variant Value | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | -- | |

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

| | | | |
|-----------------------------------------|----------------------------------------------------------------------------------------------------|----|---------------------|
| SWS Item | ECUC_ComM_00876 : | | |
| Name | ComMUserPerPnc | | |
| Description | Reference to the ComMUsers that correspond to this PNC. ImplementationType: COMM_UserHandleType | | |
| Multiplicity | 0..255 | | |
| Type | Reference to [ComMUser] | | |
| Post-Build Variant Multiplicity | true | | |
| Post-Build Variant Value | true | | |
| Multiplicity Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | -- | |
| | Post-build time | X | VARIANT-POST-BUILD |
| Value Configuration Class | Pre-compile time | X | VARIANT-PRE-COMPILE |
| | Link time | -- | |
| | Post-build time | X | VARIANT-POST-BUILD |
| Scope / Dependency | scope: local | | |

| Included Containers | | |
|----------------------------|---------------------|-------------------------------------------------------------------------------------------------|
| Container Name | Multiplicity | Scope / Dependency |
| ComMPncComSignal | 0..* | Represents the PncComSignals which are used to communicate the EIRA and ERA status of this PNC. |

10.2.11 ComMPncComSignal

| | |
|---------------------------------|-------------------------------------------------------------------------------------------------|
| SWS Item | ECUC_ComM_00881 : |
| Container Name | ComMPncComSignal |
| Description | Represents the PncComSignals which are used to communicate the EIRA and ERA status of this PNC. |
| Configuration Parameters | |

| | | | |
|----------------------------------|-------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00885 : | | |
| Name | ComMPncComSignalDirection | | |
| Description | Indicates the communication direction of this PncComSignal. | | |
| Multiplicity | 1 | | |
| Type | EcucEnumerationParamDef | | |
| Range | RX | -- | |
| | TX | -- | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: local | | |

| | | | |
|-----------------|--------------------------|--|--|
| SWS Item | ECUC_ComM_00883 : | | |
|-----------------|--------------------------|--|--|

| | | | |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| Name | ComMPncComSignalKind | | |
| Description | Indicates whether this PncComSignal represents EIRA or ERA PNC information. This parameter ComMPncComSignalKind is optional and shall be ignored when ComMPncComSignalDirection equals TX. | | |
| Multiplicity | 0..1 | | |
| Type | EcucEnumerationParamDef | | |
| Range | EIRA | -- | |
| | ERA | -- | |
| 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 dependency: This parameter ComMPncComSignalKind shall be ignored when ComMPncComSignalDirection equals TX. | | |

| | | | |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00884 : | | |
| Name | ComMPncComSignalChannelRef | | |
| Description | Reference to the ComMChannel which is used to determine whether this PncComSignal shall participate in the active or passive role (via the parameter ComMPncGatewayType of the ComMChannel). | | |
| Multiplicity | 0..1 | | |
| Type | Reference to [ComMChannel] | | |
| 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 dependency: ComMPncGatewayEnabled | | |

| | | | |
|----------------------------------|--------------------------------------------------------------------------------------------------------|----|--------------|
| SWS Item | ECUC_ComM_00882 : | | |
| Name | ComMPncComSignalRef | | |
| Description | Reference to the ComSignal which is used to transport the partial network channel request information. | | |
| Multiplicity | 1 | | |
| Type | Symbolic name reference to [ComSignal] | | |
| Post-Build Variant Value | false | | |
| Value Configuration Class | Pre-compile time | X | All Variants |
| | Link time | -- | |
| | Post-build time | -- | |
| Scope / Dependency | scope: ECU | | |

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|-------------------------------|
| No Included Containers |
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10.3 Published information

[SWS_ComM_00418] [The version information in the module header and source files shall be validated and consistent (e.g. by comparing the version information in the module header and source files with a pre-processor macro).] (SRS_BSW_00004)

11 Not applicable requirements

[SWS_ComM_00499] [These requirements are not applicable to this specification.
] (SRS_BSW_00005, SRS_BSW_00009, SRS_BSW_00010, SRS_BSW_00161,
SRS_BSW_00162, SRS_BSW_00164, SRS_BSW_00168, SRS_BSW_00170,
SRS_BSW_00314, SRS_BSW_00325, SRS_BSW_00326, SRS_BSW_00341,
SRS_BSW_00343, SRS_BSW_00344, SRS_BSW_00353, SRS_BSW_00361,
SRS_BSW_00375, SRS_BSW_00378, SRS_BSW_00398, SRS_BSW_00404,
SRS_BSW_00405, SRS_BSW_00413, SRS_BSW_00416, SRS_BSW_00417,
SRS_BSW_00422, SRS_BSW_00423, SRS_BSW_00424, SRS_BSW_00425,
SRS_BSW_00426, SRS_BSW_00427, SRS_BSW_00428, SRS_BSW_00429,
BSW00431, SRS_BSW_00432, SRS_BSW_00433, BSW00434, SRS_BSW_00437,
SRS_BSW_00438, SRS_BSW_00439)