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1 Introduction and Functional Overview

This specification describes the functionality, the 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 module 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, Abbreviations, and Terms

2.1 Definition of Acronyms and Abbreviations

The table below contains all acronyms, abbreviations or initialisms that are component-specific and not available in the AUTOSAR glossary [1].

Acronym/ Abbreviation	Description
AC	SAE J1939 AddressClaimed PG (PGN = 0x0EE00), which contains the NAME and is used for the SAE J1939 address claiming, CannotClaimAddress when SA = 0xFE
BswM	Basic Software Mode Manager, controlling modes of the whole BSW, see [2, SWS Basic Software Mode Manager]
CA	Controller Application, role of an ECU tied to one address, referred to as node in the remainder of this specification
CanIf	CAN Interface, abstracting from CAN drivers and transceivers, see [3, SWS CAN Interface]
CDD	Complex Driver, any software that interfaces directly with AUTOSAR BSW modules, but is not defined by AUTOSAR, see [4, CDD Design And Integration Guideline] and [5, TPS ECU Configuration]
ComM	Communication Manager, controlling the bus communication, see [6, SWS Communication Manager]
DA	Destination Address, the address of the receiving CA of a PG. Part of the 29 bit CAN identifier of SAE J1939 PGs.
DMx	SAE J1939 Diagnostic Message defined in SAE J1939-73, many of these consisting of the Lamp Status and a variable number of DTCs
DP	Data Page, the most significant bit (MSB) of the 18 bit PGN
DTC	Diagnostic Trouble Code, transmitted inside a diagnostic message and containing the source of the problem (SPN), the kind of the problem (FMI), and an occurrence counter (OC)
EcuM	ECU State Manager, mainly responsible for startup and shutdown of the ECU, see [7, SWS ECU State Manager]
EDP	Extended Data Page, the second bit (after MSB) of the 18 bit PGN
FMI	Failure Mode Indicator, identifying the problem with an SPN in a DTC
J1939Nm	SAE J1939 Network Management module, this BSW module, implementing the SAE J1939 Address Claiming
J1939Rm	SAE J1939 Request Manager, implementing the SAE J1939 Request Handling, see [8, SWS SAE J1939 Request Manager]
LSduR	L-SDU Router, establishes communication between bus interface and other BSW modules, see [9, SWS L-SDU Router]
NAME	The 64 bit NAME of a CA used in the AddressClaimed PG

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Acronym/ Abbreviation	Description
Nm	Network Management Interface, coordinates all network management modules, see [10, SWS Network Management]
OC	Occurrence Counter, counting how often a problem with an SPN occurred since the last reset of a DTC
PDU1	SAE J1939 PDU Type 1, this kind of PG can be sent to a specific destination address
PDU2	SAE J1939 PDU Type 2, this kind of PG can only be sent as broadcast
PDUF	PDU Format, the middle byte of the 18 bit PGN which identifies the PG and determines the layout (PDU1/PDU2) of the PGN
PduR	PDU Router, establishes communication between BSW modules, see [11, SWS PDU Router]
PDUS	PDU Specific, the lower byte of the 18 bit PGN which further identifies PDU2 PGs which cannot have a destination address
PG	Parameter Group
PGN	Parameter Group Number
RQST	SAE J1939 Request PG (PGN = 0x0EA00)
RQST2	SAE J1939 Request2 PG (PGN = 0x0C900)
SA	Source Address, the address of the transmitting CA of a PG. Part of the 29 bit CAN identifier of SAE J1939 PGs.
SchM	Basic Software Schedule Manager, part of the RTE
SNA	Signal Not Available, all bits set to 1 in SAE J1939 PGs/Parameters
SPN	Suspect Parameter Number, unique identifier of an SAE J1939 Parameter

Table 2.1: Acronyms and Abbreviations

The table below contains all document-independant acronyms or abbreviations that are defined in the AUTOSAR glossary [1].

Acronym/ Abbreviation	Description
BSW	Basic Software
DEM	Diagnostic Event Manager
DET	Default Error Tracer, supports development and runtime error reporting, see [12, Specification of Default Error Tracer]
PDU	Protocol Data Unit

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Acronym/ Abbreviation	Description
RTE	Run-Time Environment, provides the infrastructure services that enable communication to occur between AUTOSAR SWCs as well as acting as the means by which AUTOSAR SWCs access basic software modules including the OS and communication service. This includes the RTE's responsibility for the realization of the scheduling of the SWCs. See [13, Specification of RTE Software]
SAE	Society of Automotive Engineers, see: SAE J1939

Table 2.2: Acronyms and Abbreviations used from AUTOSAR Glossary

Missing Citations

The following entries in Table 2.2 lack citations:

DEM Diagnostic Event Manager, stores DTCs containing diagnostic events (production errors) and test results, and associated information, see [14, SWS Diagnostic Event Manager]

2.2 Definition of Terms

The table below contains all definitions of terms that are used in this document.

Glossary Term	Explanation
Basic Software module (BSW)	A module of the AUTOSAR stack below the RTE
Lamp Status	The Lamp Status contains information about the severity of active errors, transmitted as part of diagnostic messages
Meta Data	Meta data transferred alongside a PDU, consisting of a set of meta data items
Meta Data Item	A single item of meta data of defined type and size
Node	Synonym for the SAE J1939 CA
NodeChannel	The connection of a node to one channel
Parameter	A parameter is a signal of the SAE J1939 application layer. The Parameter definition includes defined scale, limits, offset, and physical unit. Parameters are uniquely identified by the SPN.
Parameter Group	A Parameter Group is a message of the SAE J1939 application layer. Each Parameter Group contains several Parameters (signals), and is uniquely identified by the PGN.

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Glossary Term	Explanation
Parameter Group Number	Unique identifier (18 bits: EDP, DP, PDUF, PDUS) of an SAE J1939 Parameter Group that is contained in the payload of many SAE J1939 protocol messages and in the 29bit CAN identifier of SAE J1939 PGs.
SAE J1939	Serial control and communications standard for heavy duty vehicle networks created by the SAE, see [15, SAE J1939]
SAE J1939-21	Data link layer for CAN 2.0 created by the SAE, see [16, SAE J1939-21]
SAE J1939-73	Diagnostics application layer created by the SAE, see [17, SAE J1939-73]
SAE J1939-81	Network management layer created by the SAE, see [18, SAE J1939-81]
SAE J1939 Address Claiming	The SAE J1939 address claiming procedure is the core feature of the network management of SAE J1939 defined in the standard document SAE J1939-81. Address claiming assigns a temporary 8-bit identifier to each CAs connected to an SAE J1939 network, based on the NAME of the CAs. Within each network, the 8-bit identifier is required to be unique. The 8-bit identifier is used as SA and DA of Parameter Groups (messages) transferred via the SAE J1939 network. The address claiming procedure is based on the exchange of AddressClaimed messages.
SAE J1939 Request Handling	The SAE J1939 request handling allows a CA to request the transmission of a PG with transmission mode “On Request”. The request handling is defined in the network layer standard document SAE J1939-21.

Table 2.3: Definition of terms in the scope of this Document

3 Related Documentation

3.1 Input Documents & Related Standards and Norms

[1] Glossary
AUTOSAR_FO_TR_Glossary

[2] Specification of Basic Software Mode Manager
AUTOSAR_CP_SWS_BSWModeManager

[3] Specification of CAN Interface
AUTOSAR_CP_SWS_CANInterface

[4] Complex Driver design and integration guideline
AUTOSAR_CP_EXP_CDDDesignAndIntegrationGuideline

[5] Specification of ECU Configuration
AUTOSAR_CP_TPS_ECUConfiguration

[6] Specification of Communication Manager
AUTOSAR_CP_SWS_COMManager

[7] Specification of ECU State Manager
AUTOSAR_CP_SWS_ECUStateManager

[8] Specification of a Request Manager for SAE J1939
AUTOSAR_CP_SWS_SAEJ1939RequestManager

[9] Specification of Linklayer Sdu Routing Module
AUTOSAR_CP_SWS_LSduRouter

[10] Specification of Network Management
AUTOSAR_AP_SWS_NetworkManagement

[11] Specification of PDU Router
AUTOSAR_CP_SWS_PDURouter

[12] Specification of Default Error Tracer
AUTOSAR_CP_SWS_DefaultErrorTracer

[13] Specification of RTE Software
AUTOSAR_CP_SWS_RTE

[14] Specification of Diagnostic Event Manager
AUTOSAR_CP_SWS_DiagnosticEventManager

[15] SAE J1939 – Serial Control and Communications Heavy Duty Vehicle Network

[16] SAE J1939-21 Data Link Layer

[17] SAE J1939-73 Application Layer – Diagnostics

[18] SAE J1939-81 Network Management

[19] General Specification of Basic Software Modules
AUTOSAR_CP_SWS_BSWGeneral

[20] Layered Software Architecture
AUTOSAR_CP_EXP_LayeredSoftwareArchitecture

[21] General Requirements on Basic Software Modules
AUTOSAR_CP_RS_BSWGeneral

[22] Specification of Communication Stack Types
AUTOSAR_CP_SWS_CommunicationStackTypes

[23] Specification of Standard Types
AUTOSAR_CP_SWS_StandardTypes

[24] System Template
AUTOSAR_CP_TPS_SystemTemplate

3.2 Related Specification

AUTOSAR provides a General Specification on Basic Software modules [19, SWS BSW General], which is also valid for the SAE J1939 Network Management module.

Thus, the specification [19, SWS BSW General] shall be considered as additional and required specification for the SAE J1939 Network Management module.

4 Constraints and Assumptions

4.1 Limitations

The J1939 Network Management module does not support all features defined in SAE J1939-81, especially:

- Changing the address of a node after reception of CommandedAddress or after an address loss.
- Changing the NAME of a node using the Name Management protocol.
- Detection of address violations by messages other than AddressClaimed.

4.2 Applicability to Automotive 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.

5 Dependencies to Other Modules

The [20, EXP Layered Software Architecture] shows an overview of the neighboring modules of the J1939 Network Management module.

The J1939 Network Management module (J1939Nm) has direct interfaces and/or configuration dependencies towards the L-SDU Router (LSduR), CAN Interface (CanIf), the J1939 Request Manager (J1939Rm), the Network Management Interface (Nm), the Basic Software Mode Manager (BswM), the Diagnostic Event Manager (DEM), and the Default Error Tracer (DET), and also to Complex Drivers (CDD). Besides these, there are also indirect dependencies towards the Communication Manager (ComM).

The J1939 Network Management module includes header files of the L-SDU Router, the Network Management Interface, the J1939 Request Manager, the Diagnostic Event Manager, and the Default Error Tracer.

5.1 File Structure

5.1.1 Code File Structure

For details, refer to [19, SWS BSW General] Chapter 5.1.6 *"Code file structure"*.

5.1.2 Header File Structure

For details, refer to [19, SWS BSW General] Chapter 5.1.7 *"Header file structure"*.

6 Requirements Tracing

The following table references the requirements specified in [21, RS BSW General] and links to the fulfillment of these.

Requirement	Description	Satisfied by
[SRS_BSW_00171]	Optional functionality of a Basic-SW component that is not required in the ECU shall be configurable at pre-compile-time	[SWS_J1939Nm_00059] [SWS_J1939Nm_00060]
[SRS_BSW_00350]	All AUTOSAR Basic Software Modules shall allow the enabling/ disabling of detection and reporting of development errors.	[SWS_J1939Nm_00005]
[SRS_BSW_00385]	List possible error notifications	[SWS_J1939Nm_00012]
[SRS_BSW_00386]	The BSW shall specify the configuration and conditions for detecting an error	[SWS_J1939Nm_00005] [SWS_J1939Nm_00025] [SWS_J1939Nm_00026] [SWS_J1939Nm_00067]
[SRS_BSW_00406]	API handling in uninitialized state	[SWS_J1939Nm_00002]
[SRS_BSW_00458]	Classification of production errors	[SWS_J1939Nm_00012]
[SRS_BSW_00469]	Fault detection and healing of production errors	[SWS_J1939Nm_00012]
[SRS_BSW_00470]	Execution frequency of production error detection	[SWS_J1939Nm_00012]
[SRS_BSW_00471]	Do not cause dead-locks on detection of production errors - the ability to heal from previously detected production errors	[SWS_J1939Nm_00012]
[SRS_BSW_00472]	Avoid detection of two production errors with the same root cause.	[SWS_J1939Nm_00012]
[SRS_BSW_00478]	Timing limits of main functions	[SWS_J1939Nm_00006] [SWS_J1939Nm_00039]

Table 6.1: Requirements Tracing

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_Init, the API functions of the J1939 Network Management module may only be called after the module has been properly initialized.

[SWS_J1939Nm_00002]

Upstream requirements: SRS_BSW_00406

⌈A call to J1939Nm_Init initializes all internal variables and sets the J1939 Network Management module to the initialized state.⌋

[SWS_J1939Nm_00003] ⌈A call to J1939Nm_DeInit sets the J1939 Network Management module back to the uninitialized state.⌋

[SWS_J1939Nm_00005]

Upstream requirements: SRS_BSW_00350, SRS_BSW_00386

⌈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 development error detection 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]

Upstream requirements: SRS_BSW_00478

⌈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 tick time 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:

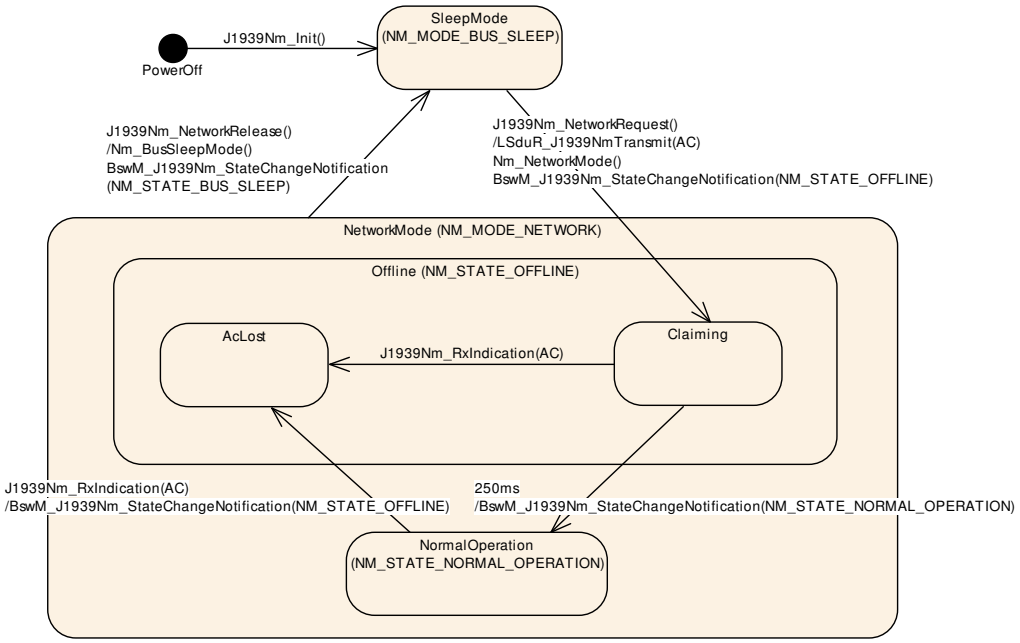

Figure 7.1: Internal states of J1939Nm with startup delay

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

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.⌋

[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 where J1939NmChannelUsesAddressArbitration is enabled.⌋

The transmission of the AddressClaimed PG is described in detail in Chapter 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).⌋

[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).⌋

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).⌋

[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).⌋

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 with result E_OK 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.⌋

[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).⌋

7.3.2 Address Loss

When a node of the J1939 Network Management module loses its claimed address on one of its channels (see Chapter 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 Chapter 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.⌋

[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).⌋

[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).⌋

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) and to BswM via BswM_J1939Nm_StateChangeNotification(NM_STATE_BUS_SLEEP).⌋

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 PDU per channel with variable source address contained in the meta data of the PDU.

[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 PDU to the CAN Interface via LSduR_J1939NmTransmit.⌋

[SWS_J1939Nm_00073] ⌈The J1939 Network Management module shall use a meta data item of type CAN_ID_32 to provide the source address of transmitted AddressClaimed and CannotClaimAddress PGs. The source address resides in the last (least significant) byte of the meta data item.⌋

[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.⌋

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

Rationale: The initial AddressClaimed PG must be transmitted before any CannotClaimAddress PG according to SAE J1939-81. 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 with result E_OK shall trigger transmission of a buffered AddressClaimed or CannotClaimAddress PG via LSduR_J1939NmTransmit.⌋

[SWS_J1939Nm_00062] ⌈When LSduR_J1939NmTransmit returns with E_NOT_OK or when J1939Nm_TxConfirmation is called with result E_NOT_OK, the transmission of that PG shall be triggered again.⌋

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 matches, 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 PDU associated with the AddressClaimed PG shall have a variable source address contained in the meta data of the PDU. In addition, the priority needs to be ignored for this PDU.

[SWS_J1939Nm_00074] ⌈The J1939 Network Management module shall use a meta data item of type CAN_ID_32 to determine the source address of received AddressClaimed and CannotClaimAddress PGs. The source address resides in the last (least significant) byte of the meta data item.⌋

[SWS_J1939Nm_00020] ⌈If J1939NmChannelUsesAddressArbitration is enabled, 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 also Chapter 7.4.

[SWS_J1939Nm_00021] ⌈If J1939NmChannelUsesAddressArbitration is enabled, 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'.⌋

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 Chapter 7.4).

Sometimes, the application needs to know the content of all AddressClaimed 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 Chapter 7.5).

[SWS_J1939Nm_00060]

Upstream requirements: SRS_BSW_00171

⌈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'.⌋

[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'.⌋

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

7.7 Address Coordination

The J1939 Network Management module is able to coordinate the addresses of different J1939 channels connected to a gateway, so that routed messages have valid addresses on every bus on which they appear.

There are two basic strategies:

1. Several J1939 channels form one common address space. In this scenario, the J1939 Network Management module replicates all AddressClaimed messages appearing on one of the networks on all other networks of the same address space. Nodes connected via the gateway perform a direct arbitration of addresses.
2. Selected nodes of one channel appear also on one or more other channels. In this scenario, the J1939 Network Management module claims the addresses of configured external nodes. Address arbitration is performed between the gateway and the nodes on one channel.

A single gateway can combine both strategies for different sets of channels. The main difference of the strategies is that addresses are not shared in the second strategy, and therefore more than 254 nodes can be present within one system.

[SWS_J1939Nm_00071] ⌈If gateway support is enabled via J1939NmGateway-Support, and the configuration contains a J1939NmSharedAddressSpace, the

J1939Nm shall transmit all AddressClaimed messages received on one of the channels referenced by J1939NmSharedAddressSpace on all other channels referenced by the same J1939NmSharedAddressSpace.⌋

[SWS_J1939Nm_00072] ⌈If gateway support is enabled via J1939NmGatewaySupport, and the configuration contains a J1939NmExternalNode, the channels referenced by J1939NmExternalNodeGatewayedChannelRef shall be treated like internal NodeChannels, with the difference that the state transition from 'SleepMode' to 'NetworkMode' is triggered by the reception of an AddressClaimed message from the external node and enters 'NormalOperation' immediately, and the transition to 'SleepMode' is triggered by the reception of a CannotClaimAddress message from the same node.⌋

7.8 Error Classification

Chapter [19, General Specification of Basic Software Modules] Chapter 7.2 *"Error Handling"* describes the error handling of the Basic Software in detail. Above all, it constitutes a classification scheme consisting of following error types which may occur in BSW modules.

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

7.8.1 Development Errors

[SWS_J1939Nm_00024] Definition of development errors in module J1939Nm ⌈

Type of error	*Related error code*	*Error value*
An API was called while the module was uninitialized	J1939NM_E_UNINIT	0x01
The Init API was called twice	J1939NM_E_REINIT	0x02
J1939Nm_Init was called with an invalid configuration pointer	J1939NM_E_INIT_FAILED	0x03
An API service was called with a NULL pointer	J1939NM_E_PARAM_POINTER	0x10
An API service was called with a wrong ID	J1939NM_E_INVALID_PDU_SDU_ID	0x11
An API service was called with wrong network handle	J1939NM_E_INVALID_NETWORK_ID	0x12
An API was called with an unsupported PGN	J1939NM_E_INVALID_PGN	0x13
An API was called with an illegal priority	J1939NM_E_INVALID_PRIO	0x14
An API was called with an illegal node address	J1939NM_E_INVALID_ADDRESS	0x15
An API was called with an illegal node ID	J1939NM_E_INVALID_NODE	0x16

⌋

7.8.2 Runtime Errors

There are no runtime errors.

7.8.3 Production Errors

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] The desired address could not be claimed.

Upstream requirements: SRS_BSW_00385, SRS_BSW_00458, SRS_BSW_00469, SRS_BSW_00470, SRS_BSW_00471, SRS_BSW_00472

⌈

Diagnostic Event (Error Name)	J1939NM_E_ADDRESS_LOST
Description	During start-up of the ECU, all J1939Nm nodes need to send an address claim to the bus and wait for acceptance of the claimed address. If another ECU claims the same address and has a higher priority, the ECU loses its address and stops communication. This is a critical problem, because J1939Nm was not specified for networks where this can happen.
Failed condition	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 production error J1939NM_E_ADDRESS_LOST with event status DEM_EVENT_STATUS_PREFAILED to DEM.
Passed condition	When address claiming succeeded, because the J1939 Network Management entered the state 'NormalOperation' (see SWS_J1939Nm_00011 and SWS_J1939 Nm_00013), the J1939 Network Management module shall report the production error J1939NM_E_ADDRESS_LOST with event status DEM_EVENT_STATUS_ PREPASSED to DEM.

⌋

8 API Specification

8.1 API Parameter Checking

The J1939 Network Management module performs parameter checks for all called APIs. It reports the development 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]

Upstream requirements: SRS_BSW_00386

⌈If development error detection 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 development error J1939NM_E_INVALID_PDU_SDU_ID when an unknown ID is provided by the call.⌋

[SWS_J1939Nm_00026]

Upstream requirements: SRS_BSW_00386

⌈If development error detection 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 development error J1939NM_E_INVALID_NETWORK_ID when an unknown handle is provided by the call.⌋

J1939NM_E_PARAM_POINTER shall be reported as specified in [19, SWS BSW General] by [SWS_BSW_00212].

8.2 Imported Types

This section lists all types used by the J1939 Network Management module together with the defining module.

[SWS_J1939Nm_00029] Definition of imported datatypes of module J1939Nm ⌈

Module	*Header File*	*Imported Type*
Comtype	ComStack_Types.h	NetworkHandleType
	ComStack_Types.h	PduIdType
	ComStack_Types.h	PduInfoType
	ComStack_Types.h	PduLengthType
Dem	Rte_Dem_Type.h	Dem_EventIdType
	Rte_Dem_Type.h	Dem_EventStatusType
J1939Rm	Rte_J1939Rm_Type.h	J1939Rm_ExtIdInfoType

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Module	Header File	Imported Type
	Rte_J1939Rm_Type.h	J1939Rm_ExtIdType
Nm	NmStack_types.h	Nm_ModeType
	NmStack_types.h	Nm_StateType
Std	Std_Types.h	Std_ReturnType

⌋

The types that are declared in `ComStack_Types.h` (Module `Comtype`) are defined in [22, SWS Communication Stack Types], the types declared in `Std_Types.h` (Module `Std`) are defined in [23, SWS Standard Types], and the types declared in `NmStack_types.h` (Module `Nm`) are declared in [10, SWS Network Management].

8.3 Type Definitions

8.3.1 J1939Nm_ConfigType

[SWS_J1939Nm_00030] Definition of datatype J1939Nm_ConfigType ⌈

Name	J1939Nm_ConfigType	
Kind	Structure	
Elements	implementation specific	
	Type	–
	Comment	–
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.	
Available via	J1939Nm.h	

⌋

8.4 Function Definitions

This chapter contains all APIs provided by the module.

8.4.1 J1939Nm_Init

[SWS_J1939Nm_00031] Definition of API function J1939Nm_Init ⌈

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.	
Available via	J1939Nm.h	

⌋

See Chapter 7.2.1 for details.

See Chapter 8.1 for parameter checks.

`J1939NM_E_INIT_FAILED` shall be reported as specified in [19, SWS BSW General] by [SWS_BSW_00050].

8.4.2 J1939Nm_DeInit

[SWS_J1939Nm_00032] Definition of API function J1939Nm_DeInit ⌈

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.
Available via	J1939Nm.h

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See Chapter 7.2.1 for details.

8.4.3 J1939Nm_NetworkRequest

[SWS_J1939Nm_00044] Definition of API function J1939Nm_NetworkRequest ⌈

Service Name	J1939Nm_NetworkRequest	
Syntax	`Std_ReturnType J1939Nm_NetworkRequest ( 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.	
Available via	J1939Nm.h	

⌋

See Chapter 7.3.1 for details.

See Chapter 7.2.1 for error handling and Chapter 8.1 for parameter checks.

8.4.4 J1939Nm_NetworkRelease

[SWS_J1939Nm_00045] Definition of API function J1939Nm_NetworkRelease ⌈

Service Name	J1939Nm_NetworkRelease	
Syntax	`Std_ReturnType J1939Nm_NetworkRelease ( 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.	
Available via	J1939Nm.h	

⌋

See Chapter 7.3.3 for details.

See Chapter 7.2.1 for error handling and Chapter 8.1 for parameter checks.

8.4.5 J1939Nm_GetState

[SWS_J1939Nm_00052] Definition of API function J1939Nm_GetState ⌈

Service Name	J1939Nm_GetState	
Syntax	`Std_ReturnType J1939Nm_GetState ( NetworkHandleType NetworkHandle, Nm_StateType* nmStatePtr, Nm_ModeType* 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.	
Available via	J1939Nm.h	

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See Chapter 7.2.1 for error handling and Chapter 8.1 for parameter checks.

8.4.6 J1939Nm_GetBusOffDelay

[SWS_J1939Nm_00070] Definition of API function J1939Nm_GetBusOffDelay ⌈

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 after a BusOff occurred. In case the returned value is CANSM_BUSOFF_CONFIGURED, use configured L1/L2 timing.
Return value	None	
Description	This callout function returns the number of CanSM base cycles to wait after a BusOff occurred.	
Available via	J1939Nm.h	

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See Chapter 7.2.1 for error handling and Chapter 8.1 for parameter checks.

8.4.7 J1939Nm_PassiveStartUp

[SWS_J1939Nm_00054] Definition of API function J1939Nm_PassiveStartUp ⌈

Service Name	J1939Nm_PassiveStartUp	
Syntax	`Std_ReturnType J1939Nm_PassiveStartUp ( 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.	
Available via	J1939Nm.h	

⌋

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

See Chapter 7.2.1 for error handling and Chapter 8.1 for parameter checks.

8.4.8 J1939Nm_RxIndication

[SWS_J1939Nm_00036] Definition of callback function J1939Nm_RxIndication ⌈

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 PDU.
	PduInfoPtr	Contains the length (SduLength) of the received PDU, a pointer to a buffer (SduDataPtr) containing the PDU, and the MetaData related to this PDU.
Parameters (inout)	None	
Parameters (out)	None	
Return value	None	
Description	Indication of a received PDU from a lower layer communication interface module.	
Available via	J1939Nm.h	

⌋

See Chapter 7.5 for details.

See Chapter 7.2.1 for error handling and Chapter 8.1 for parameter checks.

8.4.9 J1939Nm_TxConfirmation

[SWS_J1939Nm_00037] Definition of callback function J1939Nm_TxConfirmation ⌈

Service Name	J1939Nm_TxConfirmation	
Syntax	`void J1939Nm_TxConfirmation ( PduIdType TxPduId, Std_ReturnType result )`	
Service ID [hex]	0x40	
Sync/Async	Synchronous	
Reentrancy	Reentrant for different PduIds. Non reentrant for the same PduId.	
Parameters (in)	TxPduId	ID of the PDU that has been transmitted.
	result	`E_OK`: The PDU was transmitted successfully. `E_NOT_OK`: Transmission of the PDU failed.
Parameters (inout)	None	
Parameters (out)	None	
Return value	None	
Description	The lower layer communication interface module confirms the transmission of a PDU, or the failure to transmit a PDU.	
Available via	J1939Nm.h	

⌋

See Chapter 7.4 for details.

See Chapter 7.2.1 for error handling and Chapter 8.1 for parameter checks.

8.4.10 J1939Nm_RequestIndication

[SWS_J1939Nm_00043] Definition of callback function J1939Nm_RequestIndication ⌈

Service Name	J1939Nm_RequestIndication	
Syntax	`void J1939Nm_RequestIndication ( uint8 node, NetworkHandleType channel, uint32 requestedPgn, const J1939Rm_ExtIdInfoType* extIdInfo, uint8 sourceAddress, uint8 destAddress, uint8 priority )`	
Service ID [hex]	0x47	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	node	Node by which the request was received.

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	channel	Channel on which the request was received.
	requestedPgn	PGN of the requested PG.
	extIdInfo	Extended identifier bytes.
	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 or Request2 PG.	
Available via	J1939Nm.h	

⌋

See Chapter 7.6 for details.

[SWS_J1939Nm_00067]

Upstream requirements: SRS_BSW_00386

⌈The `J1939 Network Management` module shall ignore the call to `J1939Nm_RequestIndication` when the `sourceAddress` or the `priority` are not in the valid range, or when `node` is not one of the configured `node` IDs (see `J1939Nm-NodeId`), or when `requestedPgn` is not the PGN of AC, or when `destAddress` is not `0xFF` or the address of the reported `node`. If development error detection is enabled via `J1939NmDevErrorDetect`, the `J1939 Network Management` module shall report the corresponding development 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 Chapter 7.2.1 for further error handling and Chapter 8.1 for further parameter checks.

8.5 Scheduled Functions

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

8.5.1 J1939Nm_MainFunction

[SWS_J1939Nm_00038] Definition of scheduled function J1939Nm_MainFunction ⌈

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.
Available via	SchM_J1939Nm.h

⌋

[SWS_J1939Nm_00039]

Upstream requirements: SRS_BSW_00478

⌈The frequency of invocations of `J1939Nm_MainFunction` is determined by the configuration parameter `J1939NmMainFunctionPeriod`.⌋

8.6 Expected Interfaces

This section lists all interfaces required from other modules.

8.6.1 Mandatory Interfaces

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

[SWS_J1939Nm_00040] Definition of mandatory interfaces required by module J1939Nm ⌈

API Function	*Header File*	*Description*
BswM_J1939Nm_StateChange Notification	BswM_J1939Nm.h	Notification of current J1939Nm state after state changes.
Dem_SetEventStatus	Dem.h	Called by SW-Cs or BSW modules to report monitor status information to the Dem. BSW modules calling Dem_SetEventStatus can safely ignore the return value. This API will be available only if ({Dem/Dem ConfigSet/DemEventParameter/DemEvent ReportingType} == STANDARD_REPORTING)
LSduR_J1939NmTransmit (draft)	LSduR_J1939Nm.h	Requests transmission of a PDU.
Nm_BusSleepMode	Nm.h	Notification that the network management has entered Bus-Sleep Mode.
Nm_NetworkMode	Nm.h	Notification that the network management has entered Network Mode.

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API Function	Header File	Description
Nm_StateChangeNotification	Nm.h	Notification that the state of the lower layer <Bus>Nm 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] Definition of optional interfaces requested by module J1939Nm ⌈

API Function	Header File	Description
Det_ReportError	Det.h	Service to report development errors.

⌋

8.6.3 Configurable Interfaces

This section lists all interfaces where the target function can be configured. The target function is usually a call-back function. The name of this kind of interface is not fixed because they are configurable.

8.6.3.1 <User_AddressClaimedIndication>

[SWS_J1939Nm_00028] Definition of configurable interface < User_Address ClaimedIndication > ⌈

Service Name	< User_AddressClaimedIndication >	
Syntax	`void < User_AddressClaimedIndication > ( NetworkHandleType channel, uint8 sourceAddress, const uint8* name )`	
Service ID [hex]	0x20	
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.
Available via	J1939Nm_Externals.h

⌋

[SWS_J1939Nm_00059]

Upstream requirements: SRS_BSW_00171

⌈The <User_AddressClaimedIndication> function shall only be available if J1939NmUserCallout is configured.⌋

See Chapter 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.

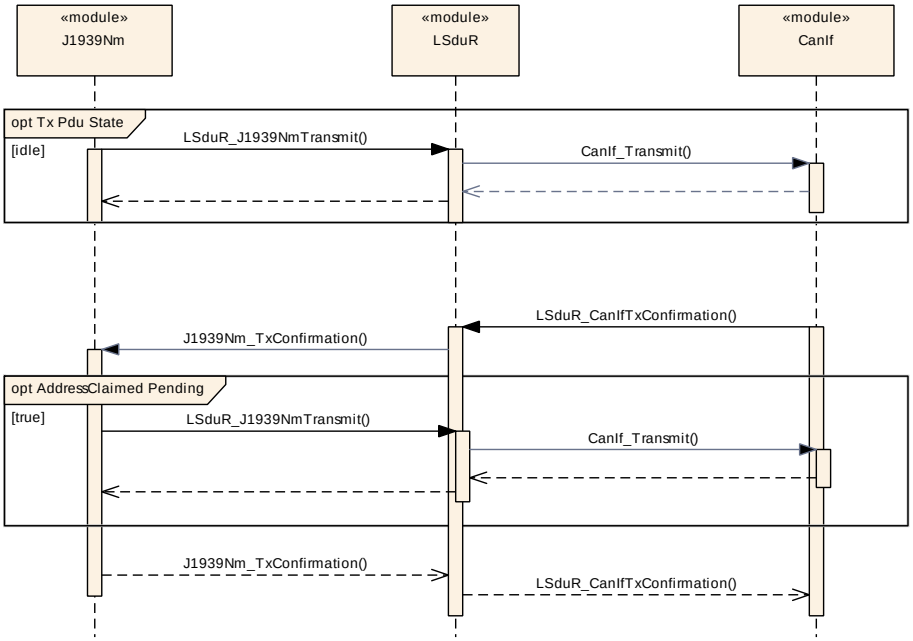

Figure 9.1: Transmission of AddressClaimed PG (“J1939Nm AC Transmission”)

9.2 Reception of AddressClaimed

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

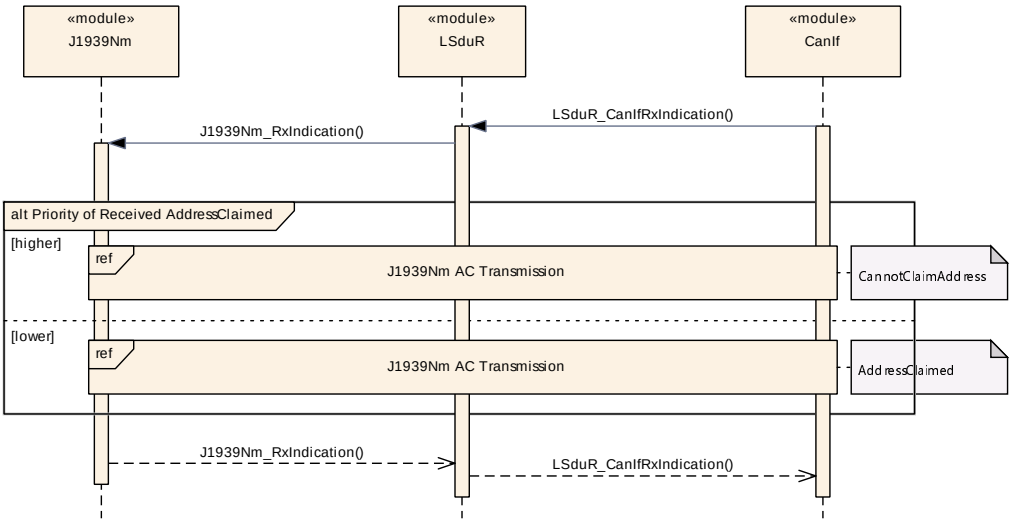

Figure 9.2: Reception of AddressClaimed PG

9.3 Request for AddressClaimed

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

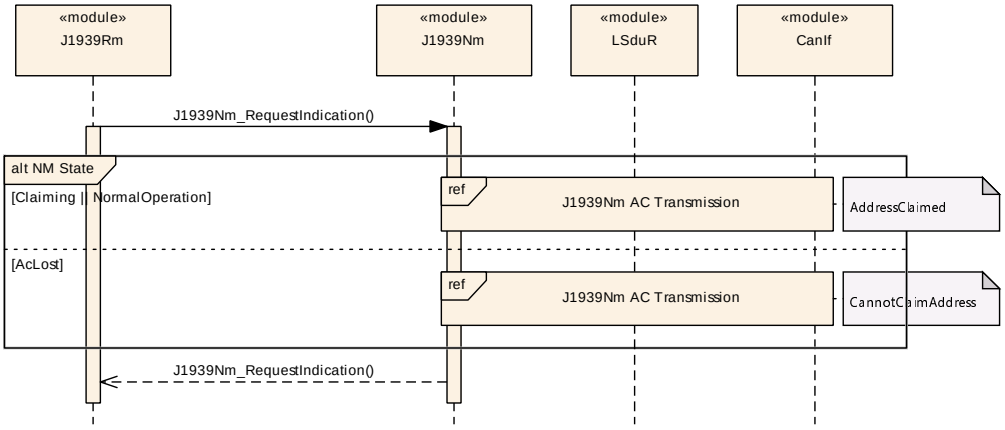

Figure 9.3: Request for the AddressClaimed PG

10 Configuration Specification

In general, this chapter defines configuration parameters and their clustering into containers. For general information about the definition of containers and parameters, refer to [19, SWS BSW General] Chapter 10.1 *"Introduction to configuration specification"*. For details about published information of the `J1939 Network Management` module, refer to [19, SWS BSW General] Chapter 10.3 *"Published Information"*.

Section 10.1 specifies the structure (containers) and the parameters of the `J1939 Network Management` module.

Section 10.2 gives hints on how to configure the `NM Interface` to support J1939Nm.

10.1 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 Chapter 7 and Chapter 8.

Some of these containers and parameters are derived from classes and attributes of the [24, TPS System Template], which also contains the rules for these derivations.

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

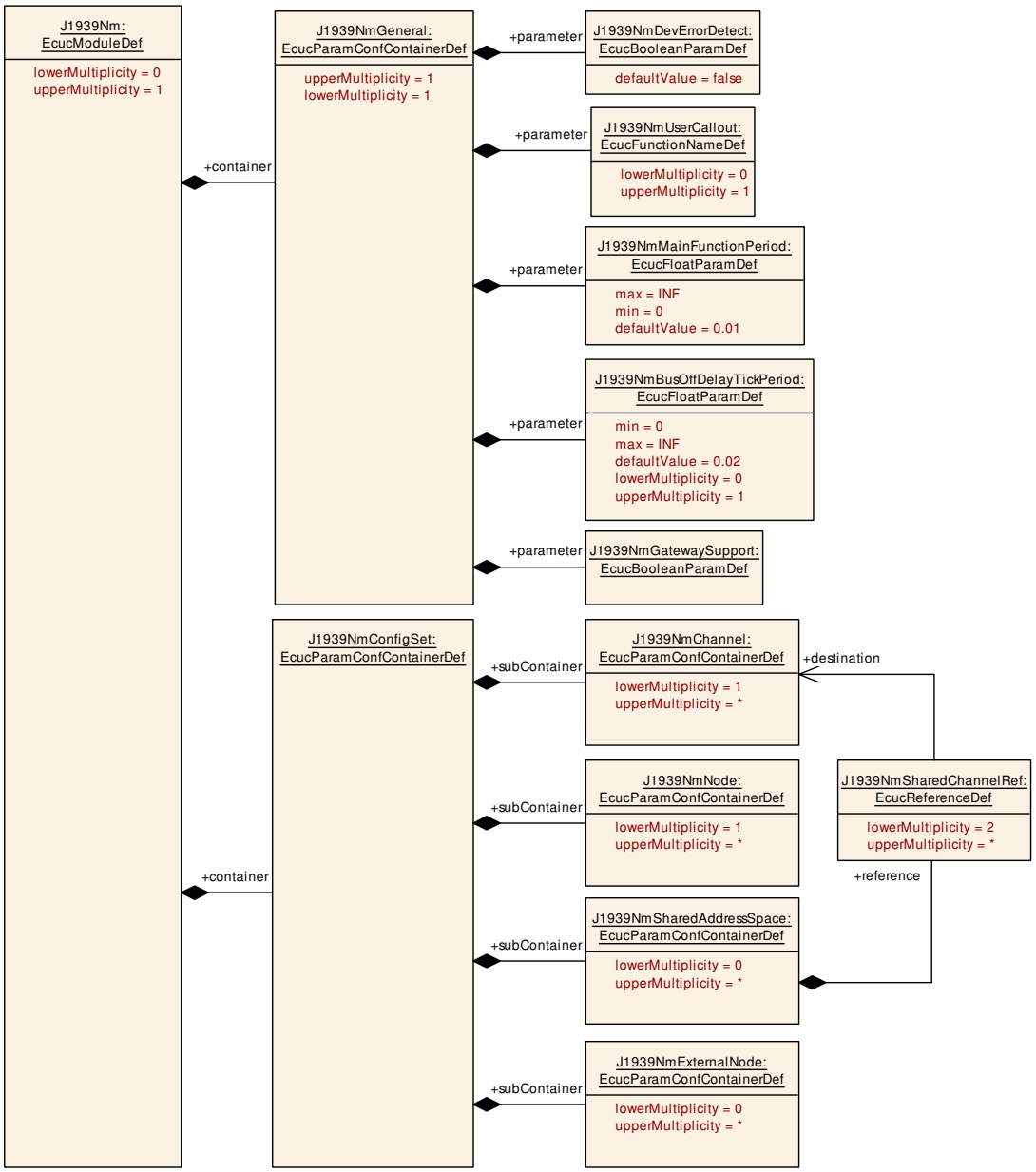

Figure 10.1: Configuration container J1939Nm

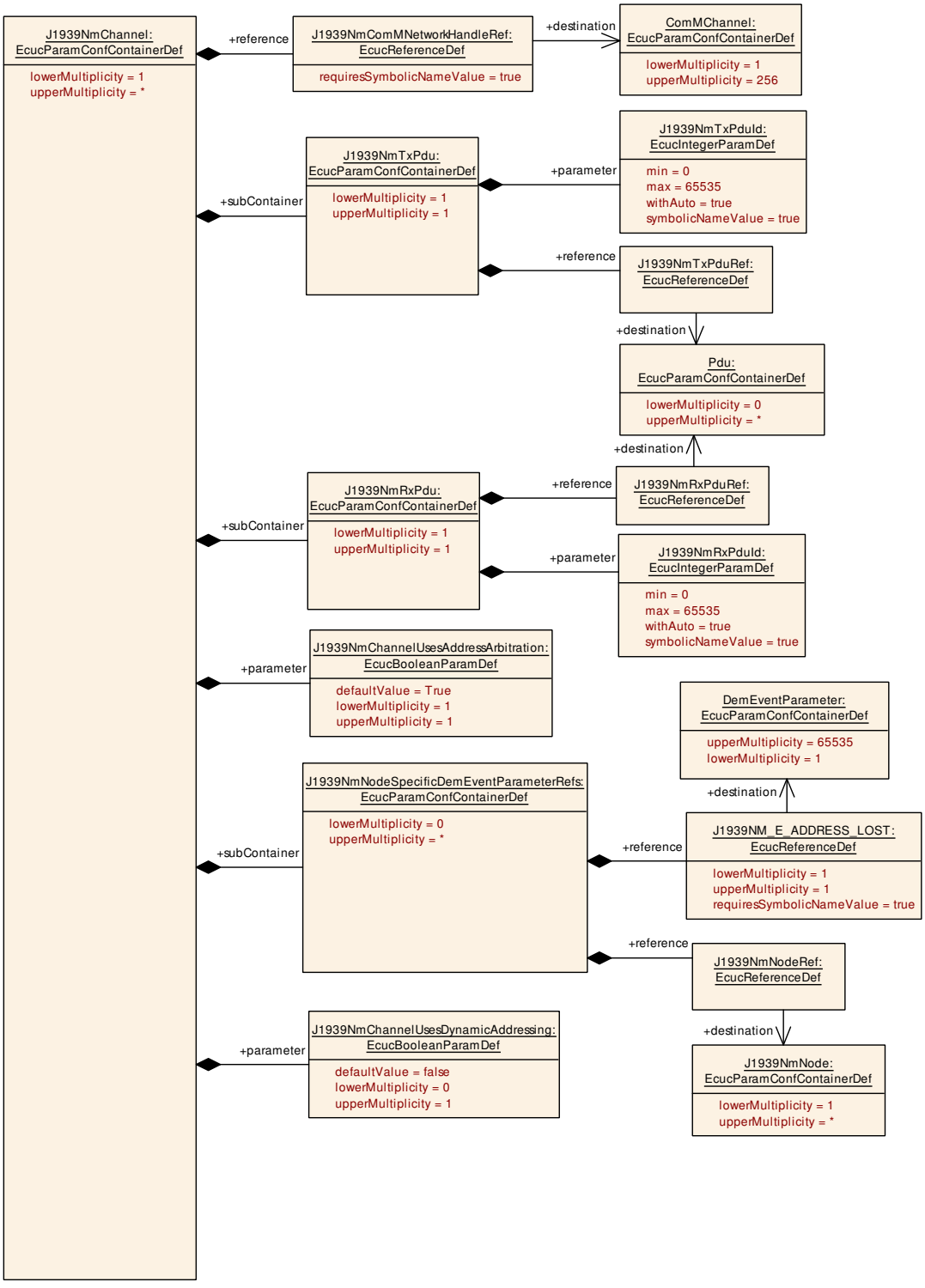

Figure 10.2: Configuration container J1939NmChannel

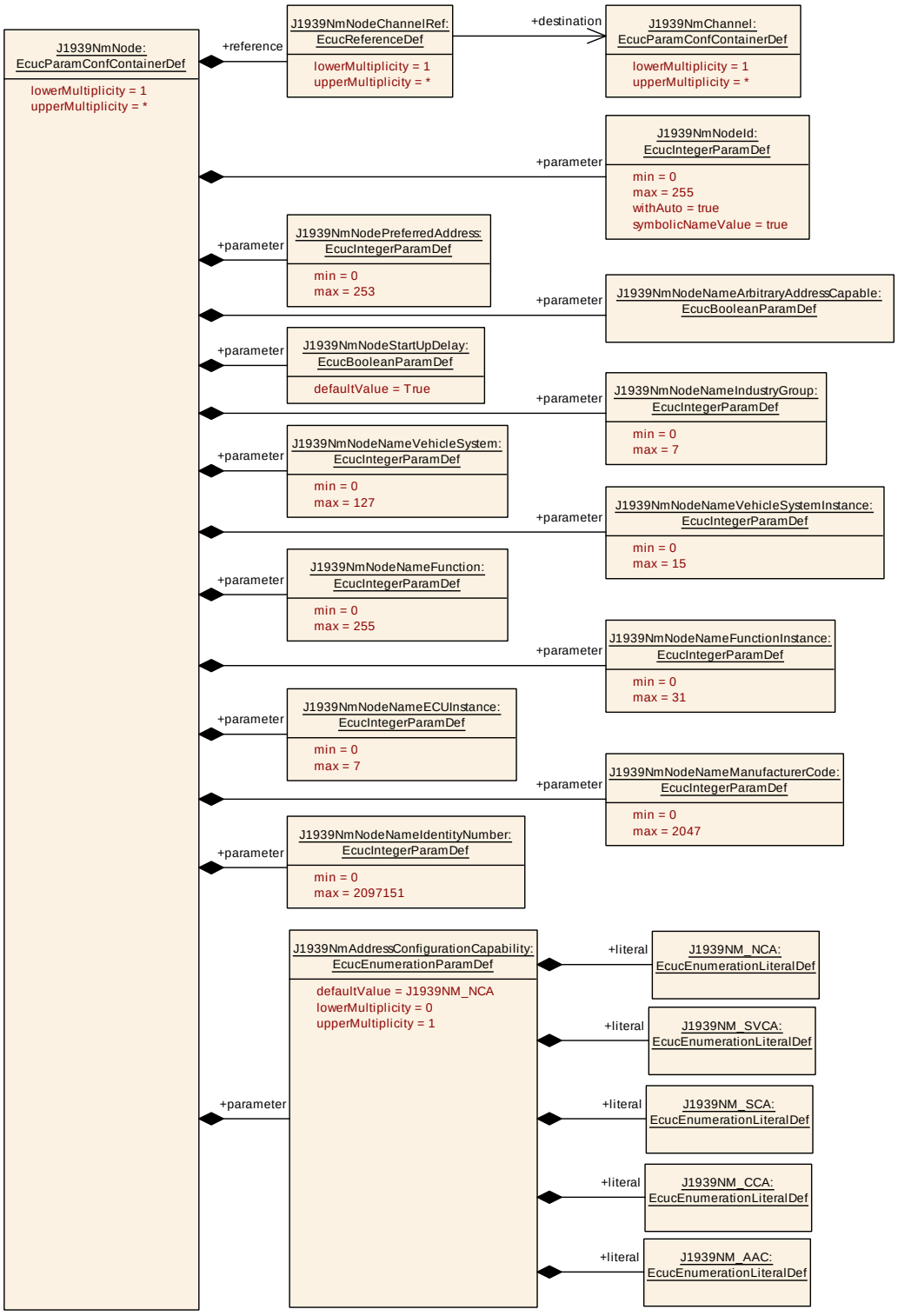

Figure 10.3: Configuration container J1939NmNode

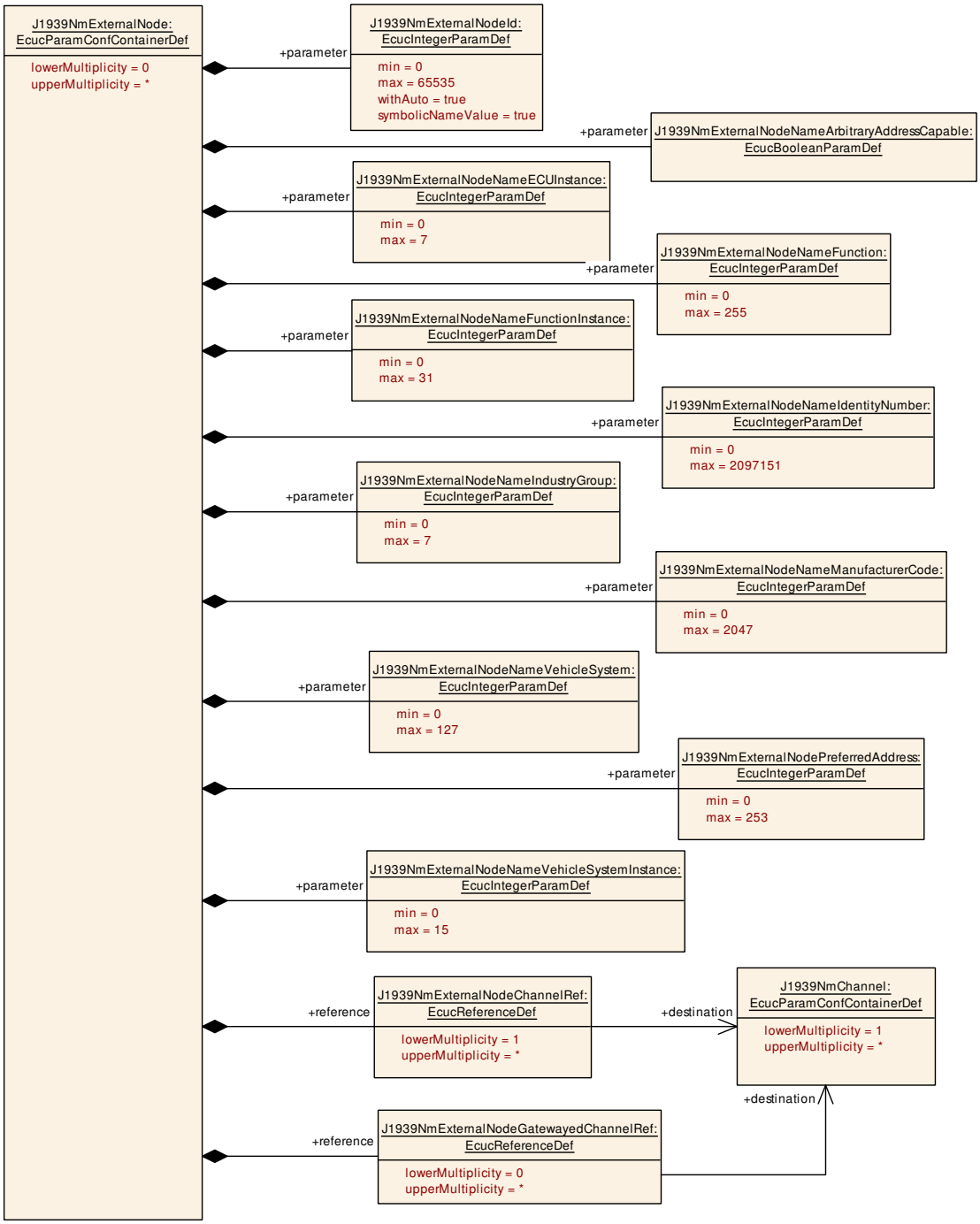

Figure 10.4: Configuration container J1939NmExternalNode

10.1.1 J1939Nm

[ECUC_J1939Nm_00028] Definition of EcucModuleDef J1939Nm ⌈

Module Name	J1939Nm
Description	Configuration of the J1939 Network Management module.
Post-Build Selectable Support	true
Post-Build Loadable Support	true

Included Containers		
Container Name	**Multiplicity**	**Description**
J1939NmConfigSet	1	This container contains the configuration parameters and sub containers of the AUTOSAR J1939Nm module.
J1939NmGeneral	1	Contains the general configuration parameters of the module.

⌋

10.1.2 J1939NmGeneral

[ECUC_J1939Nm_00001] Definition of EcucParamConfContainerDef J1939Nm General ⌈

Container Name	J1939NmGeneral
Parent Container	J1939Nm
Upstream mapping defined	–
Description	Contains the general configuration parameters of the module.
Multiplicity	1
Pre-Compile only	true
Configuration Parameters	

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
J1939NmBusOffDelayTickPeriod	0..1	[ECUC_J1939Nm_00034]
J1939NmDevErrorDetect	1	[ECUC_J1939Nm_00003]
J1939NmGatewaySupport	1	[ECUC_J1939Nm_00036]
J1939NmMainFunctionPeriod	1	[ECUC_J1939Nm_00004]
J1939NmUserCallout	0..1	[ECUC_J1939Nm_00032]

No Included Containers

⌋

[ECUC_J1939Nm_00034] Definition of EcucFloatParamDef J1939NmBusOffDelayTickPeriod ⌈

Parameter Name	J1939NmBusOffDelayTickPeriod	
Parent Container	J1939NmGeneral	
Upstream mapping defined	–	
Description	Duration of ticks that are used to time BusOff delays after conflicting address claims. This parameter must be synchronized with the main function period of the CAN State Manager.	
Multiplicity	0..1	
Type	EcucFloatParamDef	
Range	]0 .. INF[	
Default value	0.02	
Pre-Compile only	true	

⌋

[ECUC_J1939Nm_00003] Definition of EcucBooleanParamDef J1939NmDevErrorDetect ⌈

Parameter Name	J1939NmDevErrorDetect
Parent Container	J1939NmGeneral
Upstream mapping defined	–
Description	Switches the development error detection and notification on or off. • true: detection and notification is enabled. • false: detection and notification is disabled.
Multiplicity	1
Type	EcucBooleanParamDef
Default value	false
Pre-Compile only	true

⌋

[ECUC_J1939Nm_00036] Definition of EcucBooleanParamDef J1939NmGatewaySupport ⌈

Parameter Name	J1939NmGatewaySupport
Parent Container	J1939NmGeneral
Upstream mapping defined	–
Description	Enables/disables support for claiming the addresses of routed messages.
Multiplicity	1
Type	EcucBooleanParamDef
Default value	–
Pre-Compile only	true

⌋

[ECUC_J1939Nm_00004] Definition of EcucFloatParamDef J1939NmMainFunctionPeriod ⌈

Parameter Name	J1939NmMainFunctionPeriod	
Parent Container	J1939NmGeneral	
Upstream mapping defined	–	
Description	Call cycle in seconds of J1939Nm_MainFunction.	
Multiplicity	1	
Type	EcucFloatParamDef	
Range	]0 .. INF[	
Default value	0.01	
Pre-Compile only	true	

⌋

[ECUC_J1939Nm_00032] Definition of EcucFunctionNameDef J1939NmUserCallout ⌈

Parameter Name	J1939NmUserCallout
Parent Container	J1939NmGeneral
Upstream mapping defined	–
Description	Pre-processor switch for enabling the <User_AddressClaimedIndication> and defining the name of the callout function.
Multiplicity	0..1
Type	EcucFunctionNameDef
Default value	–
Regular Expression	–
Pre-Compile only	true

⌋

10.1.3 J1939NmConfigSet

[ECUC_J1939Nm_00027] Definition of EcucParamConfContainerDef J1939Nm ConfigSet ⌈

Container Name	J1939NmConfigSet
Parent Container	J1939Nm
Upstream mapping defined	–
Description	This container contains the configuration parameters and sub containers of the AUTOSAR J1939Nm module.
Multiplicity	1
Pre-Compile only	true
Configuration Parameters	

No Included Parameters

Included Containers		
Container Name	**Multiplicity**	**Description**
J1939NmChannel	1..*	Physical CAN channel handled by J1939Nm.
J1939NmExternalNode	0..*	Logical node implemented in another ECU. Configures potential communication partners. If this container is connected to more than one channel, the external ECU is linked to the local ECU by each of these channels.
J1939NmNode	1..*	Logical node representing one function handled by J1939Nm.
J1939NmSharedAddressSpace	0..*	Set of J1939NmChannels that share a common address space. Address claims will be routed between these channels.

⌋

10.1.4 J1939NmSharedAddressSpace

[ECUC_J1939Nm_00037] Definition of EcucParamConfContainerDef J1939NmSharedAddressSpace ⌈

Container Name	J1939NmSharedAddressSpace	
Parent Container	J1939NmConfigSet	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Set of J1939NmChannels that share a common address space. Address claims will be routed between these channels.	
Multiplicity	0..*	
Post-Build Multiplicity	Loadable	Selectable
Configuration Parameters		

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
J1939NmSharedChannelRef	2..*	[ECUC_J1939Nm_00038]

No Included Containers

⌋

[ECUC_J1939Nm_00038] Definition of EcucReferenceDef J1939NmSharedChannelRef ⌈

Parameter Name	J1939NmSharedChannelRef	
Parent Container	J1939NmSharedAddressSpace	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Reference to a channel that belongs to the shared address space.	
Multiplicity	2..*	
Type	Reference to J1939NmChannel	
Post-Build Multiplicity	Loadable	Selectable
Post-Build Value	Loadable	Selectable

⌋

10.1.5 J1939NmChannel

[ECUC_J1939Nm_00005] Definition of EcucParamConfContainerDef J1939NmChannel ⌈

Container Name	J1939NmChannel	
Parent Container	J1939NmConfigSet	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Physical CAN channel handled by J1939Nm.	
Multiplicity	1..*	
Post-Build Multiplicity	Loadable	Selectable
Configuration Parameters		

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
J1939NmChannelUsesAddressArbitration	1	[ECUC_J1939Nm_00035]
J1939NmChannelUsesDynamicAddressing	0..1	[ECUC_J1939Nm_00054]
J1939NmComMNetworkHandleRef	1	[ECUC_J1939Nm_00008]

Included Containers		
Container Name	**Multiplicity**	**Description**
J1939NmNodeSpecificDemEvent ParameterRefs	0..*	Container for the references to DemEventParameter elements related to one J1939NmNode which shall be invoked using the API Dem_SetEventStatus in case the corresponding error occurs. The EventId is taken from the referenced DemEvent Parameter's DemEventId symbolic value. The standardized errors are provided in this container and can be extended by vendor-specific error references.
J1939NmRxPdu	1	Contains the configuration of the PDU used to receive the AddressClaimed PG. This PDU consumes a meta data item of type CAN_ID_32.
J1939NmTxPdu	1	Contains the configuration of the PDU used to transmit the AddressClaimed PG. This PDU produces a meta data item of type CAN_ID_32.

⌋

[ECUC_J1939Nm_00035] Definition of EcucBooleanParamDef J1939NmChannel UsesAddressArbitration ⌈

Parameter Name	J1939NmChannelUsesAddressArbitration	
Parent Container	J1939NmChannel	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Defines whether the nodes attached to this channel use an initial address claim, and whether they react to contending address claims of other nodes. True: The initial address claim is sent, and the node reacts to address claims of other nodes. False: The node only sends an address claim upon request, and does not react to other address claims.	
Multiplicity	1	
Type	EcucBooleanParamDef	
Default value	true	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00054] Definition of EcucBooleanParamDef J1939NmChannelUsesDynamicAddressing ⌈

Parameter Name	J1939NmChannelUsesDynamicAddressing	
Parent Container	J1939NmChannel	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Defines whether fully dynamic address resolution according to SAE J1939-81 shall be supported on this channel. • True: The dynamically allocated addresses on the bus are matched at runtime to the configured addresses (see J1939NmNode.J1939NmNodePreferredAddress and J1939NmExternalNode.J1939NmExternalNodePreferredAddress). J1939NmNodes with J1939NmAddressConfigurationCapability set to J1939NM_AAC will change their addresses dynamically in case of an address conflict. • False: The addresses on the bus resemble the configured addresses. J1939Nm AddressConfigurationCapability shall not be set to J1939NM_AAC.	
Multiplicity	0..1	
Type	EcucBooleanParamDef	
Default value	false	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00008] Definition of EcucReferenceDef J1939NmComMNetworkHandleRef ⌈

Parameter Name	J1939NmComMNetworkHandleRef
Parent Container	J1939NmChannel
Upstream mapping defined	–
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
Pre-Compile only	true

⌋

10.1.6 J1939NmTxPdu

[ECUC_J1939Nm_00009] Definition of EcucParamConfContainerDef J1939NmTxPdu ⌈

Container Name	J1939NmTxPdu
Parent Container	J1939NmChannel
Upstream mapping defined	[24, CP_TPS_SystemTemplate]
Description	Contains the configuration of the PDU used to transmit the AddressClaimed PG. This PDU produces a meta data item of type CAN_ID_32.
Multiplicity	1
Pre-Compile only	true
Configuration Parameters	

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
J1939NmTxPduId	1	[ECUC_J1939Nm_00011]
J1939NmTxPduRef	1	[ECUC_J1939Nm_00012]

No Included Containers

⌋

[ECUC_J1939Nm_00011] Definition of EcucIntegerParamDef J1939NmTxPduId ⌈

Parameter Name	J1939NmTxPduId
Parent Container	J1939NmTxPdu
Upstream mapping defined	–
Description	The PDU identifier used for TxConfirmation from LSduR.
Multiplicity	1
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)
Range	0 .. 65535
Default value	–
With Auto	true
Pre-Compile only	true

⌋

[ECUC_J1939Nm_00012] Definition of EcucReferenceDef J1939NmTxPduRef ⌈

Parameter Name	J1939NmTxPduRef
Parent Container	J1939NmTxPdu
Upstream mapping defined	–
Description	Reference to the Pdu object representing the PDU.
Multiplicity	1
Type	Reference to Pdu
Pre-Compile only	true

⌋

10.1.7 J1939NmRxPdu

[ECUC_J1939Nm_00010] Definition of EcucParamConfContainerDef J1939NmRxPdu ⌈

Container Name	J1939NmRxPdu
Parent Container	J1939NmChannel
Upstream mapping defined	[24, CP_TPS_SystemTemplate]
Description	Contains the configuration of the PDU used to receive the AddressClaimed PG. This PDU consumes a meta data item of type CAN_ID_32.
Multiplicity	1

▽

△

Pre-Compile only	true
Configuration Parameters	

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
J1939NmRxPduId	1	[ECUC_J1939Nm_00014]
J1939NmRxPduRef	1	[ECUC_J1939Nm_00013]

No Included Containers

⌋

[ECUC_J1939Nm_00014] Definition of EcucIntegerParamDef J1939NmRxPduId ⌈

Parameter Name	J1939NmRxPduId
Parent Container	J1939NmRxPdu
Upstream mapping defined	–
Description	The PDU identifier used for RxIndication from LSduR.
Multiplicity	1
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)
Range	0 .. 65535
Default value	–
With Auto	true
Pre-Compile only	true

⌋

[ECUC_J1939Nm_00013] Definition of EcucReferenceDef J1939NmRxPduRef ⌈

Parameter Name	J1939NmRxPduRef
Parent Container	J1939NmRxPdu
Upstream mapping defined	–
Description	Reference to the Pdu object representing the PDU.
Multiplicity	1
Type	Reference to Pdu
Pre-Compile only	true

⌋

10.1.8 J1939NmNodeSpecificDemEventParameterRefs

[ECUC_J1939Nm_00006] Definition of EcucParamConfContainerDef J1939Nm NodeSpecificDemEventParameterRefs ⌈

Container Name	J1939NmNodeSpecificDemEventParameterRefs	
Parent Container	J1939NmChannel	
Upstream mapping defined	–	
Description	Container for the references to DemEventParameter elements related to one J1939Nm Node which shall be invoked using the API Dem_SetEventStatus in case the corresponding error occurs. The EventId is taken from the referenced DemEvent Parameter's DemEventId symbolic value. The standardized errors are provided in this container and can be extended by vendor-specific error references.	
Multiplicity	0..*	
Post-Build Multiplicity	Loadable	Selectable
Configuration Parameters		

Included Parameters		
Parameter Name	Multiplicity	ECUC ID
J1939NM_E_ADDRESS_LOST	1	[ECUC_J1939Nm_00007]
J1939NmNodeRef	1	[ECUC_J1939Nm_00053]

No Included Containers

⌋

[ECUC_J1939Nm_00007] Definition of EcucReferenceDef J1939NM_E_ADDRESS_LOST ⌈

Parameter Name	J1939NM_E_ADDRESS_LOST
Parent Container	J1939NmNodeSpecificDemEventParameterRefs
Upstream mapping defined	–
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
Pre-Compile only	true

⌋

[ECUC_J1939Nm_00053] Definition of EcucReferenceDef J1939NmNodeRef ⌈

Parameter Name	J1939NmNodeRef	
Parent Container	J1939NmNodeSpecificDemEventParameterRefs	
Upstream mapping defined	–	
Description	Reference to J1939NmNode.	
Multiplicity	1	
Type	Reference to J1939NmNode	
Post-Build Value	Loadable	Selectable

⌋

10.1.9 J1939NmNode

[ECUC_J1939Nm_00015] Definition of EcucParamConfContainerDef J1939Nm Node ⌈

Container Name	J1939NmNode	
Parent Container	J1939NmConfigSet	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Logical node representing one function handled by J1939Nm.	
Multiplicity	1..*	
Post-Build Multiplicity	Loadable	Selectable
Configuration Parameters		

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
J1939NmAddressConfigurationCapability	0..1	[ECUC_J1939Nm_00055]
J1939NmNodeId	1	[ECUC_J1939Nm_00030]
J1939NmNodeNameArbitraryAddressCapable	1	[ECUC_J1939Nm_00018]
J1939NmNodeNameECUInstance	1	[ECUC_J1939Nm_00024]
J1939NmNodeNameFunction	1	[ECUC_J1939Nm_00022]
J1939NmNodeNameFunctionInstance	1	[ECUC_J1939Nm_00023]
J1939NmNodeNameIdentityNumber	1	[ECUC_J1939Nm_00026]
J1939NmNodeNameIndustryGroup	1	[ECUC_J1939Nm_00019]
J1939NmNodeNameManufacturerCode	1	[ECUC_J1939Nm_00025]
J1939NmNodeNameVehicleSystem	1	[ECUC_J1939Nm_00021]
J1939NmNodeNameVehicleSystemInstance	1	[ECUC_J1939Nm_00020]
J1939NmNodePreferredAddress	1	[ECUC_J1939Nm_00016]
J1939NmNodeStartUpDelay	1	[ECUC_J1939Nm_00017]
J1939NmNodeChannelRef	1..*	[ECUC_J1939Nm_00029]

No Included Containers

⌋

[ECUC_J1939Nm_00055] Definition of EcucEnumerationParamDef J1939NmAddressConfigurationCapability ⌈

Parameter Name	J1939NmAddressConfigurationCapability	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Defines the Address Configuration Capability of the J1939NmNode (corresponding to an SAE J1939 Controller Application, CA).	
Multiplicity	0..1	
Type	EcucEnumerationParamDef	
Range	J1939NM_AAC	Arbitrary Address Capable CA.
	J1939NM_CCA	Command Configurable Address CA.
	J1939NM_NCA	Non-Configurable Address CA.

▽

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	J1939NM_SCA	Self-Configurable Address CA.
	J1939NM_SVCA	Service Configurable Address CA.
Default value	J1939NM_NCA	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00030] Definition of EcucIntegerParamDef J1939NmNodeId ⌈

Parameter Name	J1939NmNodeId	
Parent Container	J1939NmNode	
Upstream mapping defined	–	
Description	Unique identifier of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)	
Range	0 .. 255	
Default value	–	
With Auto	true	
Pre-Compile only	true	

⌋

[ECUC_J1939Nm_00018] Definition of EcucBooleanParamDef J1939NmNode NameArbitraryAddressCapable ⌈

Parameter Name	J1939NmNodeNameArbitraryAddressCapable
Parent Container	J1939NmNode
Upstream mapping defined	[24, CP_TPS_SystemTemplate]
Description	Arbitrary Address Capable field of the NAME of this node.
Multiplicity	1
Type	EcucBooleanParamDef
Default value	–
Pre-Compile only	true

⌋

[ECUC_J1939Nm_00024] Definition of EcucIntegerParamDef J1939NmNode NameECUInstance ⌈

Parameter Name	J1939NmNodeNameECUInstance	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	ECU Instance field of the NAME of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 7	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00022] Definition of EcucIntegerParamDef J1939NmNode NameFunction ⌈

Parameter Name	J1939NmNodeNameFunction	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Function field of the NAME of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 255	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00023] Definition of EcucIntegerParamDef J1939NmNode NameFunctionInstance ⌈

Parameter Name	J1939NmNodeNameFunctionInstance	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Function Instance field of the NAME of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 31	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00026] Definition of EcucIntegerParamDef J1939NmNode NameIdentityNumber ⌈

Parameter Name	J1939NmNodeNameIdentityNumber	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Identity Number field of the NAME of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 2097151	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00019] Definition of EcucIntegerParamDef J1939NmNode NameIndustryGroup ⌈

Parameter Name	J1939NmNodeNameIndustryGroup	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Industry Group field of the NAME of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 7	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00025] Definition of EcucIntegerParamDef J1939NmNode NameManufacturerCode ⌈

Parameter Name	J1939NmNodeNameManufacturerCode	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Manufacturer Code field of the NAME of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 2047	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00021] Definition of EcucIntegerParamDef J1939NmNode NameVehicleSystem ⌈

Parameter Name	J1939NmNodeNameVehicleSystem	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Vehicle System field of the NAME of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 127	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00020] Definition of EcucIntegerParamDef J1939NmNode NameVehicleSystemInstance ⌈

Parameter Name	J1939NmNodeNameVehicleSystemInstance	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Vehicle System Instance field of the NAME of this node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 15	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00016] Definition of EcucIntegerParamDef J1939NmNodePreferredAddress ⌈

Parameter Name	J1939NmNodePreferredAddress	
Parent Container	J1939NmNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Source address of this node used for address claiming.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 253	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00017] Definition of EcucBooleanParamDef J1939NmNode StartUpDelay ⌈

Parameter Name	J1939NmNodeStartUpDelay
Parent Container	J1939NmNode
Upstream mapping defined	–
Description	If enabled, the node will start communication after a delay of 250ms after transmission of the initial AddressClaimed, depending on the configured J1939NmNodePreferred Address. If disabled, the node will start communication immediately at network 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	true
Pre-Compile only	true

⌋

[ECUC_J1939Nm_00029] Definition of EcucReferenceDef J1939NmNodeChannelRef ⌈

Parameter Name	J1939NmNodeChannelRef
Parent Container	J1939NmNode
Upstream mapping defined	[24, CP_TPS_SystemTemplate]
Description	Reference to the channels this node has access to.
Multiplicity	1..*
Type	Reference to J1939NmChannel
Pre-Compile only	true

⌋

10.1.10 J1939NmExternalNode

[ECUC_J1939Nm_00039] Definition of EcucParamConfContainerDef J1939NmExternalNode ⌈

Container Name	J1939NmExternalNode
Parent Container	J1939NmConfigSet
Upstream mapping defined	[24, CP_TPS_SystemTemplate]
Description	Logical node implemented in another ECU. Configures potential communication partners. If this container is connected to more than one channel, the external ECU is linked to the local ECU by each of these channels.
Multiplicity	0..*
Pre-Compile only	true
Configuration Parameters	

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
J1939NmExternalNodeId	1	[ECUC_J1939Nm_00040]
J1939NmExternalNodeNameArbitraryAddressCapable	1	[ECUC_J1939Nm_00041]
J1939NmExternalNodeNameECUInstance	1	[ECUC_J1939Nm_00042]
J1939NmExternalNodeNameFunction	1	[ECUC_J1939Nm_00043]
J1939NmExternalNodeNameFunctionInstance	1	[ECUC_J1939Nm_00044]
J1939NmExternalNodeNameIdentityNumber	1	[ECUC_J1939Nm_00045]
J1939NmExternalNodeNameIndustryGroup	1	[ECUC_J1939Nm_00046]
J1939NmExternalNodeNameManufacturerCode	1	[ECUC_J1939Nm_00047]
J1939NmExternalNodeNameVehicleSystem	1	[ECUC_J1939Nm_00048]
J1939NmExternalNodeNameVehicleSystemInstance	1	[ECUC_J1939Nm_00050]
J1939NmExternalNodePreferredAddress	1	[ECUC_J1939Nm_00049]
J1939NmExternalNodeChannelRef	1..*	[ECUC_J1939Nm_00051]
J1939NmExternalNodeGatewayedChannelRef	0..*	[ECUC_J1939Nm_00052]

No Included Containers

⌋

[ECUC_J1939Nm_00040] Definition of EcucIntegerParamDef J1939NmExternalNodeId ⌈

Parameter Name	J1939NmExternalNodeId	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	–	
Description	Unique identifier of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)	
Range	0 .. 65535	
Default value	–	
With Auto	true	
Pre-Compile only	true	

⌋

[ECUC_J1939Nm_00041] Definition of EcucBooleanParamDef J1939NmExternalNodeNameArbitraryAddressCapable ⌈

Parameter Name	J1939NmExternalNodeNameArbitraryAddressCapable	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Arbitrary Address Capable field of the NAME of this external node.	
Multiplicity	1	
Type	EcucBooleanParamDef	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00042] Definition of EcucIntegerParamDef J1939NmExternalNodeNameECUInstance ⌈

Parameter Name	J1939NmExternalNodeNameECUInstance	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	ECU Instance field of the NAME of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 7	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00043] Definition of EcucIntegerParamDef J1939NmExternalNodeNameFunction ⌈

Parameter Name	J1939NmExternalNodeNameFunction	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Function field of the NAME of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 255	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00044] Definition of EcucIntegerParamDef J1939NmExternalNodeNameFunctionInstance ⌈

Parameter Name	J1939NmExternalNodeNameFunctionInstance	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Function Instance field of the NAME of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 31	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00045] Definition of EcucIntegerParamDef J1939NmExternalNodeNameIdentityNumber ⌈

Parameter Name	J1939NmExternalNodeNameIdentityNumber	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Identity Number field of the NAME of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 2097151	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00046] Definition of EcucIntegerParamDef J1939NmExternalNodeNameIndustryGroup ⌈

Parameter Name	J1939NmExternalNodeNameIndustryGroup	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Industry Group field of the NAME of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 7	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00047] Definition of EcucIntegerParamDef J1939NmExternalNodeNameManufacturerCode ⌈

Parameter Name	J1939NmExternalNodeNameManufacturerCode	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Manufacturer Code field of the NAME of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 2047	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00048] Definition of EcucIntegerParamDef J1939NmExternalNodeNameVehicleSystem ⌈

Parameter Name	J1939NmExternalNodeNameVehicleSystem	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Vehicle System field of the NAME of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 127	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00050] Definition of EcucIntegerParamDef J1939NmExternalNodeNameVehicleSystemInstance ⌈

Parameter Name	J1939NmExternalNodeNameVehicleSystemInstance	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Vehicle System Instance field of the NAME of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 15	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00049] Definition of EcucIntegerParamDef J1939NmExternalNodePreferredAddress ⌈

Parameter Name	J1939NmExternalNodePreferredAddress	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	[24, CP_TPS_SystemTemplate]	
Description	Source address of this external node.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	0 .. 253	
Default value	–	
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00051] Definition of EcucReferenceDef J1939NmExternalNodeChannelRef ⌈

Parameter Name	J1939NmExternalNodeChannelRef	
Parent Container	J1939NmExternalNode	
Upstream mapping defined	–	
Description	Reference to the channels of the local ECU this external node has access to.	
Multiplicity	1..*	
Type	Reference to J1939NmChannel	
Post-Build Multiplicity	Loadable	Selectable
Post-Build Value	Loadable	Selectable

⌋

[ECUC_J1939Nm_00052] Definition of EcucReferenceDef J1939NmExternalNodeGatewayedChannelRef ⌈

Parameter Name	J1939NmExternalNodeGatewayedChannelRef
Parent Container	J1939NmExternalNode
Upstream mapping defined	–

▽

△

Description	Reference to the channels on which messages to/from this external node shall be gatewayed. The address claim from the external node will be replicated on these channels.	
Multiplicity	0..*	
Type	Reference to J1939NmChannel	
Post-Build Multiplicity	Loadable	Selectable
Post-Build Value	Loadable	Selectable

┘

10.2 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

A Not Applicable Requirements

[SWS_J1939Nm_NA_00001] Requirements Not Applicable to this Specification

Upstream requirements: SRS_BSW_00168, SRS_BSW_00170, SRS_BSW_00375, SRS_BSW_00383, SRS_BSW_00384, SRS_BSW_00388, SRS_BSW_00389, SRS_BSW_00390, SRS_BSW_00392, SRS_BSW_00393, SRS_BSW_00395, SRS_BSW_00399, SRS_BSW_00403, SRS_BSW_00416, SRS_BSW_00417, SRS_BSW_00419, SRS_BSW_00422, SRS_BSW_00425, SRS_BSW_00490, SRS_BSW_00491

⌈These requirements are not applicable to this specification.⌋

[SWS_J1939Nm_NA_00002] Only One Main Function

Upstream requirements: SRS_BSW_00432

⌈The `SAE J1939 Network Management` module does not have much to do in its main function, therefore a single main function is sufficient.⌋

B Change History of AUTOSAR Traceable Items

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

B.1 Traceable Item History of this Document According to AUTOSAR Release R26-11

B.1.1 Added Specification Items in R26-11

none

B.1.2 Changed Specification Items in R26-11

[ECUC_J1939Nm_00001] [SWS_J1939Nm_00012] [SWS_J1939Nm_00029]

B.1.3 Deleted Specification Items in R26-11

[ECUC_J1939Nm_00002] [SWS_J1939Nm_00033]

B.2 Traceable Item History of this Document According to AUTOSAR Release R25-11

B.2.1 Added Specification Items in R25-11

none

B.2.2 Changed Specification Items in R25-11

[SWS_J1939Nm_00012] [SWS_J1939Nm_00070]

B.2.3 Deleted Specification Items in R25-11

none

B.3 Traceable Item History of this Document According to AUTOSAR Release R24-11

B.3.1 Added Specification Items in R24-11

none

B.3.2 Changed Specification Items in R24-11

[SWS_J1939Nm_00016] [SWS_J1939Nm_00019] [SWS_J1939Nm_00040] [SWS_J1939Nm_00062]

B.3.3 Deleted Specification Items in R24-11

none

B.4 Traceable Item History of this Document According to AUTOSAR Release R23-11

B.4.1 Added Specification Items in R23-11

none

B.4.2 Changed Specification Items in R23-11

none

B.4.3 Deleted Specification Items in R23-11

none