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1 Introduction and functional overview

This specification specifies the functionality, API and the configuration of the AUTOSAR Basic Software module J1939 Network Management.

1.1 Network Management according to SAE J1939

In contrast to other AUTOSAR network management approaches, the task of J1939 network management is not to handle sleep and wake-up of ECUs, but to assign a unique address to each ECU.
This is achieved by sending the AddressClaimed (AC, 0x0EE00) parameter group (PG) at start-up, which announces the desired address. If another ECU claims the same address, and has higher priority, the ECU has to go silent after sending the CannotClaimAddress parameter group (AC with null address 0xFE as source address). The AddressClaimed PG must also be sent upon request.

1.2 J1939 Network Management BSW Module

The J1939 Network Management module (J1939Nm) handles received and transmitted AddressClaimed (AC) PGs. It supports transmission of AC on start-up, after a contending AC received from another node, and on request (triggered by the J1939 Request Manager).

Besides this, the J1939 Network Management module also ensures that the ECU does not send any messages during startup or after address loss.

2 Acronyms and abbreviations

Abbreviation / Acronym:	***Description:***
AC	J1939 AddressClaimed PG (PGN = 0x0EE00)
BSW	Basic Software (module)
Node	J1939 node – can be attached to more than one channel
NodeChannel	The connection of a node to one channel
PG	Parameter Group
PGN	Parameter Group Number
RQST	J1939 Request PG (PGN = 0x0EA00)

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] General Specification of Basic Software Modules
AUTOSAR_SWS_BSWGeneral.pdf

[5] Requirements on BSW Modules for SAE J1939
AUTOSAR_SRS_J1939.pdf

[6] Requirements on Network Management
AUTOSAR_SRS_J1939.pdf

[7] Specification of Communication Stack Types
AUTOSAR_SWS_CommunicationStackTypes.pdf

[8] System Template
AUTOSAR_TPS_SystemTemplate.pdf

[9] Specification of CAN Interface
AUTOSAR_SWS_CANInterface.pdf

[10] Specification of Network Management Interface
AUTOSAR_SWS_NetworkManagementInterface.pdf

[11] Specification of Basic Software Mode Manager
AUTOSAR_SWS_BSWModeManager.pdf

[12] Specification of a Request Manager for SAE J1939
AUTOSAR_SWS_SAEJ1939RequestManager.pdf

[13] Specification of Development Error Tracer
AUTOSAR_SWS_DevelopmentErrorTracer.pdf

[14] Specification of Diagnostic Event Manager
AUTOSAR_SWS_DiagnosticEventManager.pdf

[15] Specification of BSW Scheduler
AUTOSAR_SWS_BSWScheduler.pdf

[16] Specification of ECU Configuration
AUTOSAR_TPS_ECUConfiguration.pdf

[17] Specification of Memory Mapping
AUTOSAR_SWS_MemoryMapping.pdf

3.2 Related standards and norms

[18] J1939-81 JUN2011, Network Management

3.3 Related specification

AUTOSAR provides a General Specification on Basic Software modules [4] (SWS BSW General), which is also valid for the SAE J1939 Network Management module.

Thus, the specification SWS BSW General shall be considered as additional and required specification for SAE J1939 Transport Layer.

4 Constraints and assumptions

4.1 Limitations

The J1939 Network Management module does not support changing of the address, neither after a CommandedAddress PG, nor after address loss. It also does not support for Name Management.

4.2 Applicability to car domains

J1939 is developed by the SAE as a standard for heavy-duty on-highway, farming, and construction vehicles. It is not applicable to passenger cars or light trucks. The J1939 Request Manager will for now only be used in heavy-duty on-highway vehicles, because other domains are currently excluded by AUTOSAR.

5 Dependencies to other modules

The J1939 Network Management module (J1939Nm) has interfaces towards the CAN Interface (CanIf), the J1939 Request Manager (J1939Rm), the Network Management Interface (Nm), the Diagnostic Event Manager (DEM), and the Development Error Tracer (DET).

The J1939 Network Management module includes header files of the CAN Interface, the Network Management Interface, the J1939 Request Manager, the Diagnostic Event Manager, and the Development Error Tracer.

5.1 File structure

5.1.1 Code file structure

For details, refer to the section 5.1.6 "Code file structure" of the SWS BSW General [4].

5.1.2 Header file structure

Besides the files defined in section 5.1.7 “Header file structure” of the SWS BSW General [4], the J1939 Network Management module needs to include the files defined below.

[SWS_J1939Nm_00001] [The implementation and callback header files (J1939Nm.h and J1939Nm_Cbk.h) shall include the file J1939Nm_Types.h.] (SRS_BSW_00415)

[SWS_J1939Nm_00008] [The header file J1939Nm_Types.h shall include the file ComStack_Types.h.] (SRS_BSW_00415)

The following picture shows the include hierarchy of the J1939 Network Management module.

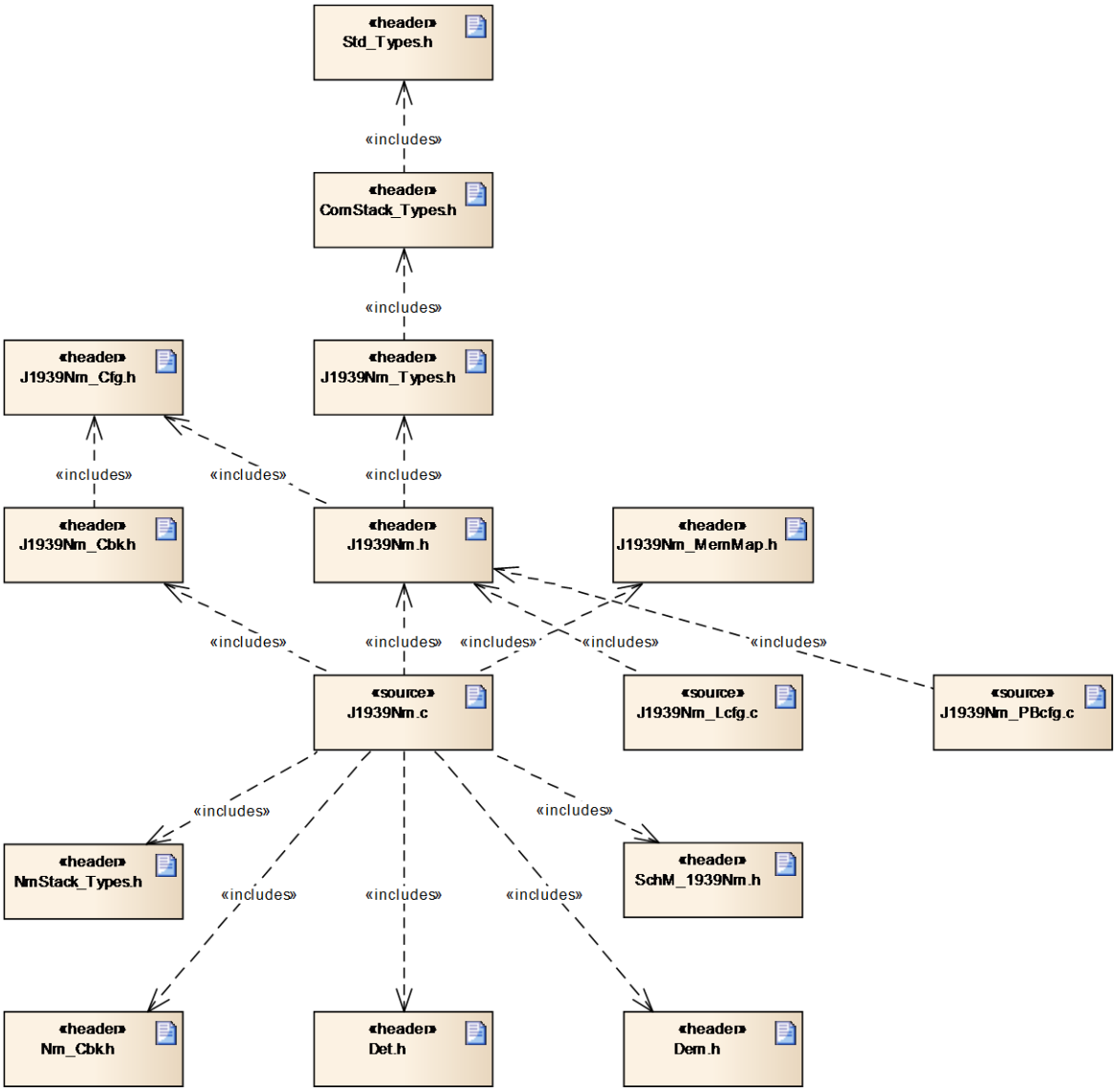

Figure 1: Include hierarchy of J1939Nm

6 Requirements traceability

Requirement	Description	Satisfied by
-	-	SWS_J1939Nm_00004
-	-	SWS_J1939Nm_00005
-	-	SWS_J1939Nm_00006
-	-	SWS_J1939Nm_00024
-	-	SWS_J1939Nm_00025
-	-	SWS_J1939Nm_00026
-	-	SWS_J1939Nm_00027
-	-	SWS_J1939Nm_00028
-	-	SWS_J1939Nm_00029
-	-	SWS_J1939Nm_00030
-	-	SWS_J1939Nm_00036
-	-	SWS_J1939Nm_00037
-	-	SWS_J1939Nm_00038
-	-	SWS_J1939Nm_00039
-	-	SWS_J1939Nm_00040
-	-	SWS_J1939Nm_00041
-	-	SWS_J1939Nm_00042
-	-	SWS_J1939Nm_00052
-	-	SWS_J1939Nm_00054
-	-	SWS_J1939Nm_00059
-	-	SWS_J1939Nm_00060
-	-	SWS_J1939Nm_00067
-	-	SWS_J1939Nm_00068
-	-	SWS_J1939Nm_00069
-	-	SWS_J1939Nm_00070
SRS_BSW_00407	Each BSW module shall provide a function to read out the version information of a dedicated module implementation	SWS_J1939Nm_00033
SRS_BSW_00415	Interfaces which are provided exclusively for one module shall be separated into a dedicated header file	SWS_J1939Nm_00001, SWS_J1939Nm_00008
SRS_J1939_00030	The J1939 Network Management module shall provide an interface for module initialization	SWS_J1939Nm_00002, SWS_J1939Nm_00007, SWS_J1939Nm_00031
SRS_J1939_00031	The J1939 Network Management module shall	SWS_J1939Nm_00003, SWS_J1939Nm_00032

	provide an interface for module shutdown	
SRS_J1939_00032	The J1939 Network Management module shall report a failed address claim to the Diagnostic Event Manager	SWS_J1939Nm_00012, SWS_J1939Nm_00034, SWS_J1939Nm_00035
SRS_J1939_00033	The J1939 Network Management module shall perform an initial address claim at startup	SWS_J1939Nm_00009, SWS_J1939Nm_00016, SWS_J1939Nm_00017, SWS_J1939Nm_00019, SWS_J1939Nm_00062
SRS_J1939_00034	The J1939 Network Management module shall react correctly to contending address claims	SWS_J1939Nm_00014, SWS_J1939Nm_00016, SWS_J1939Nm_00017, SWS_J1939Nm_00018, SWS_J1939Nm_00019, SWS_J1939Nm_00020, SWS_J1939Nm_00021, SWS_J1939Nm_00062
SRS_J1939_00035	The J1939 Network Management module shall react to requests for the AddressClaimed PG	SWS_J1939Nm_00016, SWS_J1939Nm_00017, SWS_J1939Nm_00018, SWS_J1939Nm_00019, SWS_J1939Nm_00022, SWS_J1939Nm_00023, SWS_J1939Nm_00043, SWS_J1939Nm_00062
SRS_J1939_00036	The J1939 Network Management module shall only allow communication after a successful address claim	SWS_J1939Nm_00010, SWS_J1939Nm_00011, SWS_J1939Nm_00015, SWS_J1939Nm_00021, SWS_J1939Nm_00044, SWS_J1939Nm_00045, SWS_J1939Nm_00063, SWS_J1939Nm_00064, SWS_J1939Nm_00065, SWS_J1939Nm_00066
SRS_J1939_00037	The J1939 Network Management module shall delay communication after initial address claim	SWS_J1939Nm_00010, SWS_J1939Nm_00013, SWS_J1939Nm_00061, SWS_J1939Nm_00063

7 Functional specification

This chapter defines the behavior of the J1939 Network Management module. The API of the module is defined in chapter 8, while the configuration is defined in chapter 10.

7.1 Overview

The J1939 Network Management module supports transmission and reception of AddressClaimed PGs, and handling of requests for the AddressClaimed PG. It also ensures that the ECU does not send messages during the initial address claiming phase or after the ECU sent a CannotClaimAddress PG because it lost its address to a contending address claim.

7.2 Module Handling

This section contains description of auxiliary functionality of the J1939 Network Management module.

7.2.1 Initialization

The J1939 Network Management module is initialized via J1939Nm_Init, and de-initialized via J1939Nm_DeInit. Except for J1939Nm_GetVersionInfo and J1939Nm_Init, the API functions of the J1939 Network Management module may only be called after the module has been properly initialized.

[SWS_J1939Nm_00002] [A call to J1939Nm_Init initializes all internal variables and sets the J1939 Network Management module to the initialized state.] (SRS_J1939_00030)

[SWS_J1939Nm_00003] [A call to J1939Nm_DeInit sets the J1939 Network Management module back to the uninitialized state.] (SRS_J1939_00031)

[SWS_J1939Nm_00004] [If DET reporting is enabled via J1939NmDevErrorDetect, the J1939 Network Management module shall call Det_ReportError with the error code J1939NM_E_UNINIT when any API other than J1939Nm_Init or J1939Nm_GetVersionInfo is called in uninitialized state.] ()

[SWS_J1939Nm_00005] [When J1939Nm_Init is called in initialized state, the J1939 Network Management module shall not re-initialize its internal variables. It shall instead call Det_ReportError with the error code J1939NM_E_REINIT if DET reporting is enabled via J1939NmDevErrorDetect.] ()

7.2.2 Timing Related Functionality

To be able to measure times, the J1939 Network Management module is triggered cyclically via the J1939Nm_MainFunction.

[SWS_J1939Nm_00006] [The J1939 Network Management module shall use the J1939Nm_MainFunction for timing related purposes.] ()

The recovery after a bus off must be delayed by a random time to avoid repeating bus offs when two nodes try to claim the same address. This random delay is also required when sending a CannotClaimAddress PG after a contending address claim or after a request for the AddressClaimed PG.

[SWS_J1939Nm_00068] [The J1939Nm shall calculate a random number for delaying bus off recovery and transmission of a CannotClaimAddress PG. The calculation shall use the NAME of a node as seed.] ()

[SWS_J1939Nm_00069] [When J1939Nm_GetBusOffDelay is called, J1939Nm shall return a random number based on the NAMEs of all nodes attached to the reported channel. This random number gives the delay time, based on the ticktime configured via J1939NmBusOffDelayTickPeriod.] ()

7.3 Network Management States of the J1939Nm

While the NM Interface handles network management states on channel level, the J1939 Network Management module needs a finer granularity, because several nodes can be attached to each channel. The connection of a node to one channel is called NodeChannel hereafter.

The following picture shows the internal NM related states of the J1939 Network Management module for one of its NodeChannels (i.e. one channel of a single node), and the transitions between these states:

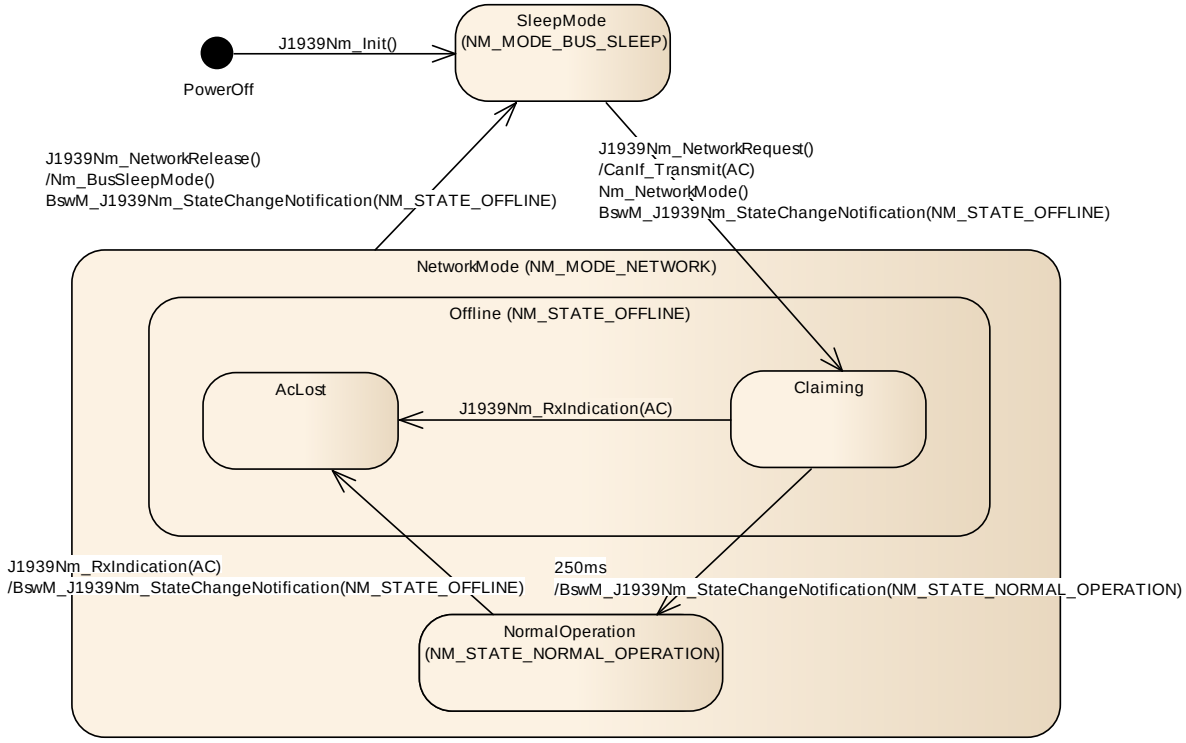

Figure 2: Internal states of J1939Nm with startup delay

The J1939 Network Management module reports state changes to the NM Interface and to the Basic Software Mode Manager (BswM).

While the states reported to the NM Interface are accumulated states of all NodeChannels of a CAN channel, the J1939 Network Management module reports states to the BswM separately for each NodeChannel.

7.3.1 ECU Startup

The J1939 Network Management module starts all NodeChannels in ‘SleepMode’ (corresponding to NM_MODE_BUS_SLEEP). The CAN channels will be switched to ‘NetworkMode’ (corresponding to NM_MODE_NETWORK) immediately afterwards by a network request issued from the ComM via NM Interface.

[SWS_J1939Nm_00007] [During initialization via J1939Nm_Init, the J1939 Network Management module shall silently assume the ‘SleepMode’ for all NodeChannels.] (SRS_J1939_00030)

[SWS_J1939Nm_00009] [A call to J1939Nm_NetworkRequest shall set all NodeChannels of the reported channel to ‘NetworkMode’. The J1939 Network Management module shall notify this mode change to the NM Interface via Nm_NetworkMode, and shall trigger transmission of an AddressClaimed PG for each NodeChannel.] (SRS_J1939_00033)

The transmission of the AddressClaimed PG is described in detail in section 7.4.

When entering the network mode, the behavior of the J1939 Network Management module depends on the configuration parameter J1939NmNodeStartupDelay. Controlled by this parameter, the J1939 Network Management module switches the state of the affected NodeChannels either to the sub state ‘Claiming’ of the state ‘Offline’ (corresponding to NM_STATE_OFFLINE), or to the state ‘NormalOperation’ (corresponding to NM_STATE_NORMAL_OPERATION).

[SWS_J1939Nm_00010] [If a node of the J1939 Network Management module is configured for deferred online state (J1939NmNodeStartUpDelay enabled), its NodeChannels shall enter the sub state ‘Claiming’ of the state ‘Offline’ immediately after the switch from ‘SleepMode’ to ‘NetworkMode’. The J1939 Network Management module shall report this state change to the Basic Software Mode Manager via BswM_J1939Nm_StateChangeNotification(NM_STATE_OFFLINE).] (SRS_J1939_00036, SRS_J1939_00037)

[SWS_J1939Nm_00011] [If a node of the J1939 Network Management module is configured for immediate online state (J1939NmNodeStartUpDelay disabled), its NodeChannels shall enter the state ‘NormalOperation’ immediately after the switch from ‘SleepMode’ to ‘NetworkMode’. The J1939 Network Management module shall report this state change to the Basic Software Mode Manager via BswM_J1939Nm_StateChangeNotification(NM_STATE_NORMAL_OPERATION).] (SRS_J1939_00036)

The NM Interface expects an accumulated channel state.

[SWS_J1939Nm_00063] [When all NodeChannels of a channel are configured for deferred online state (J1939NmNodeStartUpDelay enabled), the J1939 Network Management module shall report the state change of these NodeChannels to the ‘Offline’ state immediately to the NM Interface via Nm_StateChangeNotification(NM_STATE_OFFLINE).] (SRS_J1939_00036, SRS_J1939_00037)

[SWS_J1939Nm_00064] [When the first NodeChannel of a channel changes its state to ‘NormalOperation’, the J1939 Network Management module shall report this state change immediately to the NM Interface via Nm_StateChangeNotification(NM_STATE_NORMAL_OPERATION).] (SRS_J1939_00036)

When a NodeChannel has stayed for 250ms in state ‘Claiming’ after transmission of the initial AddressClaimed PG, it will switch to state ‘NormalOperation’.

[SWS_J1939Nm_00061] [When J1939Nm_TxConfirmation is called for the initial AddressClaimed PG of a NodeChannel (transmitted during the transition to the ‘Claiming’ sub state), the J1939 Network Management module shall start the delay timer for this NodeChannel.] (SRS_J1939_00037)

[SWS_J1939Nm_00013] [When the delay timer of a NodeChannel expires in sub state ‘Claiming’, the J1939 Network Management module shall switch that NodeChannel to state ‘NormalOperation’ and shall report this state change to the Basic Software Mode Manager via

BswM_J1939Nm_StateChangeNotification(NM_STATE_NORMAL_OPERATION).] (SRS_J1939_00037)

7.3.2 Address Loss

When a node of the J1939 Network Management module loses its claimed address on one of its channels (see section 7.5), it will switch that NodeChannel to the sub state 'AcLost' of state 'Offline', notifying the NM Interface and the BswM of this state change and sending a CannotClaimAddress PG for the losing node on that channel (see section 7.4).

[SWS_J1939Nm_00014] [When a NodeChannel loses its address in 'NetworkMode', it shall switch to the sub state 'AcLost' of state 'Offline' and, after a delay calculated according to [SWS_J1939Nm_00068], trigger transmission of a CannotClaimAddress PG.] (SRS_J1939_00034)

[SWS_J1939Nm_00065] [When a NodeChannel switches from state 'NormalOperation' to the sub state 'AcLost' of state 'Offline', the J1939 Network Management module shall notify the Basic Software Mode Manager via BswM_J1939Nm_StateChangeNotification(NM_STATE_OFFLINE).] (SRS_J1939_00036)

[SWS_J1939Nm_00066] [When the last NodeChannel of a channel changes its state to 'Offline', the J1939 Network Management module shall report this state change immediately to the NM Interface via Nm_StateChangeNotification(NM_STATE_OFFLINE).] (SRS_J1939_00036)

7.3.3 ECU Shutdown

To shut down the network, ComM calls the Nm_NetworkRelease API of the NM Interface, which in turn calls J1939Nm_NetworkRelease. The J1939 Network Management module will then switch to 'SleepMode', and notify this to the NM Interface.

[SWS_J1939Nm_00015] [A call to J1939Nm_NetworkRelease shall set all NodeChannels of the reported channel to 'SleepMode'. The J1939 Network Management module shall notify this mode change to the NM Interface via Nm_BusSleepMode, and shall report a state change to 'SleepMode' to the NM Interface via Nm_StateChangeNotification(NM_STATE_BUS_SLEEP).] (SRS_J1939_00036)

7.4 Transmission of AddressClaimed

For each NodeChannel, the J1939 Network Management module needs to ensure that a contending AddressClaimed PG or a request for AddressClaimed is answered by at least one AddressClaimed PG. If an AddressClaimed PG is still pending for that NodeChannel, but now a CannotClaimAddress PG must be sent, it suffices to send

the CannotClaimAddress. Therefore, a single buffer per NodeChannel that stores only the last transmission request is sufficient.

For the transmission of both the AddressClaimed and the CannotClaimAddress PG, the J1939 Network Management module uses just one I-PDU per channel with variable source address and a MetaDataLength >= 1.

[SWS_J1939Nm_00016] ⌈When the J1939 Network Management module needs to send an AddressClaimed (or CannotClaimAddress) PG, and no previous transmission is pending, it shall directly forward the corresponding I-PDU to the CAN Interface via CanIf_Transmit.⌋ (SRS_J1939_00033, SRS_J1939_00034, SRS_J1939_00035)

[SWS_J1939Nm_00017] ⌈When the J1939 Network Management module needs to send an AddressClaimed (or CannotClaimAddress) PG, and the CAN Interface has not yet called J1939Nm_TxConfirmation for the previous transmission, the J1939 Network Management module shall buffer this PG for later transmission.⌋ (SRS_J1939_00033, SRS_J1939_00034, SRS_J1939_00035)

[SWS_J1939Nm_00018] ⌈Apart from the initial AddressClaimed PG, the J1939 Network Management module shall buffer only the latest AddressClaimed or CannotClaimAddress PG.⌋ (SRS_J1939_00034, SRS_J1939_00035)

Rationale: The initial AddressClaimed PG must be transmitted before any CannotClaimAddress PG according to [18]. Otherwise, the J1939 Network Management module should report current state even if the original request preceded a state change.

[SWS_J1939Nm_00019] ⌈A call to J1939Nm_TxConfirmation shall trigger transmission of a buffered AddressClaimed or CannotClaimAddress PG via CanIf_Transmit.⌋ (SRS_J1939_00033, SRS_J1939_00034, SRS_J1939_00035)

[SWS_J1939Nm_00062] ⌈When J1939Nm_TxConfirmation is not called within J1939NmTxConfirmationTimeout seconds after the attempt to transmit an AddressClaimed or CannotClaimAddress PG, the transmission of that PG shall be triggered again.⌋ (SRS_J1939_00033, SRS_J1939_00034, SRS_J1939_00035)

7.5 Reception of AddressClaimed

The source address of received AddressClaimed PGs must be immediately compared to the source addresses of all NodeChannels attached to the same channel (see J1939NmNodePreferredAddress). If any of these match, the payload of the received PG must be compared to the configured NAME for the matching source address (see J1939NmNodeNameXxx), and depending on the relative priority, the J1939 Network Management module must send an AddressClaimed or a CannotClaimAddress PG. The priority is determined by the numerical value of the NAME.

To be able to identify the source address, the I-PDU associated with the AddressClaimed PG shall have a variable source address, and a MetaDataLength >= 1. It also needs to have a variable priority.

[SWS_J1939Nm_00020] [A call to J1939Nm_RxIndication indicating reception of an AddressClaimed PG with one of the source addresses configured via J1939NmNodePreferredAddress and a payload that has a higher numerical value than the NAME for this source address configured via J1939NmNodeNameXxx shall trigger transmission of an AddressClaimed PG for the according NodeChannel (see section 7.4).] (SRS_J1939_00034)

[SWS_J1939Nm_00021] [A call to J1939Nm_RxIndication indicating reception of an AddressClaimed PG with one of the source addresses configured via J1939NmNodePreferredAddress and a payload that has a lower numerical value than the NAME for this source address configured via J1939NmNodeNameXxx shall induce a state change of the according NodeChannel to the sub state ‘AcLost’ of state ‘Offline’.] (SRS_J1939_00034, SRS_J1939_00036)

The state change to ‘Offline’ will be notified to the NM Interface and the Basic Software Mode Manager and will trigger transmission of a CannotClaimAddress PG (see section 7.3.2).

Sometimes, the application needs to know the content of all address claimed messages on the bus, e.g. to build up a table that maps functions to addresses. The J1939 Network Management module shall support this use case via a generic call-out function (see section 8.6.3.1).

[SWS_J1939Nm_00060] [If enabled via J1939NmUserCallout, the J1939Nm shall forward the source address and the content of each AddressClaimed PG to the call-out function <User_AddressClaimedIndication> (see [SWS_J1939Nm_00028]).] ()

7.6 Request for AddressClaimed

When the J1939 Network Management module receives a request for the AddressClaimed PGN from the J1939 Request Manager, it will answer either with an AddressClaimed or with a CannotClaimAddress PG, depending on the current state (see below).

Independent of the request being global or specific, the transmitted PG is always global.

[SWS_J1939Nm_00022] [A call to J1939Nm_RequestIndication shall trigger transmission of an AddressClaimed PG when the addressed NodeChannel is in state ‘NormalOperation’ or sub state ‘Claiming’ of state ‘Offline’.] (SRS_J1939_00035)

[SWS_J1939Nm_00023] [A call to J1939Nm_RequestIndication shall trigger transmission of a CannotClaimAddress PG after a delay calculated according to [SWS_J1939Nm_00068] when the addressed NodeChannel is in sub state ‘AcLost’ of state ‘Offline’.] (SRS_J1939_00035)

The J1939Nm_RequestIndication will never be triggered in state ‘SleepMode’, because then no CAN messages can be received.

7.7 Development Errors

The J1939 Network Management module supports reporting of development and extended production errors. The supported development errors are defined in the following table, while the extended production errors are described in section 7.8. Development error values are of type uint8.

[SWS_J1939Nm_00024] ⌈Table of development errors used by the J1939 Network Management module:

Type or error	***Relevance***	***Related error code***	***Value [hex]***
An API was called while the module was uninitialized	Development	J1939NM_E_UNINIT	0x01
The Init API was called twice	Development	J1939NM_E_REINIT	0x02
An API service was called with a NULL pointer	Development	J1939NM_E_PARAM_POINTER	0x03
An API service was called with a wrong ID	Development	J1939NM_E_INVALID_PDU_SDU_ID	0x04
An API service was called with wrong network handle	Development	J1939NM_E_INVALID_NETWORK_ID	0x05
An API was called with an unsupported PGN	Development	J1939NM_E_INVALID_PGN	0x06
An API was called with an illegal priority	Development	J1939NM_E_INVALID_PRIO	0x07
An API was called with an illegal node address	Development	J1939NM_E_INVALID_ADDRESS	0x08
An API was called with an illegal node ID	Development	J1939NM_E_INVALID_NODE	0x09

⌋ ()

The J1939 Network Management module checks the initialization state when one of its API functions is called, and reports the DET errors J1939NM_E_UNINIT and J1939NM_E_REINIT in this case. See also [SWS_J1939Nm_00004] and [SWS_J1939Nm_00005].

Besides this, the J1939 Network Management module performs parameter checks for all called APIs. It reports the DET error J1939NM_E_INVALID_PDU_SDU_ID when a check of a PDU/SDU ID fails, J1939NM_E_INVALID_NETWORK_ID when a check of a network handle fails, and J1939NM_E_PARAM_POINTER when a call provides a NULL pointer.

[SWS_J1939Nm_00025] ⌈If DET reporting is enabled via J1939NmDevErrorDetect, the J1939 Network Management module shall check PduIdType parameters (SDU/PDU IDs) of its API functions against the configured IDs, and shall report the DET error J1939NM_E_INVALID_PDU_SDU_ID when an unknown ID is provided by the call.⌋ ()

[SWS_J1939Nm_00026] ⌈If DET reporting is enabled via J1939NmDevErrorDetect, the J1939 Network Management module shall check NetworkHandleType parameters (network handles) of its API functions against the referenced network handles of ComM, and shall report the DET error J1939NM_E_INVALID_NETWORK_ID when an unknown handle is provided by the call.⌋ ()

[SWS_J1939Nm_00027] ⌈If DET reporting is enabled via J1939NmDevErrorDetect, the J1939 Network Management module shall check pointer parameters of its API functions, and shall report the DET error J1939NM_E_PARAM_POINTER when a NULL pointer is provided by the call.⌋ ()

7.8 Extended Production Errors

Extended production errors are handled as events of the Diagnostic Event Manager. The event IDs are defined in the following tables, while the actual values are assigned externally by the configuration of the Diagnostic Event Manager, and are included in the J1939 Network Management module via Dem.h.

[SWS_J1939Nm_00012] ⌈Table of extended production errors used by the J1939 Network Management module:

Type or error	***Related error code***	***Value [hex]***
The desired address could not be claimed.	J1939NM_E_ADDRESS_LOST	Assigned by DEM

⌋ (SRS_J1939_00032)

While the detection of development errors is configurable (see section 10.2, J1939NmDevErrorDetect), the detection of production code errors cannot be switched off.

[SWS_J1939Nm_00034] ⌈When address claiming failed, because an AddressClaimed message with higher priority was received (see [SWS_J1939Nm_00021]), the J1939 Network Management module shall report the extended production error J1939NM_E_ADDRESS_LOST with event status DEM_EVENT_STATUS_PREFAILED to DEM.⌋ (SRS_J1939_00032)

[SWS_J1939Nm_00035] ⌈When address claiming succeeded, because the J1939 Network Management entered the state ‘NormalOperation’ (see [SWS_J1939Nm_00011] and [SWS_J1939Nm_00013]), the J1939 Network Management module shall report the extended production error

J1939NM_E_ADDRESS_LOST with event status DEM_EVENT_STATUS_PREPASSED to DEM.] (SRS_J1939_00032)

8 API specification

8.1 Imported types

In this section, all types used by the J1939 Network Management module are listed together with the defining module:

[SWS_J1939Nm_00029] ⌈

Module	*Imported Type*
ComStack_Types	NetworkHandleType
	PduIdType
	PduInfoType
Dem	Dem_EventIdType
	Dem_EventStatusType
Nm	Nm_ModeType
	Nm_StateType
Std_Types	Std_ReturnType
	Std_VersionInfoType

⌋ ()

8.2 Type definitions

8.2.1 J1939Nm_ConfigType

[SWS_J1939Nm_00030] ⌈

Name:	`J1939Nm_ConfigType`	
Type:	`Structure`	
Range:	`implementation specific`	--
Description:	This is the base type for the configuration of the J1939 Network Management module. A pointer to an instance of this structure will be used in the initialization of the J1939 Network Management module. The content of this structure is defined in chapter 10 Configuration specification.	

⌋ ()

8.3 Function definitions

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

8.3.1 J1939Nm_Init

[SWS_J1939Nm_00031] ⌈

Service name:	J1939Nm_Init	

Syntax:	`void J1939Nm_Init(`
	`  const J1939Nm_ConfigType* configPtr`
	`)`	

Service ID[hex]:	0x01	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	configPtr	Pointer to selected configuration structure
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	This function initializes the J1939 Network Management module.	

] (SRS_J1939_00030)

See section 7.2.1 for details.

See section 7.7 for details on error handling.

8.3.2 J1939Nm_DeInit

[SWS_J1939Nm_00032] [

Service name:	J1939Nm_DeInit

Syntax:	`void J1939Nm_DeInit(`
	`  void`
	`)`

Service ID[hex]:	0x02
Sync/Async:	Synchronous
Reentrancy:	Non Reentrant
Parameters (in):	None
Parameters (inout):	None
Parameters (out):	None
Return value:	None
Description:	This function resets the J1939 Network Management module to the uninitialized state.

] (SRS_J1939_00031)

See section 7.2.1 for details.

8.3.3 J1939Nm_GetVersionInfo

[SWS_J1939Nm_00033] [

Service name:	J1939Nm_GetVersionInfo

Syntax:	`void J1939Nm_GetVersionInfo(`
	`  Std_VersionInfoType* versionInfo`
	`)`

Service ID[hex]:	0x03
Sync/Async:	Synchronous

Reentrancy:	Non Reentrant	
Parameters (in):	None	
Parameters (inout):	None	
Parameters (out):	versionInfo	Pointer to where to store the version information of this module.
Return value:	None	
Description:	Returns the version information of this module.	

] (SRS_BSW_00407)

See section 8.3.4 “Get Version Information” of [4] for details.

See section 7.7 for details on error handling.

8.3.4 J1939Nm_NetworkRequest

[SWS_J1939Nm_00044] [

Service name:	J1939Nm_NetworkRequest	
Syntax:	`Std_ReturnType J1939Nm_NetworkRequest( const NetworkHandleType nmChannelHandle )`	
Service ID[hex]:	0x05	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant (but not for the same NM-Channel)	
Parameters (in):	nmChannelHandle	Identification of the NM-channel
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: No error E_NOT_OK: Requesting of network has failed
Description:	Request the network, since ECU needs to communicate on the bus.	

] (SRS_J1939_00036)

See section 7.3.1 for details.

See sections 7.2.1 and 7.7 for details on error handling.

8.3.5 J1939Nm_NetworkRelease

[SWS_J1939Nm_00045] [

Service name:	J1939Nm_NetworkRelease	
Syntax:	`Std_ReturnType J1939Nm_NetworkRelease( const NetworkHandleType nmChannelHandle )`	
Service ID[hex]:	0x06	
Sync/Async:	Asynchronous	
Reentrancy:	Reentrant (but not for the same NM-Channel)	
Parameters (in):	nmChannelHandle	Identification of the NM-channel
Parameters (inout):	None	
Parameters (out):	None	

Return value:	Std_ReturnType	E_OK: No error E_NOT_OK: Releasing of network has failed
Description:	Release the network, since ECU doesn't have to communicate on the bus.	

] (SRS_J1939_00036)

See section 7.3.3 for details.

See sections 7.2.1 and 7.7 for details on error handling.

8.3.6 J1939Nm_GetState

[SWS_J1939Nm_00052] [

Service name:	J1939Nm_GetState	

Syntax:	`Std_ReturnType J1939Nm_GetState(`
	`  const NetworkHandleType NetworkHandle,`
	`  Nm_StateType* const nmStatePtr,`
	`  Nm_ModeType* const nmModePtr`
	`)`	

Service ID[hex]:	0x0d	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant	
Parameters (in):	NetworkHandle	Identification of the NM-channel
Parameters (inout):	None	
Parameters (out):	nmStatePtr	Pointer where state of the network management shall be copied to.
	nmModePtr	Pointer where the mode of the network management shall be copied to.
Return value:	Std_ReturnType	E_OK: No error E_NOT_OK: Getting of NM state has failed
Description:	Returns the state and the mode of the network management.	

] ()

See sections 7.2.1 and 7.7 for details on error handling.

8.3.7 J1939Nm_GetBusOffDelay

[SWS_J1939Nm_00070] [

Service name:	J1939Nm_GetBusOffDelay	

Syntax:	`void J1939Nm_GetBusOffDelay(`
	`  NetworkHandleType network,`
	`  uint8* delayCyclesPtr`
	`)`	

Service ID[hex]:	0x10	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant for different networks	
Parameters (in):	network	CAN network where a BusOff occurred.
Parameters (inout):	None	
Parameters (out):	delayCyclesPtr	Number of CanSM base cycles to wait additionally to L1/L2 after a BusOff occurred.

Return value:	None
Description:	This callout function returns the number of CanSM base cycles to wait additionally to L1/L2 after a BusOff occurred.

] ()

See sections 7.2.1 and 7.7 for details on error handling.

8.3.8 J1939Nm_PassiveStartup

[SWS_J1939Nm_00054] [

Service name:	J1939Nm_PassiveStartup	
Syntax:	`Std_ReturnType J1939Nm_PassiveStartup( const NetworkHandleType nmChannelHandle )`	
Service ID[hex]:	0x0f	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant (but not for the same NM-Channel)	
Parameters (in):	nmChannelHandle	Identification of the NM-channel
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: No error E_NOT_OK: Passive startup of network management has failed
Description:	Passive startup of the NM. It triggers the transition from Bus-Sleep Mode to the Network Mode without requesting the network.	

] ()

This API is just a dummy to satisfy NM interface linkage. It shall always return E_NOT_OK.

See sections 7.2.1 and 7.7 for details on error handling.

8.4 Call-back notifications

This is a list of functions provided for other modules. The function prototypes of the callback functions shall be provided in the file J1939Nm_Cbk.h

8.4.1 J1939Nm_RxIndication

[SWS_J1939Nm_00036] [

Service name:	J1939Nm_RxIndication
Syntax:	`void J1939Nm_RxIndication( PduIdType RxPduId, const PduInfoType* PduInfoPtr )`
Service ID[hex]:	0x42
Sync/Async:	Synchronous
Reentrancy:	Reentrant for different PduIds. Non reentrant for the same PduId.

Parameters (in):	RxPduId	ID of the received I-PDU.
	PduInfoPtr	Contains the length (SduLength) of the received I-PDU and a pointer to a buffer (SduDataPtr) containing the I-PDU.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	Indication of a received I-PDU from a lower layer communication interface module.	

] ()

See section 7.5 for details.

See sections 7.2.1 and 7.7 for details on error handling.

8.4.2 J1939Nm_TxConfirmation

[SWS_J1939Nm_00037] [

Service name:	J1939Nm_TxConfirmation	

Syntax:	`void J1939Nm_TxConfirmation(`
	`  PduIdType TxPduId`
	`)`	

Service ID[hex]:	0x40	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant for different PduIds. Non reentrant for the same PduId.	
Parameters (in):	TxPduId	ID of the I-PDU that has been transmitted.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	The lower layer communication interface module confirms the transmission of an I-PDU.	

] ()

See section 7.4 for details.

See sections 7.2.1 and 7.7 for details on error handling.

8.4.3 J1939Nm_RequestIndication

[SWS_J1939Nm_00043] [

Service name:	J1939Nm_RequestIndication

Syntax:	`void J1939Nm_RequestIndication(`
	`  uint8 node,`
	`  NetworkHandleType channel,`
	`  uint32 requestedPgn,`
	`  uint8 sourceAddress,`
	`  uint8 destAddress,`
	`  uint8 priority`
	`)`

Service ID[hex]:	0x43

Sync/Async:	Synchronous	
Reentrancy:	Reentrant	
Parameters (in):	node	Node by which the request was received.
	channel	Channel on which the request was received.
	requestedPgn	PGN of the requested PG.
	sourceAddress	Address of the node that sent the Request PG.
	destAddress	Address of this node or 0xFF for broadcast.
	priority	Priority of the Request PG.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	Indicates reception of a Request PG.	

] (SRS_J1939_00035)

See section 7.6 for details.

[SWS_J1939Nm_00067] [The J1939 Network Management module shall ignore the request indication when the 'sourceAddress' or the 'priority' are not in the valid range, or when 'node' is not one of the configured node IDs (see J1939NmNodeId), or when 'requestedPgn' is not the PGN of AC, or when 'destAddress' is not 0xFF or the address of the reported node. If DET reporting is enabled via J1939NmDevErrorDetect, the J1939 Network Management module shall report the corresponding DET error: J1939NM_E_INVALID_NODE for 'node', J1939NM_E_INVALID_PGN for 'requestedPgn', J1939NM_E_INVALID_ADDRESS for 'sourceAddress' or 'destAddress', and J1939NM_E_INVALID_PRIO for 'priority'.] ()

See sections 7.2.1 and 7.7 for further details on error handling.

8.5 Scheduled functions

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

8.5.1 J1939Nm_MainFunction

[SWS_J1939Nm_00038] [

Service name:	J1939Nm_MainFunction

Syntax:	`void J1939Nm_MainFunction(`
	`  void`
	`)`

Service ID[hex]:	0x04
Description:	Main function of the J1939 Network Management module. Used for scheduling purposes and timeout supervision.

] ()

[SWS_J1939Nm_00039] [The frequency of invocations of J1939Nm_MainFunction is determined by the configuration parameter J1939NmMainFunctionPeriod.] ()

8.6 Expected Interfaces

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

8.6.1 Mandatory Interfaces

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

[SWS_J1939Nm_00040] ⌈

API function	***Description***
BswM_J1939Nm_StateChangeNotification	Notification of current J1939Nm state after state changes.
CanIf_Transmit	This service initiates a request for transmission of the CAN L-PDU specified by the CanTxSduId and CAN related data in the L-SDU structure.
Dem_ReportErrorStatus	Queues the reported events from the BSW modules (API is only used by BSW modules). The interface has an asynchronous behavior, because the processing of the event is done within the Dem main function. OBD Events Suppression shall be ignored for this computation.
Nm_BusSleepMode	Notification that the network management has entered Bus-Sleep Mode.
Nm_NetworkMode	Notification that the network management has entered Network Mode.
Nm_StateChangeNotification	Notification that the state of the lower layer <BusNm> has changed.

⌋ ()

8.6.2 Optional Interfaces

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

[SWS_J1939Nm_00041] ⌈

API function	***Description***
Det_ReportError	Service to report development errors.

⌋ ()

8.6.3 Configurable interfaces

In this section, all interfaces are listed where the target function could be configured. The target function is usually a call-back function. The name of this kind of interfaces is not fixed because they are configurable.

8.6.3.1 <User_AddressClaimedIndication>

[SWS_J1939Nm_00028] ⌈

Service name:	< User_AddressClaimedIndication >	
Syntax:	`void < User_AddressClaimedIndication >( NetworkHandleType channel, uint8 sourceAddress, uint8* name )`	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant	
Parameters (in):	channel	Channel on which the AC was received.
	sourceAddress	Address of the node that sent the AC or NULL address (0xFE).
	name	Pointer to the byte array containing the 64bit NAME.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	Provides the content of received AddressClaimed (AC) PGs.	

] ()

[SWS_J1939Nm_00059] [The <User_AddressClaimedIndication> function shall only be available if J1939NmUserCallout is configured.] ()

See section 7.5 for details.

9 Sequence diagrams

The following sequence diagrams shall give an impression of the way the J1939 Network Management module shall behave and interoperate with other BSW modules. They are not complete and not binding for the implementation.

9.1 Transmission of AddressClaimed

The following diagram shows the interaction with CanIf when an AddressClaimed is transmitted.

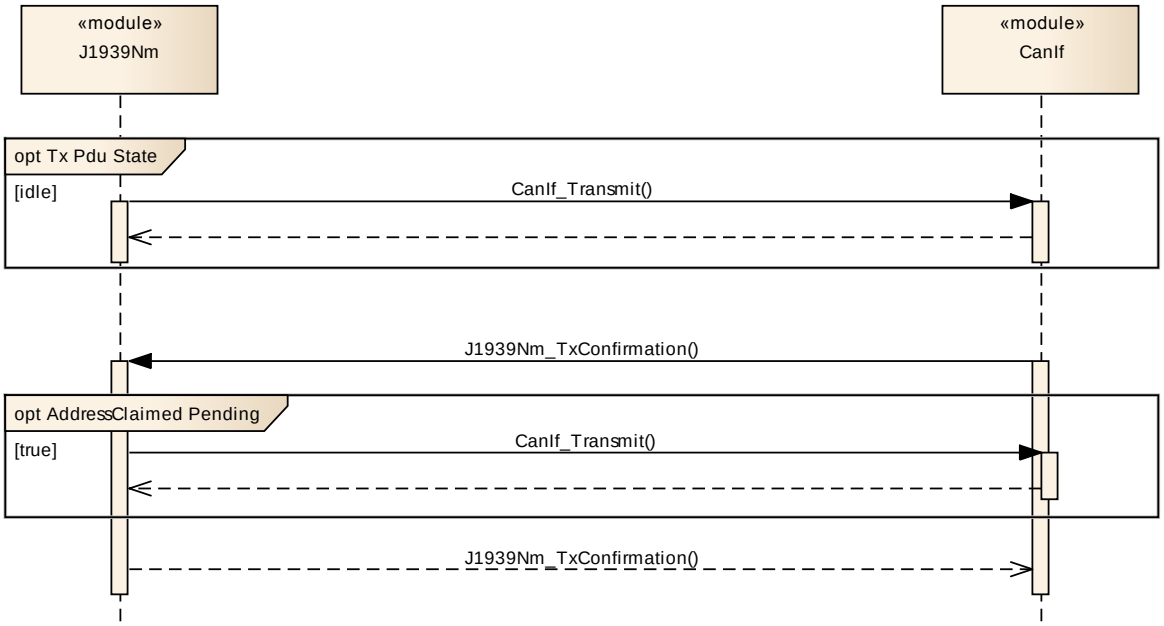

Figure 3: Transmission of AddressClaimed PG

9.2 Reception of AddressClaimed

The following diagram shows the interaction with CanIf when an AddressClaimed is received.

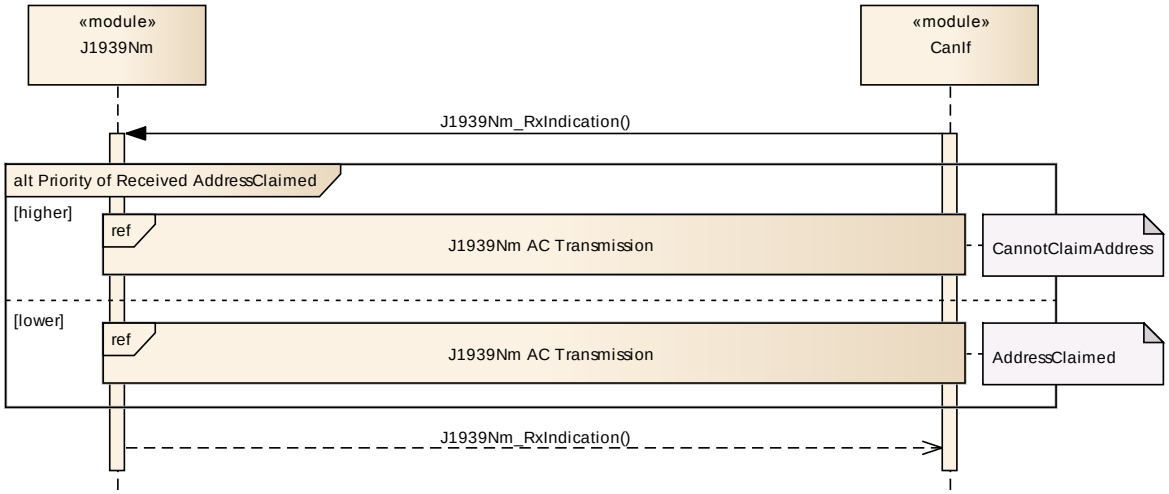

Figure 4: Reception of AddressClaimed PG

9.3 Request for AddressClaimed

The following diagram shows the interaction with J1939Rm and CanIf when a request for AddressClaimed is handled.

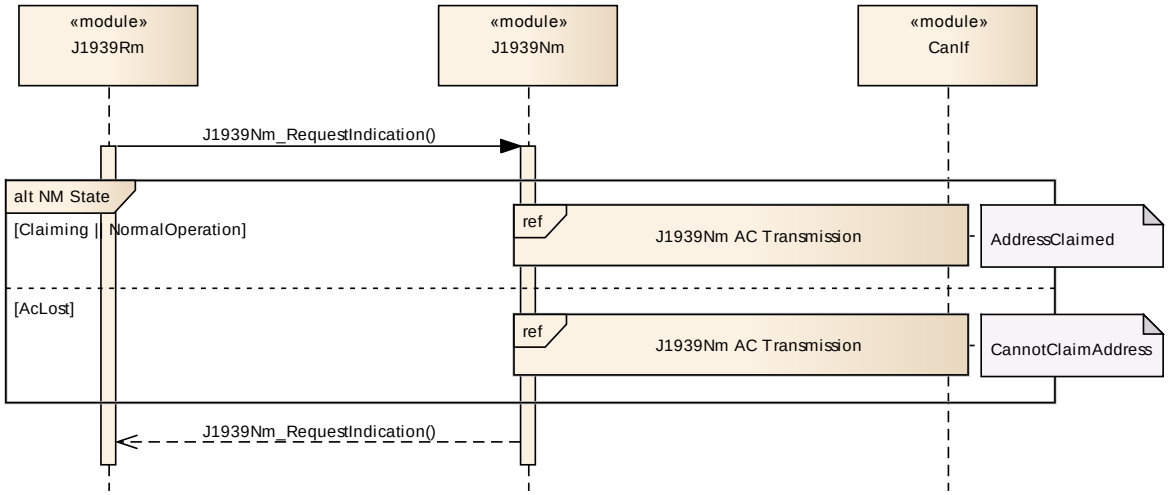

Figure 5: Request for the AddressClaimed PG

10 Configuration specification

In general, this chapter defines configuration parameters and their clustering into containers. In order to support the specification section 10.1 describes fundamentals. It also specifies a template (table) you shall use for the parameter specification. We intend to leave section 10.1 in the specification to guarantee comprehension.

Section 10.2 specifies the structure (containers) and the parameters of the J1939 Network Management module.

Section 10.3 specifies published information of the J1939 Network Management module.

10.1 How to read this chapter

For details, refer to the chapter 10.1 “Introduction to configuration specification” in the SWS BSW General [4].

10.2 Containers and configuration parameters

The following sections summarize all configuration parameters of the J1939 Network Management module. The detailed meaning of the parameters is described in chapters 7 and 8.

The following pictures show an overview of the configuration parameters available for J1939Nm:

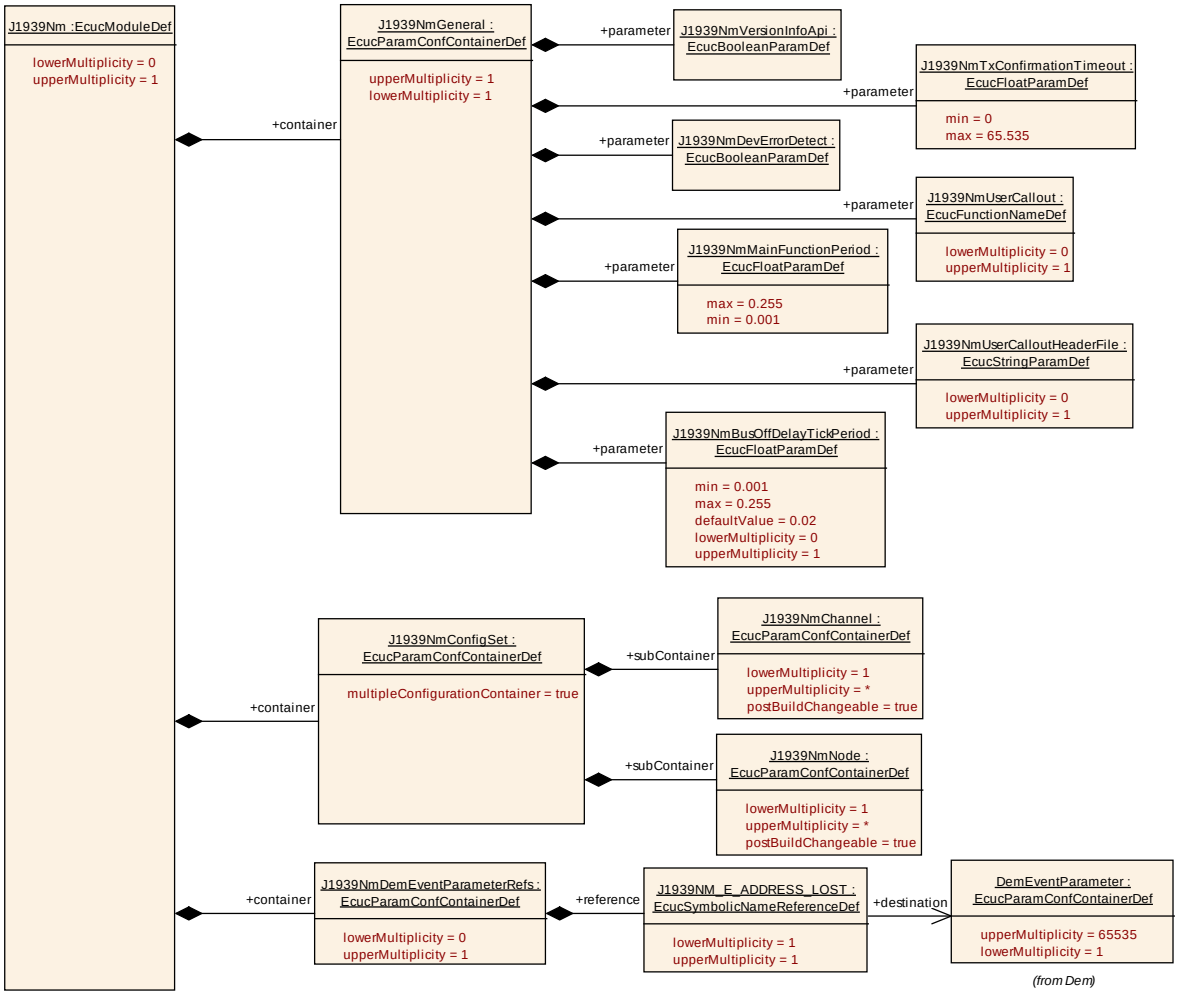

Figure 6: Configuration container J1939Nm with subcontainers J1939NmGeneral, J1939NmConfigSet, and J1939NmDemEventParameterRefs

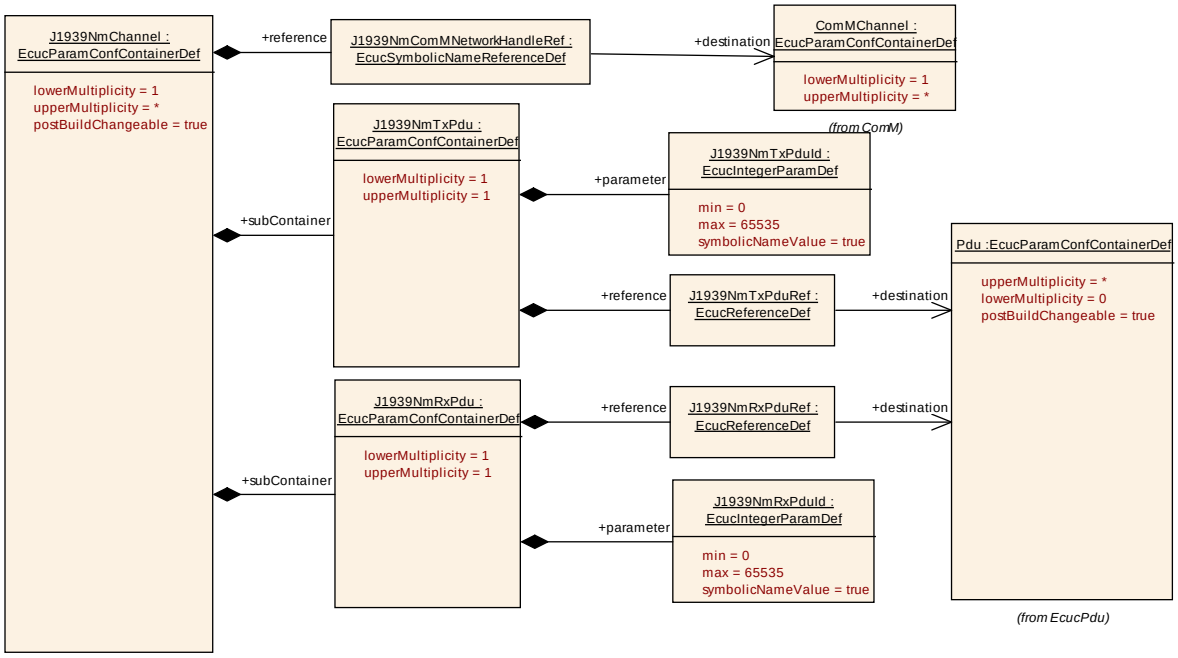

Figure 7: Configuration container J1939NmChannel

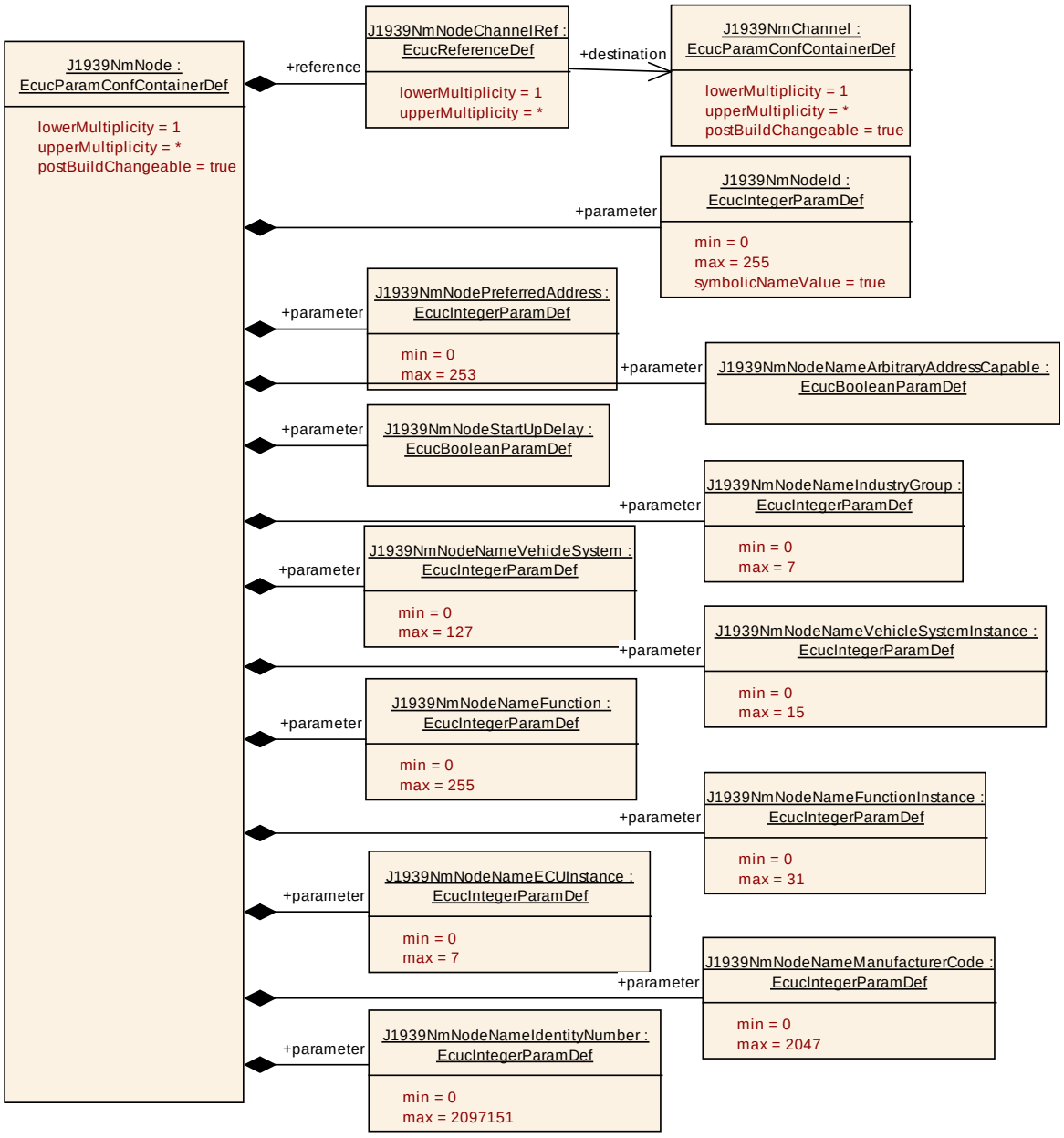

Figure 8: Configuration container J1939NmNode

10.2.1 Variants

[SWS_J1939Nm_00042] [The J1939 Network Management module shall support the configuration variants VARIANT-PRE-COMPILE, VARIANT-LINK-TIME, and VARIANT-POST-BUILD.] ()

10.2.2 J1939Nm

SWS Item	**ECUC_J1939Nm_00028 :**
Module Name	*J1939Nm*
Module Description	Configuration of the J1939 Network Management module.

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
J1939NmConfigSet	1	This container is a MultipleConfigurationContainer, i.e. this container and its sub-containers exist once per configuration set.
J1939NmDemEventParameterRefs	0..1	Container for the references to DemEventParameter elements which shall be invoked using the API Dem_ReportErrorStatus in case the corresponding error occurs. The EventId is taken from the referenced DemEventParameter's DemEventId value. The standardized errors are provided in the container and can be extended by vendor specific error references.
J1939NmGeneral	1	Contains the general configuration parameters of the module.

10.2.3 J1939NmGeneral

SWS Item	**ECUC_J1939Nm_00001 :**
Container Name	J1939NmGeneral
Description	Contains the general configuration parameters of the module.
Configuration Parameters	

SWS Item	**ECUC_J1939Nm_00034 :**		
Name	J1939NmBusOffDelayTickPeriod		
Description	Duration of ticks that are used to time BusOff delays after conflicting address claims. This parameter should be synchronized with the main function period of the CAN State Manager.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	0.001 .. 0.255		
Default value	0.02		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00003 :**		
Name	J1939NmDevErrorDetect		
Description	Pre-processor switch for enabling development error detection support.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00004 :**		
Name	J1939NmMainFunctionPeriod		
Description	Call cycle in seconds of J1939Nm_MainFunction.		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	0.001 .. 0.255		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_J1939Nm_00031 :**		
Name	J1939NmTxConfirmationTimeout		
Description	Time in seconds to wait for a confirmation after transmission of a message. The behaviour when the time elapses depends on the transmitted message.		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	0 .. 65.535		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00032 :**		
Name	J1939NmUserCallout		
Description	Pre-processor switch for enabling the <User_AddressClaimedIndication> and defining the name of the callout function.		
Multiplicity	0..1		
Type	EcucFunctionNameDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00033 :**		
Name	J1939NmUserCalloutHeaderFile		
Description	Header file which is included by J1939Nm when J1939NmUserCallout is enabled. This header file must provide the prototype of the <User_AddressClaimedIndication> defined in J1939NmUserCallout.		
Multiplicity	0..1		
Type	EcucStringParamDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
ConfigurationClass	***Pre-compile time***	X	All Variants

	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00002 :**		
Name	J1939NmVersionInfoApi		
Description	Pre-processor switch for enabling version info API support.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers

10.2.4 J1939NmConfigSet

SWS Item	**ECUC_J1939Nm_00027 :**
Container Name	J1939NmConfigSet [Multi Config Container]
Description	This container is a MultipleConfigurationContainer, i.e. this container and its sub-containers exist once per configuration set.
Configuration Parameters	

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
J1939NmChannel	1..*	Physical CAN channel handled by J1939Nm.
J1939NmNode	1..*	Logical node representing one function handled by J1939Nm.

10.2.5 J1939NmChannel

SWS Item	**ECUC_J1939Nm_00005 :**
Container Name	J1939NmChannel
Description	Physical CAN channel handled by J1939Nm. **Attributes:** postBuildChangeable=true
Configuration Parameters	

SWS Item	**ECUC_J1939Nm_00008 :**		
Name	J1939NmComMNetworkHandleRef		
Description	Reference to the channel defined by the ComMChannel providing access to the unique channel index ComMChannelId.		
Multiplicity	1		
Type	Symbolic name reference to [ComMChannel]		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	

Scope / Dependency	scope: local

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
J1939NmRxPdu	1	Contains the configuration of the I-PDU used to receive the AddressClaimed PG.
J1939NmTxPdu	1	Contains the configuration of the I-PDU used to transmit the AddressClaimed PG.

10.2.6 J1939NmTxPdu

SWS Item	**ECUC_J1939Nm_00009 :**
Container Name	J1939NmTxPdu
Description	Contains the configuration of the I-PDU used to transmit the AddressClaimed PG.
Configuration Parameters	

SWS Item	**ECUC_J1939Nm_00011 :**		
Name	J1939NmTxPduId		
Description	The I-PDU identifier used for TxConfirmation from CanIf.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 65535		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_J1939Nm_00012 :**		
Name	J1939NmTxPduRef		
Description	Reference to the Pdu object representing the I-PDU.		
Multiplicity	1		
Type	Reference to [Pdu]		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers

10.2.7 J1939NmRxPdu

SWS Item	**ECUC_J1939Nm_00010 :**
Container Name	J1939NmRxPdu
Description	Contains the configuration of the I-PDU used to receive the AddressClaimed PG.
Configuration Parameters	

SWS Item	**ECUC_J1939Nm_00014 :**		
Name	J1939NmRxPduId		
Description	The I-PDU identifier used for RxIndication from CanIf.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 65535		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_J1939Nm_00013 :**		
Name	J1939NmRxPduRef		
Description	Reference to the Pdu object representing the I-PDU.		
Multiplicity	1		
Type	Reference to [Pdu]		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers

10.2.8 J1939NmNode

SWS Item	**ECUC_J1939Nm_00015 :**
Container Name	J1939NmNode
Description	Logical node representing one function handled by J1939Nm. **Attributes:** postBuildChangeable=true
Configuration Parameters	

SWS Item	**ECUC_J1939Nm_00030 :**		
Name	J1939NmNodeId		
Description	Unique identifier of this node. May be chosen to be identical with J1939NmNodePreferredAddress, if the same address shall not be used by different nodes on different channels.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 255		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_J1939Nm_00018 :**
Name	J1939NmNodeNameArbitraryAddressCapable

Description	Arbitrary Address Capable field of the NAME of this node.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00024 :**		
Name	J1939NmNodeNameECUInstance		
Description	ECU Instance field of the NAME of this node.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 7		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00022 :**		
Name	J1939NmNodeNameFunction		
Description	Function field of the NAME of this node.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 255		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00023 :**		
Name	J1939NmNodeNameFunctionInstance		
Description	Function Instance field of the NAME of this node.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 31		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00026 :**		
Name	J1939NmNodeNameIdentityNumber		
Description	Identity Number field of the NAME of this node.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 2097151		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD

Scope / Dependency	scope: local

SWS Item	**ECUC_J1939Nm_00019 :**		
Name	J1939NmNodeNameIndustryGroup		
Description	Industry Group field of the NAME of this node.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 7		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00025 :**		
Name	J1939NmNodeNameManufacturerCode		
Description	Manufacturer Code field of the NAME of this node.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 2047		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00021 :**		
Name	J1939NmNodeNameVehicleSystem		
Description	Vehicle System field of the NAME of this node.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 127		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00020 :**		
Name	J1939NmNodeNameVehicleSystemInstance		
Description	Vehicle System Instance field of the NAME of this node.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 15		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00016 :**
Name	J1939NmNodePreferredAddress
Description	Source address of this node used for address claiming.
Multiplicity	1
Type	EcucIntegerParamDef

Range	0 .. 253		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_J1939Nm_00017 :**		
Name	J1939NmNodeStartUpDelay		
Description	If enabled, the communication will start after a delay of 250ms after transmission of the initial AddressClaimed. If disabled, communication will start immediately at start-up. Please note: According to J1939/81, the 250ms delay is not required for single address CAs with desired source addresses in the ranges 0..127 or 248..253.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_J1939Nm_00029 :**		
Name	J1939NmNodeChannelRef		
Description	Reference to the channels this node has access to.		
Multiplicity	1..*		
Type	Reference to [J1939NmChannel]		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers

10.2.9 J1939NmDemEventParameterRefs

SWS Item	**ECUC_J1939Nm_00006 :**
Container Name	J1939NmDemEventParameterRefs
Description	Container for the references to DemEventParameter elements which shall be invoked using the API Dem_ReportErrorStatus in case the corresponding error occurs. The EventId is taken from the referenced DemEventParameter's DemEventId value. The standardized errors are provided in the container and can be extended by vendor specific error references.
Configuration Parameters	

SWS Item	**ECUC_J1939Nm_00007 :**
Name	J1939NM_E_ADDRESS_LOST
Description	Reference to the DemEventParameter which shall be issued when the ECU failed to claim one of its addresses.
Multiplicity	1

Type	Symbolic name reference to [DemEventParameter]		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers

10.3 Configuration of NM Interface

The J1939 Network Management module relies on the following channel configuration in the NM Interface to be operational:

- NmActiveCoordinator: False
- NmBusSynchronizationEnabled: False
- NmChannelSleepMaster: True
- NmComControlEnabled: False
- NmCoordClusterIndex: <undefined>
- NmCoordinatorSyncSupport: False
- NmNodeDetectionEnabled: False
- NmNodeIdEnabled: False
- NmPassiveModeEnabled: False
- NmRemoteSleepIndEnabled: False
- NmShutdownDelayTimer: 0.0
- NmStateReportEnabled: False
- NmStateReportSignalRef: <undefined>
- NmSynchronizingNetwork: False
- NmUserDataEnabled: False

10.4 Published Information

For details, refer to the chapter 10.3 “Published Information” in the SWS BSW General [4].