Document Title	Specification of Vehicle-2-X Data Manager
Document Owner	AUTOSAR
Document Responsibility	AUTOSAR
Document Identification No	1023

Document Status	published
Part of AUTOSAR Standard	Classic Platform
Part of Standard Release	R24-11

Document Change History			
Date	**Release**	**Changed by**	**Description**
2024-11-27	R24-11	AUTOSAR Release Management	• Definition of imported data types.
2023-11-23	R23-11	AUTOSAR Release Management	• List non-applicable requirements from SRS V2x Communication • Editorial changes
2022-11-24	R22-11	AUTOSAR Release Management	• Initial release

Disclaimer

Contents

1 Introduction and functional overview

This specification describes the functionality, API and the configuration for the AUTOSAR Basic Software module V2X Data Manager (**V2xDM**). The V2X Data Manager has the task to take over the V2x message that was received and pre-processed by the regional V2x stack and to perform the operation according to the configuration. Thus, the V2xDM is **only relevant on reception of a V2x message** and not to generate a V2x message for transmission. This is still in the responsibility of the V2x stack. The V2X Data Manager is independent from the underlying V2x stack and does not contain any V2X regional stack implementation. This means, it can be used in combination of any V2x stack regardless if that is specific to China, US or Europe. In fact, it is one of the key features of the V2x Data Manager to distribute parts of the V2x message to the RTE and adapt to it so that the resulting information can be independent from the underlying regional specific V2x stack.

1.1 Architectural overview

Positioning of the V2xDM module within the AUTOSAR BSW and the Layered Software architecture is shown in below.

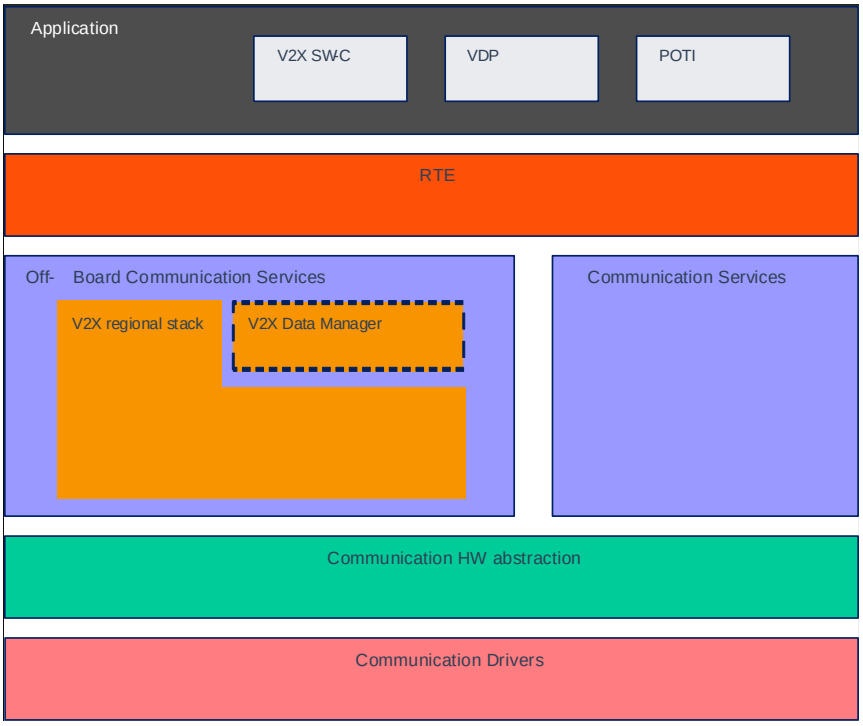

Figure 1.1: AUTOSAR BSW software architecture - V2xDM scope

2 Acronyms and Abbreviations

The glossary below includes acronyms and abbreviations relevant to the V2X Data Manager module that are not included in the [1, AUTOSAR glossary].

Abbreviation / Acronym:	Description:
BS	Basic Service
3GPP	The 3rd Generation Partnership Project provides environment to produce the Reports and Specifications that define 3GPP technologies.
5GAA	The 5G Automotive Association is a global, cross-industry organisation to develop future mobility and transportation services.
ASN.1	Abstract Syntax Notation (see [2]). Description language to define data structures.
BSW	Basic Software Module
BswM	BSW Mode Manager
BSM	Basic Safety Message
CAM	Cooperative Awareness Message
CCSA	China Communications Standards Association
DCC	Decentralized Congestion Control
DENM	Decentralized Environment Notification Message
DET	Default Error Tracer
ECU	Electronic Control Unit
EcuM	Electronic Control Unit Manager
ETSI	European Telecommunications Standards Institute
ITS	Intelligent Transport System
ITS-S	ITS-Station
ITS-G5	Wireless communication as specified by ETSI.
POTI	Position and Time Management
PduR	PDU Router
RSU	Road Side Unit
RTE	Run Time Environment
SW-C	Software Component
UPER	Unaligned Packed Encoding Rule. Most efficient encoding rule for ASN.1
V2X	Either vehicle to vehicle (V2V), or vehicle to infrastructure (V2I) and/or infrastructure to vehicle (I2V).
V2xBtp	Vehicle-2-X Basic Transport Protocol
V2xDM	Vehicle-2-X Data Manager
V2xFac	Vehicle-2-X Facilities
V2xGn	Vehicle-2-X Geo Networking
V2xM	Vehicle-2-X Management
V2xML	Vehicle-2-X Message Layer
CnV2xMsg	Chinese Vehicle-2-X Message Layer
CnV2xMgt	Chinese Vehicle-2-X Management
V2xNL	Vehicle-2-X Network Layer
VDP	Vehicle Data Provider

Terms:	Description:
Structured type	A structured type denotes a structure within ASN.1 that contains one or more types. ASN.1 defines a Sequence (like a struct), SequenceOf (like an array) or a "Choice of Sequences" (like a union).

Terms:	Description:
Simple type	A simple type denotes an element within ASN.1 that describes data, such as an integer, an enumeration or a string. In this context it specifies a V2x message element of a V2x message.
V2x catalog item	A data item derived from one or more simple type(s) of a V2x message. It is either a direct representation of this simple type or is a result from a conversion routine attached to this item that provides the required result.
V2x message	A collection of data information provided in ASN.1 UPER encoded form, according to the definition of the V2X regional specification.
V2x message element	This term is used for an element that is contained in a V2x message. This element must be of type ”Simple Type”.
V2x object	Defines a set of data elements that is provided through a Sender-Receiver port to the RTE.
V2x stack	Software module(s) that processes V2x information according to a standardization organisation (e.g. ETSI, SAE) that defines V2X communication standards for their regions.

3 Related documentation

3.1 Input documents & related standards and norms

[1] Glossary
AUTOSAR_FO_TR_Glossary

[2] X.690 : Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)
https://www.itu.int/rec/T-REC-X.690

[3] General Specification of Basic Software Modules
AUTOSAR_CP_SWS_BSWGeneral

[4] Specification of Default Error Tracer
AUTOSAR_CP_SWS_DefaultErrorTracer

[5] Specification of Vehicle-2-X Facilities
AUTOSAR_CP_SWS_V2XFacilities

[6] Specification of RTE Software
AUTOSAR_CP_SWS_RTE

[7] Specification of PDU Router
AUTOSAR_CP_SWS_PDURouter

[8] Requirements on Vehicle-2-X Communication
AUTOSAR_CP_RS_V2XCommunication

[9] Software Component Template
AUTOSAR_CP_TPS_SoftwareComponentTemplate

3.2 Related specification

AUTOSAR provides a General Specification on Basic Software modules [3, SWS BSW General], which is also valid for V2xDM.

Thus, the specification SWS BSW General shall be considered as additional and required specification for V2xDM.

4 Constraints and assumptions

4.1 Limitations

- The V2X modules follow the guidance regarding the Day-1 scenarios defined by China Communications Standards Association (CCSA), Car-2-Car-Consortium and C-Roads platform.
- Service discovery is not managed by V2xDM. Either, the discovery for event types is auto initialized or an SW-C is needed to manage service discovery.

4.2 Applicability to car domains

This specification is applicable to all car domains.

5 Dependencies to other modules

This section describes the relations of the V2xDM module to other modules within the AUTOSAR basic software architecture. It outlines the modules that are required or optional for the realization of the V2xDM module and services that this module uses.

5.1 AUTOSAR DET (Default Error Tracer)

In development mode, the V2xDM module reports errors through the Det_ReportError function of the [4, SWS DET Module].

5.2 AUTOSAR V2xFac (V2xFacilities)

The V2xFac specified in [5] provides V2x messages to the V2xDM.

5.3 AUTOSAR V2xM (V2xManagement)

The V2xM module manages the operation of the V2X protocol stack.

5.4 AUTOSAR CnV2xMsg (ChineseV2xMessage)

The CnV2xMsg provides Chinese V2X messages (e.g. BSM) to the V2xDataManager.

5.5 AUTOSAR CnV2xMgt (ChineseV2xManagement)

The CnV2xMgt module manages the operation of the Chinese V2X protocol stack.

5.6 AUTOSAR RTE (Run Time Environment)

The V2xDataManager forwards V2x Signals to the upper layer through the RTE (see [6]).

5.7 AUTOSAR PDU Router (PduR)

The V2xDataManager forwards V2x messages to the PduR (see [7]) or optionally can receive V2x messages from PduR (as an alternative to the V2x stack).

6 Requirements Tracing

The following tables reference the requirements specified in [8, SRS V2X Communication] and links to the fulfillment of these. Please note that if column “Satisfied by” is empty for a specific requirement this means that this requirement is not fulfilled by this document.

Requirement	Description	Satisfied by
[SRS_BSW_00003]	All software modules shall provide version and identification information	[CP_SWS_V2xDM_01004]
[SRS_BSW_00101]	The Basic Software Module shall be able to initialize variables and hardware in a separate initialization function	[CP_SWS_V2xDM_01005]
[SRS_BSW_00350]	All AUTOSAR Basic Software Modules shall allow the enabling/ disabling of detection and reporting of development errors.	[CP_SWS_V2xDM_00010] [CP_SWS_V2xDM_00011]
[SRS_BSW_00358]	The return type of init() functions implemented by AUTOSAR Basic Software Modules shall be void	[CP_SWS_V2xDM_01005]
[SRS_BSW_00359]	Callback Function Return Types for AUTOSAR BSW	[CP_SWS_V2xDM_01007]
[SRS_BSW_00360]	AUTOSAR Basic Software Modules callback functions are allowed to have parameters	[CP_SWS_V2xDM_01007]
[SRS_BSW_00373]	The main processing function of each AUTOSAR Basic Software Module shall be named according the defined convention	[CP_SWS_V2xDM_01006]
[SRS_BSW_00385]	List possible error notifications	[CP_SWS_V2xDM_00101] [CP_SWS_V2xDM_00102]
[SRS_BSW_00386]	The BSW shall specify the configuration and conditions for detecting an error	[CP_SWS_V2xDM_00018]
[SRS_BSW_00406]	API handling in uninitialized state	[CP_SWS_V2xDM_00009]
[SRS_BSW_00407]	Each BSW module shall provide a function to read out the version information of a dedicated module implementation	[CP_SWS_V2xDM_01004]
[SRS_BSW_00414]	Init functions shall have a pointer to a configuration structure as single parameter	[CP_SWS_V2xDM_01005]
[SRS_BSW_00424]	BSW module main processing functions shall not be allowed to enter a wait state	[CP_SWS_V2xDM_01006]
[SRS_BSW_00432]	Modules should have separate main processing functions for read/receive and write/transmit data path	[CP_SWS_V2xDM_00017] [CP_SWS_V2xDM_01006]
[SRS_BSW_00450]	A Main function of a un-initialized module shall return immediately	[CP_SWS_V2xDM_00010]
[SRS_BSW_00459]	It shall be possible to concurrently execute a service offered by a BSW module in different partitions	[CP_SWS_V2xDM_00036]
[SRS_BSW_00478]	Timing limits of main functions	[CP_SWS_V2xDM_00012]

△

Requirement	Description	Satisfied by
[SRS_BSW_00482]	Get version information function shall follow a naming rule	[CP_SWS_V2xDM_01004]
[SRS_V2X_26001]	The V2X system shall provide selected information from a V2X message to the application layer and/ or to the vehicle network.	[CP_SWS_V2xDM_00002] [CP_SWS_V2xDM_00004] [CP_SWS_V2xDM_00005] [CP_SWS_V2xDM_00006] [CP_SWS_V2xDM_00008] [CP_SWS_V2xDM_00016] [CP_SWS_V2xDM_00032] [CP_SWS_V2xDM_00034] [CP_SWS_V2xDM_00037] [CP_SWS_V2xDM_00038] [CP_SWS_V2xDM_CONSTR_00026] [CP_SWS_V2xDM_CONSTR_00027] [CP_SWS_V2xDM_CONSTR_00028]
[SRS_V2X_26002]	Transformation of V2X message elements shall be possible	[CP_SWS_V2xDM_00007] [CP_SWS_V2xDM_00033] [CP_SWS_V2xDM_00039] [CP_SWS_V2xDM_01010]
[SRS_V2X_26003]	It shall be possible to forward V2X messages to the vehicle network as a whole	[CP_SWS_V2xDM_00003] [CP_SWS_V2xDM_00013] [CP_SWS_V2xDM_00035] [CP_SWS_V2xDM_01012] [CP_SWS_V2xDM_CONSTR_00014]
[SRS_V2X_26004]	All elements of a V2X object shall have the same V2X message as source	[CP_SWS_V2xDM_00032] [CP_SWS_V2xDM_CONSTR_00024] [CP_SWS_V2xDM_CONSTR_00025] [CP_SWS_V2xDM_CONSTR_00031]
[SRS_V2X_26005]	Modules in the V2X stack shall provide interfaces for module initialization	[CP_SWS_V2xDM_00009] [CP_SWS_V2xDM_01005]
[SRS_V2X_26006]	The V2X Data Manager shall provide mathematical operations to re-scale V2X message elements	[CP_SWS_V2xDM_01010] [CP_SWS_V2xDM_CONSTR_00029] [CP_SWS_V2xDM_CONSTR_00030]
[SRS_V2X_26010]	Regional V2X stack implementation shall support selective distribution of V2X message data through V2X Data Manager	[CP_SWS_V2xDM_00001]

Table 6.1: Requirements Tracing

7 Functional specification

This chapter defines the behavior of the V2xDM module.

The API of the module is defined in chapter 8, while the configuration is defined in chapter 10.

7.1 Overview

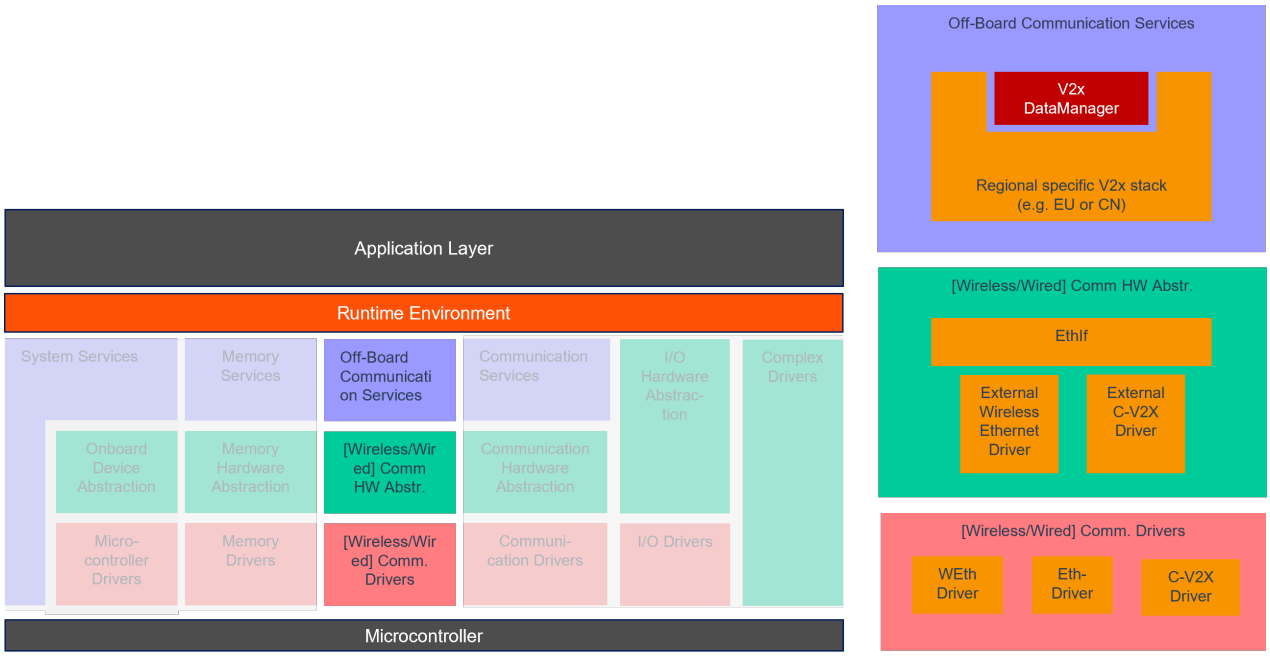

Figure 7.1: AUTOSAR layered view with V2xDM

The V2x Data Manager (V2xDM) is located on top of the regional V2x stack. It is a service layer and has the task to provide individual information from V2x messages, that was served from the regional V2x stack below or through a PDU from the PduR, to the RTE through Sender-Receiver Ports. Pre-defined means, that the VariableDataPrototypes are not created by the V2xDM. Which of the information from the V2x messages shall be provided through Sender-Receiver ports can be configured within the V2xDM in its EcuC configuration (see chapter 10). A Sender-Receiver port in this context is called a "V2x object".

The main task of the V2xDM is to take over a V2x message from the lower layer V2x stack, decode it according to the defined ASN.1 codec definition of this message, extract the necessary V2x message element, set the data types of one or more S/R ports that was mapped in its EcuC configuration to this message and triggers the RTE to indicate the data reception.

It is also possible that a V2x message doesn't need to be decoded within the V2xDM. Instead, the whole message can be forwarded to another ECU on the vehicle network

for further operation. In this case, the V2xDM will forward the data to the PduR to send the whole V2x message to the vehicle network as depicted in Figure 7.2. If the above case is desired and additionally no element of this message is needed in an object, the V2xDM does not decode this message.

Info: In fact, this could be considered as a statically configured complex event processing (CEP) system, with the structured data transformation and conversion, in the context of the V2x stack and RTE.

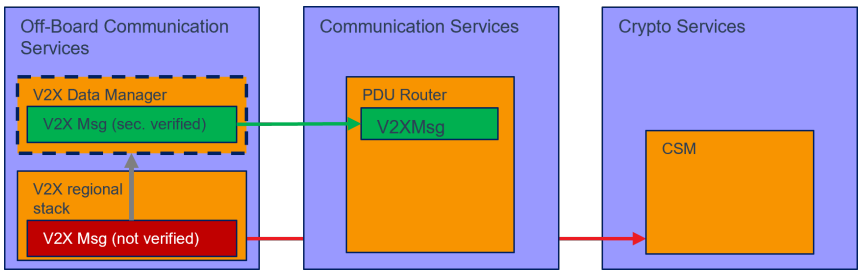

Figure 7.2: Routing of V2x messages to PduR through the V2xDM

As a summary, the V2xDM provides the following features:

- Get a V2x message, either by the V2x stack *OR* through PduR.
- Pass on the V2x message to the PduR to transmit the entire message to the vehicle network via bus communication. This is an optional step and can only be used if the V2x message was provided by a V2x stack, not by the PduR itself!
- Forward contents of the V2x messages to the RTE by:
  - decoding the ASN.1 coded V2x message,
  - (optionally) transform simple types into V2x catalog items (one or more simple types can be transformed into one V2x catalog item. Several V2x catalog items can be generated from one V2x message),
  - write the V2x catalog item into a variable data prototype of a S/R interface,
  - call the RTE to provide the results to a software component (SW-C) or to a SOME/IP transformer (depending on the configuration of the pre-configured S/R port).

This is illustrated in Figure 7.3.

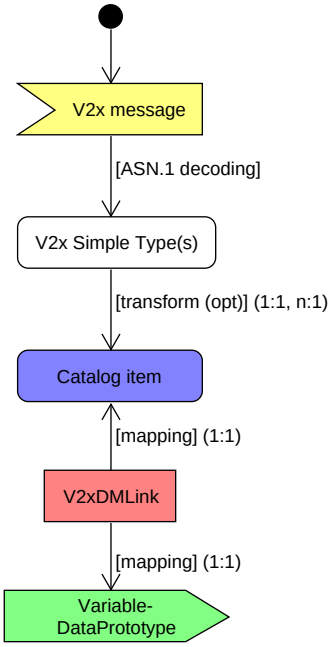

Figure 7.3: Data flow diagram of an incoming V2x message

[CP_SWS_V2xDM_00001] Regional V2x stack provides the V2x message to the V2xDM

Upstream requirements: SRS_V2X_26010

⌈The regional `V2x stack` shall forward any `V2x message` that is processed by the `V2xDM` module. Any security checks that is required by the regional `V2x stack` (e.g. signature verification) shall successfully be done before the message is passed on to the V2xDM.⌋

[CP_SWS_V2xDM_00002] Configuration of V2x messages in V2xDM

Upstream requirements: SRS_V2X_26001

⌈The `V2xDM` shall provide a configuration per `V2x message` type in the EcuC configuration through `V2xDMMessage` to indicate that this message is handled within the `V2xDM`. This configuration also contains information how to process this message within the `V2xDM`.⌋

[CP_SWS_V2xDM_00003] V2xDM shall optionally forward V2x messages to the PDU-Router

Upstream requirements: SRS_V2X_26003

⌈The configuration of the `V2x message` within the `V2xDM` shall allow to indicate if that `V2x message` shall be forwarded to the `PDU-Router` (see `V2xDMPdu`). If this configuration is active for a `V2x message`, the `V2xDM` shall forward the received data to the `PDU-Router` any time the message has been indicated by the `V2x stack` and trigger the transmission of a PDU.⌋

Rationale: This allows to forward the whole secured V2x message to the vehicle network to delegate the processing of the whole information in the receiving ECU (see Figure 7.2). This forwarding option ensures that only the V2xDM needs an interface with the PDU router. A regional V2x stack doesn't need to implement that. At the same time it allows to distribute any V2x message to a node on the network if decoding is too complex within this ECU or the V2x message information is only needed in one ECU as a whole. It should be noted that ASN.1 decoding is then needed in the receiving ECU.

Note: The V2xDM will forward any V2x message that is provided by the underlying regional V2x stack. It will not check if it is a duplicate from a previously provided message, and will not guarantee ordering relations between the messages. Thus, if the V2x stack provides a duplicated message, this will also appear as a duplicate on the vehicle network or SWC.

[CP_SWS_V2xDM_00004] V2xDM configures references to S/R-port and associated VariableDataPrototypes in its EcuC configuration

Upstream requirements: SRS_V2X_26001

⌈The V2xDM shall provide an EcuC configuration that references pre-defined and existing VariableDataPrototypes (see [9]).⌋

This allows the definition of S/R ports and to reference the VariableDataPrototypes by the V2xDM through configuration and the mapping of V2x message elements.

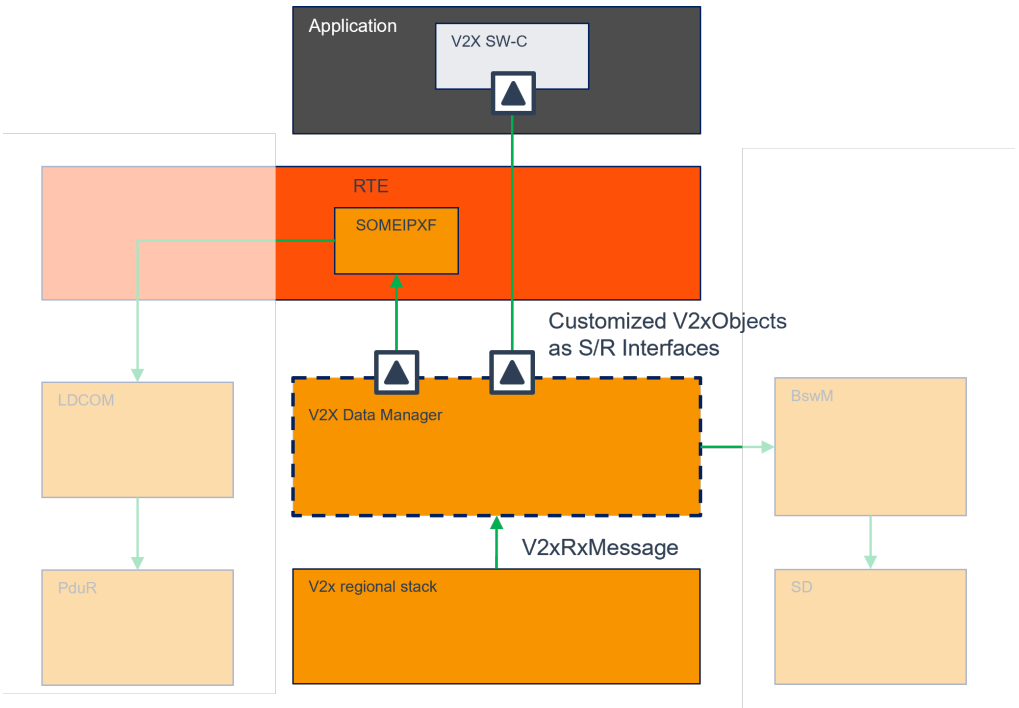

Figure 7.4: V2x objects provided by the V2xDM as S/R ports

One major goal of the V2xDM is to provide a selective view to the V2x message elements contained in the V2x message. Ideally, these V2x message elements are independent from the underlying regional V2x stack and can be provided like a data catalog that contains unified V2x catalog items. For example, a view to the position, speed and heading of a car can be derived from a V2x message. This information can be provided as a unified set of V2x catalog items, independent from the underlying regional V2x stack. But one V2x stack may define the speed with resolution of 1 m/s, the other defines a resolution of 2 m/s. The vehicle database engineer of an OEM decides to provide a unified V2x catalog item "speed" within the vehicle network from the V2x stack with a unit of 1 m/s. This requires a conversion function to be applied in the V2xDM for one specific V2x stack, whereas the speed value of the other can be provided "as is". It depends on the variant which V2x stack and its set of V2x messages are currently used and, depending on this, which sources are used to derive the V2x catalog items. These items are then mapped to the corresponding VariableDataPrototypes of the V2x object.

7.2 Modelling approach

To allow greater flexibility, the relations of V2x messages, V2x stack and V2x catalog item are modelled in the EcuC configuration of the V2xDM. The basic blocks and their relations are shown in Figure 7.5.

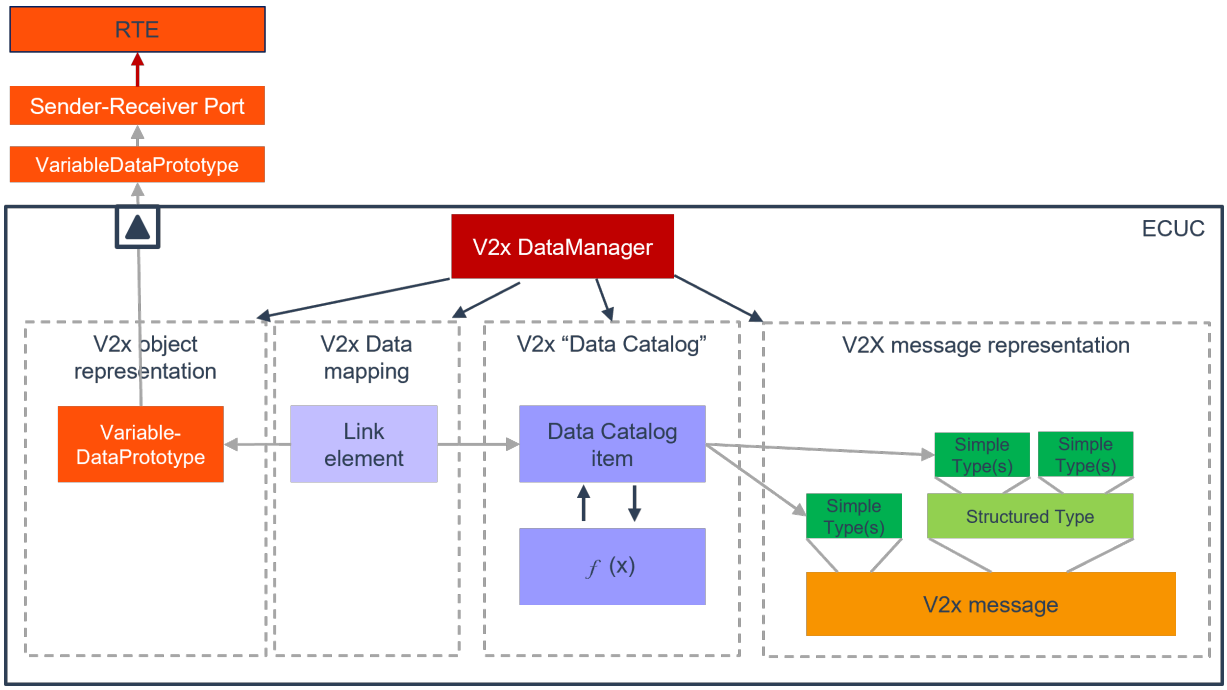

Figure 7.5: EcuC modelling overview of the V2xDM

The EcuC model of the V2xDM can roughly be divided into the following sections:

1. **V2x message representation:** Defines the V2x message according to the ASN.1 (UPER) format description in the specification. It defines all simple type and structured type elements in their order and representation.
2. **V2x Data Catalog:** This section models the V2x catalog item and references the V2x message element(s) from a V2x message. A conversion routine can be referenced to adapt the V2x message element to a unified format and data type.
3. **V2x Data Mapping:** This section models the link between the VariableDataPrototype of the V2x object and the V2x catalog item and builds the connection.
4. **V2x object representation:** This section models the references to the VariableDataPrototypes of the pre-defined V2x object so that it can be addressed by the V2xDM.

[CP_SWS_V2xDM_00005] V2xDM provides references to V2x message elements

Upstream requirements: SRS_V2X_26001

⌈The V2xDM shall provide references to simple types of a V2x message. This allows to define a representation of the contents of a V2x message through the EcuC configuration. It allows to identify the position of a V2x message element in the V2x message.⌋

[CP_SWS_V2xDM_00006] V2x catalog item shall be defined

Upstream requirements: SRS_V2X_26001

⌈The V2xDM shall define V2x data catalog that represents information from a V2x message. The V2x catalog item is a one-to-one representation of a simple type from a V2x message or can even be a result of a calculation where one or more simple types are involved.⌋

[CP_SWS_V2xDM_00007] V2xDM shall optionally transform V2x message elements into V2x catalog items

Upstream requirements: SRS_V2X_26002

⌈Optionally it shall be possible to define a transformation or conversion of at least one simple type of a V2x message into a V2x data link element (as the V2x Data Mapping) that can be mapped to a VariableDataPrototype. The transformation or conversion routine can either be provided by the V2xDM or can be provided as an operation that can be configured.

In addition, the V2xDM shall offer an interface for such a transformation or conversion routine through a defined API (as a kind of a plug-in interface).⌋

[CP_SWS_V2xDM_00008] V2xDM links V2x catalog items to VariableDataPrototypes of a S/R-port

Upstream requirements: SRS_V2X_26001

⌈The V2xDM shall map V2x catalog item to a VariableDataPrototype of a S/R port. The mapping shall be configured within its EcuC configuration.⌋

The main operation within the V2xDM is the decoding of the V2x message, the transformation of its V2x message elements and to place the results into VariableDataPrototypes of the V2x object. This all depends on the EcuC configuration. Thus, the main part of the V2xDM will consist of generated code as a result of the EcuC configuration. The static code part is mainly glue code to embed the V2xDM into the AUTOSAR environment.

7.3 Module Handling

[CP_SWS_V2xDM_00036]

Upstream requirements: SRS_BSW_00459

⌈The V2xDM shall reside in the same partition as the underlying V2XStack.⌋

7.3.1 Initialization

[CP_SWS_V2xDM_00009]

Upstream requirements: SRS_BSW_00406, SRS_V2X_26005

⌈A call to V2xDM_Init initializes all internal variables and set the V2xDM module to the initialization state.⌋

[CP_SWS_V2xDM_00010]

Upstream requirements: SRS_BSW_00350, SRS_BSW_00450

⌈If development error reporting is enabled via V2xDMDevErrorDetect, V2xDM shall call Det_ReportError with the error code V2xDM_E_UNINIT when any API other than V2xDM_Init or V2xDM_GetVersionInfo is called in uninitialized state.⌋

[CP_SWS_V2xDM_00011]

Upstream requirements: SRS_BSW_00350

⌈When V2xDM_Init is called in initialized state, the V2xDM module shall not re-initialize its internal variables. It shall instead call Det_ReportError with

the error code V2xDM_E_REINIT if development error reporting is enabled (see V2xDMDevErrorDetect).⌋

7.3.2 Scheduling

Message receive indication is triggered asynchronously to the V2xDM by the function call V2xDM_V2xStackRxIndication from the regional V2x stack or by the function call V2xDM_RxIndication from the PDU-Router. To decouple actions taken inside the V2xDM from the asynchronous calls, the main function V2xDM_MainFunction shall be called cyclically. The V2xDM will typically call other modules (e.g. RTE) in the context of this main function.

[CP_SWS_V2xDM_00012]

Upstream requirements: SRS_BSW_00478

⌈The main function V2xDM_MainFunction shall be called with the period configured in V2xDMMainFunctionPeriod. This function is used to perform operations within the V2xDM and to call other modules if a trigger operation is required.⌋

7.4 Data Transmission and Reception

7.4.1 Data Transmission

[CP_SWS_V2xDM_00013]

Upstream requirements: SRS_V2X_26003

⌈If V2xDMPduDirection is set to V2XDM_PDU_SEND, then V2xDMPduRef references a global PDU. The regional V2x stack has to call V2xDM_V2xStackRxIndication with a reference to the message (symbolic name reference) to provide the message payload to the V2xDM. Every time this message is indicated, the V2xDM shall call PduR_V2xDMTransmit with PduInfoPtr->MetaDataPtr set to the NULL_PTR and PduInfoPtr->SduLength to the length of the V2x message payload, and PduInfoPtr->SduDataPtr shall be set to the payload of the V2x message.⌋

7.4.2 Data Reception

The V2xDM gets the raw V2x message (typically including the ITS-header) in ASN.1 UPER format as input. These messages can either be provided directly by an integrated V2x stack or can be provided as a PDU from the network by the PduR.

[CP_SWS_V2xDM_00035]

Upstream requirements: SRS_V2X_26003

⌈The V2x message shall either be received through the PDU-Router or through an underlying V2x stack.⌋

[CP_SWS_V2xDM_CONSTR_00014]

Upstream requirements: SRS_V2X_26003

⌈In a configuration where V2xDMPduDirection is set to V2XDM_PDU_RECEIVE, the parameter V2xDMPduRef shall reference a global PDU that provides the V2x message.⌋

Info: It is rather assumed that no regional V2x stack is present in such a configuration.

Note: When configuring the V2xDM make sure to configure a source for every V2xDMMessage. This source can either be an input from the PduR as described in [CP_SWS_V2xDM_CONSTR_00014] or the call of V2xDM_V2xStackRxIndication from a regional V2x stack.

[CP_SWS_V2xDM_00016]

Upstream requirements: SRS_V2X_26001

⌈If V2xDMPduDirection is set to V2XDM_PDU_SEND, the V2xDM forwards this message to the PDU-Router as specified in [CP_SWS_V2xDM_00013]. If V2x objects are also assigned to this message, the V2xDM shall also decode the message, prepare the V2x objects and pass it on to the RTE.⌋

[CP_SWS_V2xDM_00017]

Upstream requirements: SRS_BSW_00432

⌈If V2xDMMsgQueue is present then any incoming V2XMessage through a call of V2xDM_V2xStackRxIndication or V2xDM_RxIndication shall be placed into the queue and further processing of the message shall be postponed to the scheduled function V2xDM_MainFunction.⌋

[CP_SWS_V2xDM_00018]

Upstream requirements: SRS_BSW_00386

⌈If V2xDMMsgQueue is present and an incoming V2XMessage through a call of V2xDM_V2xStackRxIndication or V2xDM_RxIndication is received but the queue is full, the a RuntimeError V2xDM_E_QUEUE_OVERRUN shall be reported through Det_ReportRuntimeError and the message shall be dropped.⌋

The queue configuration parameters V2xDMMsgQueueElementSize and V2xDMMsgQueueNumberOfEntries can be used to configure the message queue for incoming V2x messages. If a queue is configured (by the pres-

ence of the container V2xDMMsgQueue) the queue depth is specified by V2xDMMsgQueueNumberOfEntries. Each entry of the queue has the same size. The size of each queue entry is specified by V2xDMMsgQueueElementSize and specifies the number of bytes of a message. This element size shall be able to store the largest V2XMessage.

7.5 Data Modelling

7.5.1 V2x message representation

To support multiple regional V2x stacks, the data model of the V2xDM supports a hierarchical system. Every regional specific V2x stack and its corresponding V2x messages are configured in the V2xDMStack and subsequent containers of V2xDMMessages that belongs to this stack. The configuration of various V2x stacks and its V2x messages is optional. Due to the support of the AUTOSAR Variant concept, the V2x stack and its messages can be assigned to such variants to enable or disable them. The configuration of at least one container of V2xDMStack is mandatory, even if just one regional V2x stack is required. But the definition of variants is only useful if more than one V2x stack is used.

[CP_SWS_V2xDM_CONSTR_00019] ⌈For a regional V2x stack a container V2xDMStack shall be defined. All V2x message that the V2xDM supports shall be configured in subsequent containers of V2xDMMessage.⌋

[CP_SWS_V2xDM_CONSTR_00020] ⌈Exactly one regional V2x stack shall be present per AUTOSAR variation.⌋

[CP_SWS_V2xDM_CONSTR_00021] ⌈Each message shall be addressable by external module configurations. Therefore, the V2xDMMessage container contains an AUTOSAR SymbolicName.⌋

[CP_SWS_V2xDM_CONSTR_00022] ⌈Each ASN.1 type, whether it is a structured type or a simple type, must be explicitly modeled and may only be used exactly once. It follows that each ASN.1 element representation may have only one parent node in the V2xDMMessage container.⌋

Rationale: For example, the configuration represents each instance of an ASN.1 type individually. It follows that the V2xDMMessage container contains exactly one reference to each represented ASN.1 element.

Info: This is necessary because the elements are used as source for the CatalogItems. If there are, for example, two elements of the same type in a sequence and model this

type only once and then reference it from both elements, it would no longer be clear which element should be used as source for the CatalogItem.

[CP_SWS_V2xDM_CONSTR_00023] ⌈The shortnames assigned to the V2xDMMessage containers shall be globally unique. There shall be no two V2xDMMessage containers (within the same or) within different V2xDMStack containers sharing the same shortname.⌋

7.5.2 V2x data catalog

As second essential part of the model, the data catalog offers the possibility to define a custom data set. This data set can then be used to fill the V2x objects. Each item within this catalog is derived from one or many V2x message elements. Each V2XCatalogItem is an abstraction to the different regional V2X specifications. To enable compatibility between possibly deviating data representations in different regional stacks, conversions can be applied.

[CP_SWS_V2xDM_CONSTR_00024]

Upstream requirements: SRS_V2X_26004

⌈For each AUTOSAR variation, the V2XCatalogItem needs to be connected to the corresponding V2x message. Each connection is configured as V2xDMConnection container.⌋

[CP_SWS_V2xDM_CONSTR_00025]

Upstream requirements: SRS_V2X_26004

⌈The sources of each V2xDMConnection need to be elements of one message. Each source is a necessary piece of information for deriving the V2x catalog item value.⌋

[CP_SWS_V2xDM_CONSTR_00026]

Upstream requirements: SRS_V2X_26001

⌈Only SimpleTypes can be used as sources of the catalog items.⌋

[CP_SWS_V2xDM_CONSTR_00027]

Upstream requirements: SRS_V2X_26001

⌈Each source is configured using the container V2xDMConnectionSource. The SimpleType shall be identified using the V2xDMConnectionSourceTargetRef reference. If one or multiple of its parents in the ASN.1 hierarchy is of type SequenceOf, for each of these parents the V2xDMConnectionSourceContext container needs to be defined. The V2xDMConnectionSourceContext container specifies a reference

to the corresponding SequenceOf root type and the accessed index of the SequenceOf to uniquely address the message element.⌋

[CP_SWS_V2xDM_CONSTR_00028]

Upstream requirements: SRS_V2X_26001

⌈If the data type of the source message element does not correspond to the `V2x catalog item` type, or if multiple sources are used to derive the item value, a conversion routine needs to be configured using the `V2xDMConversion` container.⌋

7.5.3 V2x data mapping

The final part of the model is used to connect the `V2x object` elements with `V2x catalog item`s. The connection is achieved by defining a `V2xDMLink` container which contains a reference to the `V2XCatalogItem` and one or more references of `V2XObject` elements.

[CP_SWS_V2xDM_CONSTR_00029]

Upstream requirements: SRS_V2X_26006

⌈The references of V2x object elements are configured as `V2xDMLink`. Each instance of the container shall have one reference to a `V2xDMCatalogItem` and a reference to the V2x object element as `V2xDMLinkV2xObjectElementInstanceRef`.⌋

[CP_SWS_V2xDM_CONSTR_00030]

Upstream requirements: SRS_V2X_26006

⌈Only V2x object elements with a type capable of representing all possible values of the `V2x catalog item` type can be connected.⌋

[CP_SWS_V2xDM_CONSTR_00031]

Upstream requirements: SRS_V2X_26004

⌈All elements inside one V2x object shall share only one source message.⌋

Rationale: It is not allowed that data from different messages are combined in the same V2x object. The `V2xDM` does not assemble such messages. All elements inside one `V2XObject` need to be filled for the V2x object to be dispatched. It follows that a V2x object can only ever be dispatched if all its elements are derived from the same message. If multiple messages provide all the sources for a V2x object, it is dispatched whenever one of the messages is received.

7.6 Message Decoding and Forwarding

The V2x-messages received by the V2xDM are encoded in ASN.1 format (UPER format). Before the data from such a message can be accessed, they are decoded into data structures that are accessible by a microcontroller (highly densed coding format). The exact encoding rule of an ASN.1 message is available through the individual standards and can vary.

[CP_SWS_V2xDM_00032]

Upstream requirements: SRS_V2X_26001, SRS_V2X_26004

⌈If a message is provided to the V2xDM, either through PduR or the regional V2x stack, and V2x catalog items are assigned to a V2x object for this message, then the V2xDM will start decoding the message according to the configuration of the V2xDMMessage and will fill in the VariableDataPrototypes of a V2x object that are mapped to the respective V2XCatalogItems.⌋

[CP_SWS_V2xDM_00033]

Upstream requirements: SRS_V2X_26002

⌈During the decoding of the ASN.1 coded V2x message, the decoder shall call a generated callback function for every StructuredType where the CallbackEnabled flag is set (see V2xDMStructuredTypeSequenceOfCallbackEnabled, V2xDMStructuredTypeChoiceCallbackEnabled or V2xDMStructuredTypeSequenceCallbackEnabled). The implementation of this callback function shall be user specific (see V2xDM_Callback_<Stack>_<Msg>_<Type>). If this function returns E_OK, the decoder proceeds its operation with decoding the next sequence of the V2x message. Any other return value will abort the decoding process and no V2x object assigned to the V2x message will be indicated to the RTE.⌋

[CP_SWS_V2xDM_00039]

Upstream requirements: SRS_V2X_26002

⌈If an error occurs during decoding of a V2x message then V2xDM shall generate a RuntimeError and call Det_ReportRuntimeError with the error code V2xDM_E_DECODING_FAILURE.⌋

[CP_SWS_V2xDM_00038]

Upstream requirements: SRS_V2X_26001

⌈If the value of a V2x catalog item is not an immediate copy of the V2x message element, the conversion function <V2xDM_ItemConversionFunc> shall be applied to derive the value. The name of the conversion function shall be configured in V2xDMConversionFunc as a parameter of the container V2xDMConversion which

is a sub container of V2xDMConnection inside the corresponding catalog item connection. The assigned conversion function name shall be unique and must not collide with an unrelated function's name.⌋

A conversion function is needed if a V2x catalog item is derived from one V2x message element and the source of this message element needs to be converted into another unit (e.g. through linear trasformation). Or a V2x catalog item is derived from several V2x message elements. In the latter case the conversion function generates the resulting V2x catalog item out of the input values of the V2x message elements.

An alternative to a user defined conversion function is the usage of standard conversion functions offered by the V2xDM, e.g. the V2xDMConversionFunctionLinear.

Note: The conversion function will only be generated if a V2x catalog item is referenced by a V2x object. Without a reference, no conversion function will be generated.

[CP_SWS_V2xDM_00034]

Upstream requirements: SRS_V2X_26001

⌈The V2xDM shall indicate any V2x objects that are associated to the V2x catalog item of a V2x message to the RTE only after the complete V2x message was successfully decoded and all V2x objects have been filled completely.⌋

[CP_SWS_V2xDM_00037]

Upstream requirements: SRS_V2X_26001

⌈If an error occurs during conversion of a V2x message then V2xDM shall generate a RuntimeError and call Det_ReportRuntimeError with the error code V2xDM_E_CONVERSION_FAILURE.⌋

Details of the conversion flow can be found in Figure 9.1.

Note: A V2x object may be configured for transmission via SOME/IP. Values for the transformer and event type are configured accordingly. The V2x Data Manager does not manage service discovery. Either, event types are auto initialized on startup or are managed by SW-C.

7.7 Error Classification

7.7.1 Development Errors

[CP_SWS_V2xDM_00101] Definiton of development errors in module V2xDM

Upstream requirements: SRS_BSW_00385

⌈

Type of error	*Related error code*	*Error value*
API service called with wrong parameter	V2XDM_E_PARAM	0x01
API service call before the module has been initialized	V2XDM_E_UNINIT	0x02
Call to V2xDM_Init() after the module has already been initialized by a previous call to V2xDM_Init().	V2XDM_E_REINIT	0x03
An API service was called with a NULL pointer	V2XDM_E_PARAM_POINTER	0x04

⌋

7.7.2 Runtime Errors

[CP_SWS_V2xDM_00102] Definiton of runtime errors in module V2xDM

Upstream requirements: SRS_BSW_00385

⌈

Type of error	*Related error code*	*Error value*
Indicates that the V2xDM queue is full while a new message was received.	V2XDM_E_QUEUE_OVERRUN	0x10
Indicates that the ASN.1 decoding has failed.	V2XDM_E_DECODING_FAILURE	0x11
Indicates that the conversion of the V2x message element into the catalog item has failed.	V2XDM_E_CONVERSION_FAILURE	0x12

⌋

7.7.3 Production Errors

The V2xDM module does not define production errors.

7.7.4 Extended Production Errors

The V2xDM module does not define extended production errors.

8 API specification

8.1 API parameter checking

The V2x Data Manager module reports the development error V2xDM_E_PARAM_POINTER when a NULL_PTR is not accepted as an argument to a service or callback function. The exact behavior is specified in [SWS_BSW_00050] and [SWS_BSW_00212].

8.2 Imported types

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

[CP_SWS_V2xDM_01003] Definition of imported datatypes of module V2xDM ⌈

Module	*Header File*	*Imported Type*
Comtype	ComStack_Types.h	PduIdType
Rte	Rte_<SWC>.h	Rte_Instance
Std	Std_Types.h	Std_ReturnType
	Std_Types.h	Std_VersionInfoType

⌋

8.3 Type definitions

8.3.1 V2xDM_ConfigType

[CP_SWS_V2xDM_01009] Definition of datatype V2xDm_Rep_<Stack>_<Msg>_<Type> ⌈

Name	V2xDm_Rep_<Stack>_<Msg>_<Type>	
Kind	Structure	
Elements	implementation specific	
	Type	–
	Comment	–

▽

△

Description	This is a generated data structure used in the generated callback (see [CP_SWS_V2xDM_01008]). The generated structure name will be derived from various container names defined in the EcuC configuration: <Stack>: Container name if V2xDMStack <Msg>: Container name of V2xDMMessage <Type>: Container name of the V2xDMStructuredType where the callback references to.
Available via	V2xDM.h

⌋

8.4 Function definitions

This is a list of functions provided for upper layer modules and other `V2x stack` modules.

8.4.1 V2xDM_Init

[CP_SWS_V2xDM_01005] Definition of API function V2xDM_Init

Upstream requirements: SRS_BSW_00101, SRS_BSW_00358, SRS_BSW_00414, SRS_V2X_-26005

⌈

Service Name	V2xDM_Init	

Syntax	`void V2xDM_Init (`
	`  void CfgPtr`
	`)`	

Service ID [hex]	0x01	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	CfgPtr	Component configuration structure
Parameters (inout)	None	
Parameters (out)	None	
Return value	None	
Description	Service to initialize the module V2xDM. It initializes all variables and sets the module state to initialized.	
Available via	V2xDM.h	

⌋

8.4.2 V2xDM_GetVersionInfo

[CP_SWS_V2xDM_01004] Definition of API function V2xDM_GetVersionInfo

Upstream requirements: SRS_BSW_00407, SRS_BSW_00482, SRS_BSW_00003

⌈

Service Name	V2xDM_GetVersionInfo	
Syntax	`void V2xDM_GetVersionInfo ( Std_VersionInfoType VersionInfoPtr )`	
Service ID [hex]	0x02	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	None	
Parameters (inout)	None	
Parameters (out)	VersionInfoPtr	Pointer to where to store the version information. Parameter shall not be NULL.
Return value	None	
Description	Returns version information, vendor ID and AUTOSAR module ID of the component.	
Available via	V2xDM.h	

⌋

8.5 Callback notifications

This is a list of functions provided for other modules.

8.5.1 V2xDM_RxIndication

[CP_SWS_V2xDM_01012] Definition of callback function V2xDM_RxIndication

Upstream requirements: SRS_V2X_26003

⌈

Service Name	V2xDM_RxIndication	
Syntax	`void V2xDM_RxIndication ( PduIdType RxPduId, const PduIdType PduInfoPtr )`	
Service ID [hex]	0x07	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
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 (PduR).	
Available via	V2xDM.h	

⌋

8.5.2 V2xDM_V2xStackRxIndication

[CP_SWS_V2xDM_01007] Definition of callback function V2xDM_V2xStackRxIndication

Upstream requirements: SRS_BSW_00359, SRS_BSW_00360

⌈

Service Name	V2xDM_V2xStackRxIndication	

Syntax	`void V2xDM_V2xStackRxIndication (`
	`  uint32 MsgId,`
	`  uint8* V2xMsgDataPtr,`
	`  uint32 V2xMsgDataLength`
	`)`	

Service ID [hex]	0x04	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	MsgId	Holds the identifier to the message
	V2xMsgDataPtr	Pointer to the V2x message data in ASN.1 UPER representation
	V2xMsgDataLength	Indicates the number of bytes provided to the function.
Parameters (inout)	None	
Parameters (out)	None	
Return value	None	
Description	Function is called by the underlying V2x stack to provide a V2x message to the V2x Data Manager	
Available via	V2xDM.h	

⌋

8.6 Scheduled functions

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

8.6.1 V2xDM_MainFunction

[CP_SWS_V2xDM_01006] Definition of scheduled function V2xDM_MainFunction

Upstream requirements: SRS_BSW_00432, SRS_BSW_00373, SRS_BSW_00424

⌈

Service Name	V2xDM_MainFunction

Syntax	`void V2xDM_MainFunction (`
	`  void`
	`)`

Service ID [hex]	0x03
Description	Function is called periodically according the specified time interval.
Available via	V2xDM.h

⌋

8.7 Expected interfaces

In this chapter all interfaces required from other modules are listed.

8.7.1 Mandatory interfaces

Note: This section defines all interfaces, which are required to fulfill the core functionality of the module.

[CP_SWS_V2xDM_01001] Definition of mandatory interfaces required by module V2xDM ⌈

API Function	***Header File***	***Description***
Det_ReportRuntimeError	Det.h	Service to report runtime errors. If a callout has been configured then this callout shall be called.

⌋

8.7.2 Optional interfaces

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

[CP_SWS_V2xDM_01002] Definition of optional interfaces requested by module V2xDM ⌈

API Function	*Header File*	*Description*
Det_ReportError	Det.h	Service to report development errors.
Rte_Write_<p>_<o>	<application.h> or Rte_<Mip>.h	–

⌋

8.7.3 Configurable interfaces

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

There are currently no configurable interfaces available in V2xDM.

8.7.4 V2xDM_Callback_<Stack>_<Msg>_<Type>

[CP_SWS_V2xDM_01008] Definition of configurable interface V2xDM_Callback_<Stack>_<Msg>_<Type> ⌈

Service Name	V2xDM_Callback_<Stack>_<Msg>_<Type>	
Syntax	`Std_ReturnType V2xDM_Callback_<Stack>_<Msg>_<Type> ( const V2xDm_Rep_<Stack>_<Msg>_<Type> StructData )`	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	StructData	Pointer to the structure that has been decoded.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_ReturnType	`E_OK`: Data are accepted, continue operation. `E_NOT_OK`: Data are not accepted abort operation, do not send V2xObject(s) associated to this message.
Description	This is a generated callback that is called after decoding a sequence, sequenceOf or union of the V2x message. Individual functions are generated when the "...CalbackEnabled" flag is set in the configuration. The function name will be derived from various containernames in the Ecu C configuration: <Stack>: V2xDMStack <Msg>: Container name of V2xDMMessage <Type>: Name of the V2xDMStructuredType where this callback references to.	
Available via	V2xDM.h	

⌋

8.7.5 <V2xDM_ItemConversionFunc>

[CP_SWS_V2xDM_01010] Definition of configurable interface <V2xDM_ItemConversionFunc>

Upstream requirements: SRS_V2X_26002, SRS_V2X_26006

⌈

Service Name	<V2xDM_ItemConversionFunc>	

Syntax	`Std_ReturnType <V2xDM_ItemConversionFunc> (`
	`  <GeneratedType> ItemResult,`
	`  <GeneratedType> ItemInput1,`
	`  <GeneratedType> ...`
	`)`	

Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	ItemInput1	This value contains the SimpleType of the V2x message mapped to the catalog item. The data type depends on the SimpleType and is vendor specific.
	...	This value contains the SimpleType of the V2x message mapped to the catalog item. The data type depends on the SimpleType and is vendor specific.
Parameters (inout)	None	
Parameters (out)	ItemResult	This value provides the result of the calculation. The data type depends on the data type where V2xDMCatalogItemTypeRef refers to.
Return value	Std_ReturnType	`E_OK`: Conversion successfully performed. `E_NOT_OK`: Conversion failed. ItemResult is not valid.
Description	This is a generated callback that is called before a catalog item is written to a VariableData Prototype of a V2x object. It allows to transform the V2x message element into the platform type of the VariableDataPrototype and/or to re-scale the value. If more than one V2x message element is assigned to the catalog item, further input elements will be added to the parameter list of the function. The function name will be derived from the configuration item V2x DMConversionFunc of the container V2xDMConversion in the EcuC configuration.	
Available via	V2xDM.h	

⌋

8.8 Service Interfaces

The `V2xDM` provides Sender-Receiver ports as service interfaces to the `RTE`. However, in contradiction to other service modules, the `V2xDM` is not mandating specific ports and service interfaces to interconnect to the pre-defined S/R ports. The `V2xDM` takes the information, which P-Port prototypes need to be generated from the EcuC configuration of `V2xDMLinkV2xObjectElementInstanceRef`(s). This parameter references to the pre-defined RPortPrototype of a SenderReceiverInterface and its VariableDataPrototype, so that the `V2xDM` can generate the necessary PPortPrototype(s).

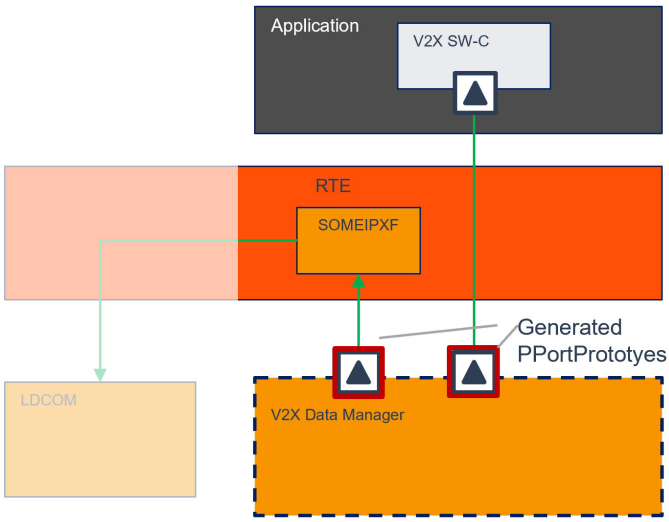

Figure 8.1: Generated PPortPrototype(s) by the V2xDM

9 Sequence diagrams

9.1 V2x message reception

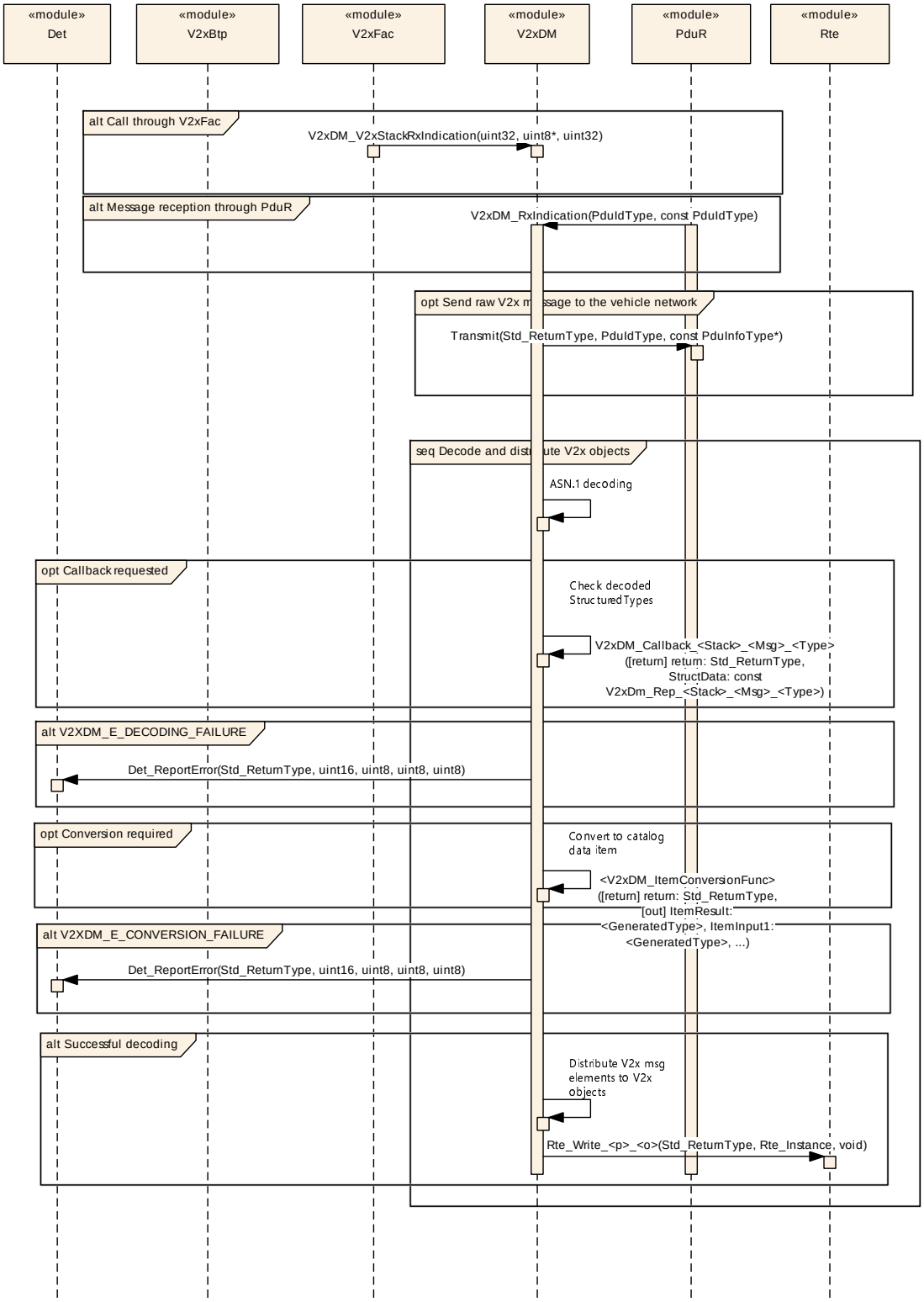

Figure 9.1: V2x message reception and processing

10 Configuration specification

In general, this chapter defines configuration parameters and their clustering into containers. For general information about the definition of containers and parameters, refer to the section 10.1 “Introduction to configuration specification” in [3, SWS BSW General].

Chapter 10.1 specifies the structure (containers) and the parameters of the module V2x_DataManager.

Chapter 10.2 specifies published information of the module V2x_DataManager.

10.1 Containers and configuration parameters

The following chapters summarize all configuration parameters. The detailed meanings of the parameters describe Chapter 7 and Chapter 8.

10.1.1 V2xDM

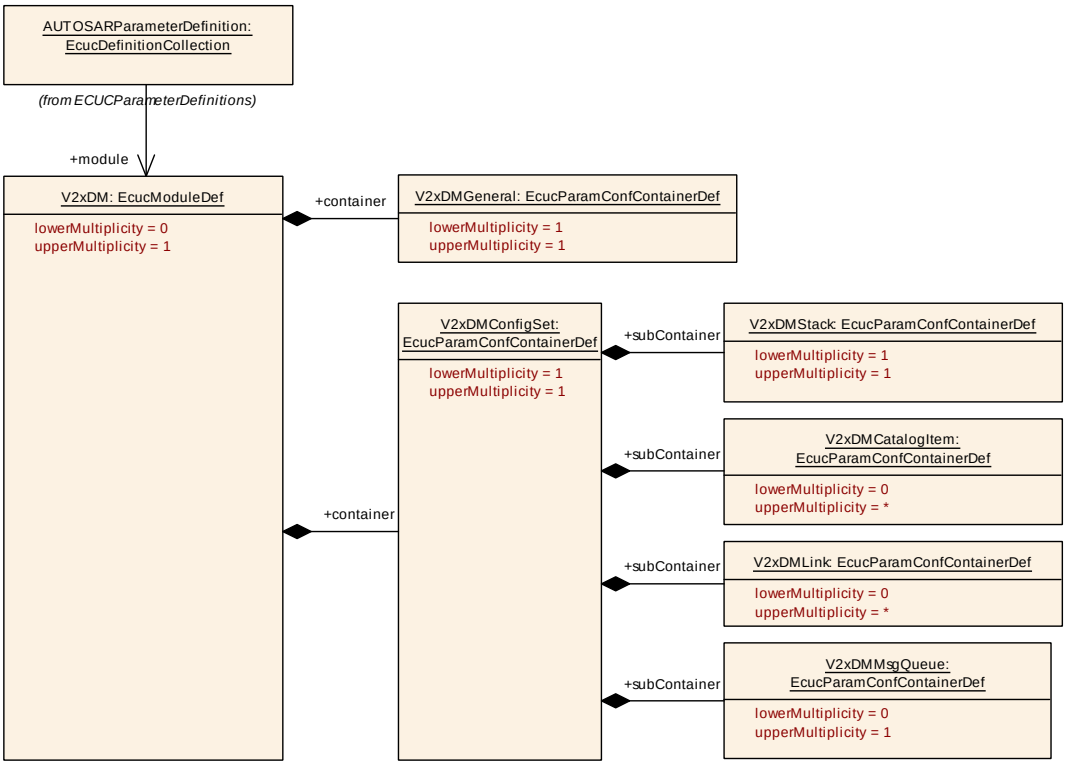

Figure 10.1: V2xDataManager

[ECUC_V2xDM_00001] Definition of EcucModuleDef V2xDM ⌈

Module Name	V2xDM
Description	Configuration of the V2XDM module
Post-Build Variant Support	false
Supported Config Variants	VARIANT-PRE-COMPILE

Included Containers		
Container Name	Multiplicity	Scope / Dependency
V2xDMConfigSet	1	Container contains all configuration items for the V2xDM
V2xDMGeneral	1	This container contains the general configuration parameters of the Vehicle-2-X Data Manager.

⌋

10.1.2 V2xDMGeneral

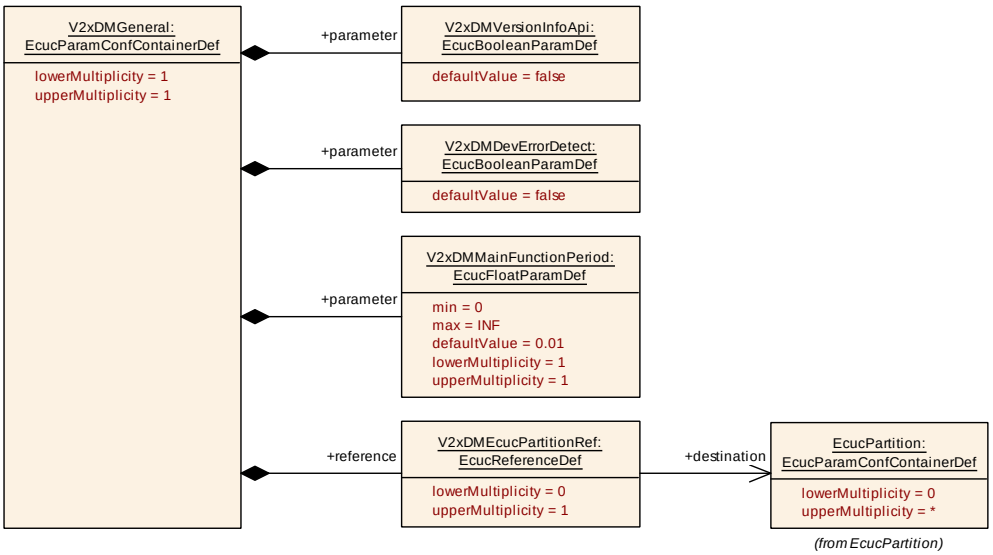

Figure 10.2: V2xDMGeneral

[ECUC_V2xDM_00002] Definition of EcucParamConfContainerDef V2xDMGeneral ⌈

Container Name	V2xDMGeneral
Parent Container	V2xDM
Description	This container contains the general configuration parameters of the Vehicle-2-X Data Manager.
Configuration Parameters	

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMDevErrorDetect	1	[ECUC_V2xDM_00003]
V2xDMMainFunctionPeriod	1	[ECUC_V2xDM_00020]
V2xDMVersionInfoApi	1	[ECUC_V2xDM_00004]
V2xDMEcucPartitionRef	0..1	[ECUC_V2xDM_00098]

No Included Containers

⌋

[ECUC_V2xDM_00003] Definition of EcucBooleanParamDef V2xDMDevErrorDetect ⌈

Parameter Name	V2xDMDevErrorDetect		
Parent Container	V2xDMGeneral		
Description	Switches the Default Error Tracer (Det) detection and notification ON or OFF. • true: enabled (ON) • false: disabled (OFF)		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00020] Definition of EcucFloatParamDef V2xDMMainFunctionPeriod ⌈

Parameter Name	V2xDMMainFunctionPeriod		
Parent Container	V2xDMGeneral		
Description	Specifies the period of main function V2xDM_MainFunction in seconds.		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	]0 .. INF[		
Default value	0.01		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: ECU		

⌋

[ECUC_V2xDM_00004] Definition of EcucBooleanParamDef V2xDMVersionInfo Api ⌈

Parameter Name	V2xDMVersionInfoApi		
Parent Container	V2xDMGeneral		
Description	Enable/disables the API for reading the version information of the V2xDM Module. • true: enabled (ON) • false: disabled (OFF)		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00098] Definition of EcucReferenceDef V2xDMEcucPartitionRef ⌈

Parameter Name	V2xDMEcucPartitionRef		
Parent Container	V2xDMGeneral		
Description	Reference to EcucPartition, where V2x Data Manager module is assigned to.		
Multiplicity	0..1		
Type	Reference to EcucPartition		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.3 V2xDMConfigSet

[ECUC_V2xDM_00086] Definition of EcucParamConfContainerDef V2xDMConfig Set ⌈

Container Name	V2xDMConfigSet
Parent Container	V2xDM
Description	Container contains all configuration items for the V2xDM
Configuration Parameters	

No Included Parameters

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMCatalogItem	0..*	Contains all catalog items of the V2x DataManager
V2xDMLink	0..*	Defines the links between the VariableDataPrototypes of the V2x object to the V2x catalog items.
V2xDMMsgQueue	0..1	Specifies a message queue for incoming V2x messages of the data manager. If this container is not present, no queue is used for incoming V2x messages. If it is present, the elements of the container specifies the queue depth and its elements.
V2xDMStack	1	Holds the V2x stack specific container and parameter.

⌋

10.1.4 V2xDMLink

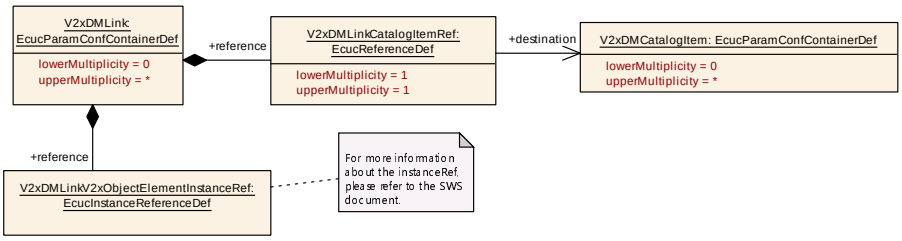

Figure 10.3: V2xDMLink

[ECUC_V2xDM_00079] Definition of EcucParamConfContainerDef V2xDMLink ⌈

Container Name	V2xDMLink		
Parent Container	V2xDMConfigSet		
Description	Defines the links between the VariableDataPrototypes of the V2x object to the V2x catalog items.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMLinkCatalogItemRef	1	[ECUC_V2xDM_00080]
V2xDMLinkV2xObjectElementInstanceRef	1..*	[ECUC_V2xDM_00081]

No Included Containers

⌋

[ECUC_V2xDM_00080] Definition of EcucReferenceDef V2xDMLinkCatalogItem Ref ⌈

Parameter Name	V2xDMLinkCatalogItemRef		
Parent Container	V2xDMLink		
Description	References to the catalog item that is used for this link.		
Multiplicity	1		
Type	Reference to V2xDMCatalogItem		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00081] Definition of EcucInstanceReferenceDef V2xDMLinkV2x ObjectElementInstanceRef ⌈

Parameter Name	V2xDMLinkV2xObjectElementInstanceRef		
Parent Container	V2xDMLink		
Description	This container references to the port prototype and VariableDataPrototype as a V2x object.		
Multiplicity	1..*		
Type	Instance reference to IMPLEMENTATION-DATA-TYPE-ELEMENT context: ROOT-SW-COMPOSITION-PROTOTYPE SW-COMPONENT-PROTOTYPE PORT-PROTOTYPE AUTOSAR-DATA-PROTOTYPE IMPLEMENTATION-DATA-TYPE-ELEMENT*		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.5 V2xDMCatalogItem

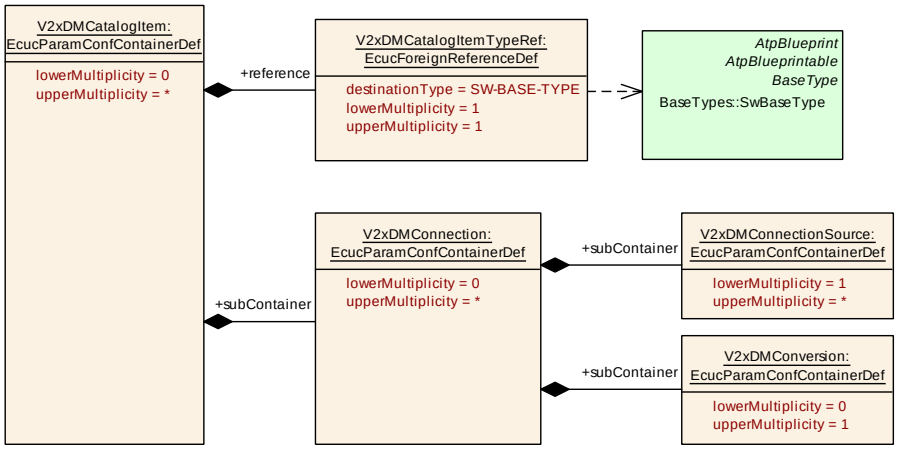

Figure 10.4: V2xDMCatalog

[ECUC_V2xDM_00065] Definition of EcucParamConfContainerDef V2xDMCatalogItem ⌈

Container Name	V2xDMCatalogItem		
Parent Container	V2xDMConfigSet		
Description	Contains all catalog items of the V2x DataManager		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMCatalogItemTypeRef	1	[ECUC_V2xDM_00064]

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMConnection	0..*	Collects all connection information for this catalog item.

⌋

[ECUC_V2xDM_00064] Definition of EcucForeignReferenceDef V2xDMCatalogItemTypeRef ⌈

Parameter Name	V2xDMCatalogItemTypeRef
Parent Container	V2xDMCatalogItem
Description	Reference to the base type of this catalog item.

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Multiplicity	1		
Type	Foreign reference to SW-BASE-TYPE		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.6 V2xDMConnection

[ECUC_V2xDM_00066] Definition of EcucParamConfContainerDef V2xDMConnection ⌈

Container Name	V2xDMConnection		
Parent Container	V2xDMCatalogItem		
Description	Collects all connection information for this catalog item.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

No Included Parameters

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMConnectionSource	1..*	Contains definition for the connected sources of V2x message items.
V2xDMConversion	0..1	Allows to define a conversion routine to adapt V2x simple item(s) to the data catalog element.

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10.1.7 V2xDMConnectionSource

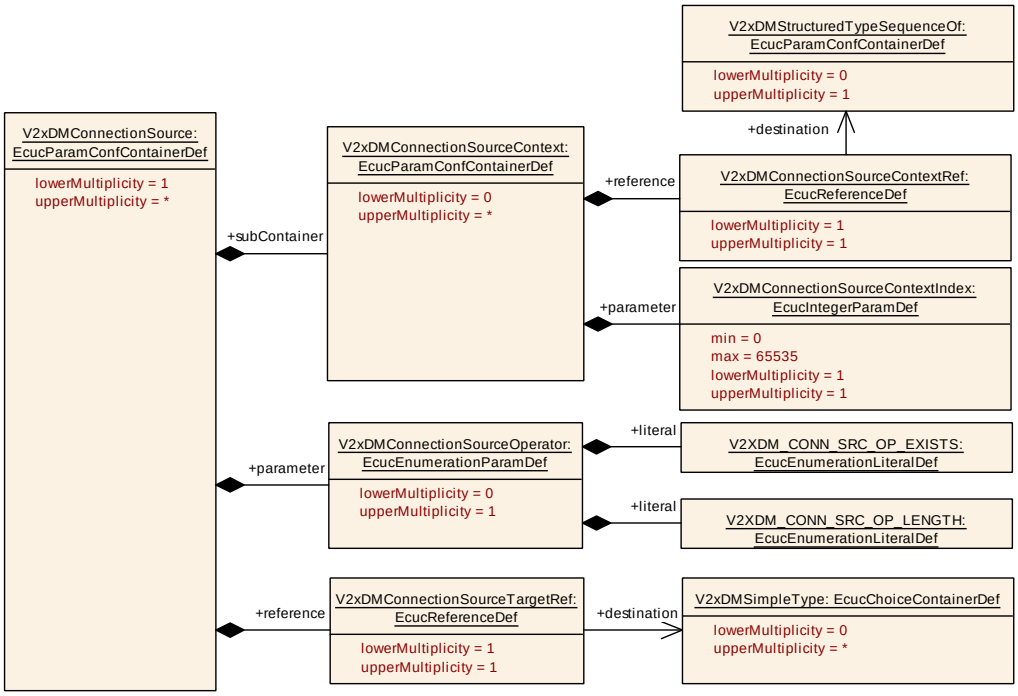

Figure 10.5: V2xDMConnectionSource

[ECUC_V2xDM_00067] Definition of EcucParamConfContainerDef V2xDMConnectionSource ⌈

Container Name	V2xDMConnectionSource		
Parent Container	V2xDMConnection		
Description	Contains definition for the connected sources of V2x message items.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMConnectionSourceOperator	0..1	[ECUC_V2xDM_00072]
V2xDMConnectionSourceTargetRef	1	[ECUC_V2xDM_00073]

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMConnectionSourceContext	0..*	Contains information to uniquely address a V2X message element. I.e. the V2x message element can be contained in a SequenceOf. In that case the index inside the SequenceOf must be provided to avoid an ambiguous reference.

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[ECUC_V2xDM_00072] Definition of EcucEnumerationParamDef V2xDMConnectionSourceOperator ⌈

Parameter Name	V2xDMConnectionSourceOperator		
Parent Container	V2xDMConnectionSource		
Description	Selects the source type of the operator.		
Multiplicity	0..1		
Type	EcucEnumerationParamDef		
Range	V2XDM_CONN_SRC_OP_EXISTS	–	
	V2XDM_CONN_SRC_OP_LENGTH	–	
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00073] Definition of EcucReferenceDef V2xDMConnectionSourceTargetRef ⌈

Parameter Name	V2xDMConnectionSourceTargetRef		
Parent Container	V2xDMConnectionSource		
Description	Links to the simple type of a V2x message.		
Multiplicity	1		
Type	Reference to V2xDMSimpleType		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.8 V2xDMConnectionSourceContext

[ECUC_V2xDM_00069] Definition of EcucParamConfContainerDef V2xDMConnectionSourceContext ⌈

Container Name	V2xDMConnectionSourceContext		
Parent Container	V2xDMConnectionSource		
Description	Contains information to uniquely address a V2X message element. I.e. the V2x message element can be contained in a SequenceOf. In that case the index inside the SequenceOf must be provided to avoid an ambiguous reference.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMConnectionSourceContextIndex	1	[ECUC_V2xDM_00070]
V2xDMConnectionSourceContextRef	1	[ECUC_V2xDM_00071]

No Included Containers

⌋

[ECUC_V2xDM_00070] Definition of EcucIntegerParamDef V2xDMConnectionSourceContextIndex ⌈

Parameter Name	V2xDMConnectionSourceContextIndex		
Parent Container	V2xDMConnectionSourceContext		
Description	Index to the SequenceOf element that the SourceContextRef references to.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00071] Definition of EcucReferenceDef V2xDMConnectionSourceContextRef ⌈

Parameter Name	V2xDMConnectionSourceContextRef
Parent Container	V2xDMConnectionSourceContext
Description	Reference to the SequenceOf element of a V2x message.
Multiplicity	1
Type	Reference to V2xDMStructuredTypeSequenceOf

▽

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

⌋

10.1.9 V2xDMConversion

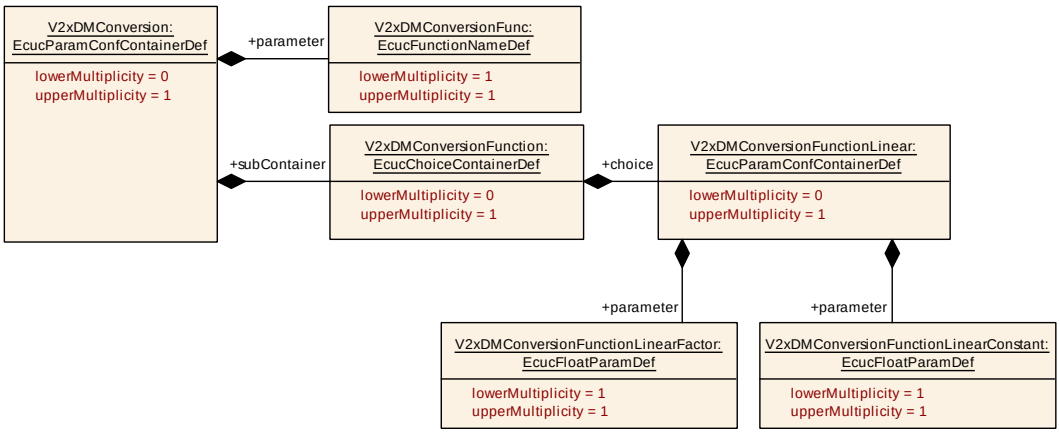

Figure 10.6: V2xDMConversion

[ECUC_V2xDM_00068] Definition of EcucParamConfContainerDef V2xDMConversion ⌈

Container Name	V2xDMConversion		
Parent Container	V2xDMConnection		
Description	Allows to define a conversion routine to adapt V2x simple item(s) to the data catalog element.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMConversionFunc	1	[ECUC_V2xDM_00075]

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMConversionFunction	0..1	Defines the conversion function container that shall be applied to convert the V2x message element into the unified data catalog item.

⌋

[ECUC_V2xDM_00075] Definition of EcucFunctionNameDef V2xDMConversion Func ⌈

Parameter Name	V2xDMConversionFunc		
Parent Container	V2xDMConversion		
Description	This parameter provides the function name for the callback <V2xDM_ItemConversion Func>.It is used to convert the simple type information into the data catalog item value and its base type.		
Multiplicity	1		
Type	EcucFunctionNameDef		
Default value	–		
Regular Expression	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.10 V2xDMConversionFunction

[ECUC_V2xDM_00074] Definition of EcucChoiceContainerDef V2xDMConversion Function ⌈

Choice Container Name	V2xDMConversionFunction		
Parent Container	V2xDMConversion		
Description	Defines the conversion function container that shall be applied to convert the V2x message element into the unified data catalog item.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	

No Included Parameters

Container Choices		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMConversionFunctionLinear	0..1	This container defines th parameter for the linear conversion routine.

⌋

10.1.11 V2xDMConversionFunctionLinear

[ECUC_V2xDM_00076] Definition of EcucParamConfContainerDef V2xDMConversionFunctionLinear ⌈

Container Name	V2xDMConversionFunctionLinear		
Parent Container	V2xDMConversionFunction		
Description	This container defines th parameter for the linear conversion routine.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMConversionFunctionLinearConstant	1	[ECUC_V2xDM_00077]
V2xDMConversionFunctionLinearFactor	1	[ECUC_V2xDM_00078]

No Included Containers

⌋

[ECUC_V2xDM_00077] Definition of EcucFloatParamDef V2xDMConversionFunctionLinearConstant ⌈

Parameter Name	V2xDMConversionFunctionLinearConstant		
Parent Container	V2xDMConversionFunctionLinear		
Description	This parameter defines the offset to the linear conversion function		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	[-INF .. INF]		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00078] Definition of EcucFloatParamDef V2xDMConversionFunctionLinearFactor ⌈

Parameter Name	V2xDMConversionFunctionLinearFactor		
Parent Container	V2xDMConversionFunctionLinear		
Description	This defines the scale factor for the linear conversion function.		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	[-INF .. INF]		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.12 V2xDMStack

[ECUC_V2xDM_00005] Definition of EcucParamConfContainerDef V2xDMStack ⌈

Container Name	V2xDMStack
Parent Container	V2xDMConfigSet
Description	Holds the V2x stack specific container and parameter.
Configuration Parameters	

No Included Parameters

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMMessage	1..*	Definition of a V2x message and its layout

⌋

10.1.13 V2xDMMessage

[ECUC_V2xDM_00006] Definition of EcucParamConfContainerDef V2xDMMessage ⌈

Container Name	V2xDMMessage		
Parent Container	V2xDMStack		
Description	Definition of a V2x message and its layout		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	Multiplicity	ECUC ID
V2xDMMsgId	1	[ECUC_V2xDM_00088]
V2xDMMsgRootRef	1	[ECUC_V2xDM_00012]

Included Containers		
Container Name	Multiplicity	Scope / Dependency
V2xDMPdu	0..1	Container for parameters that are necessary for the configuration of the V2xDM to serve as the UpperLayer of the PDU-Router module.
V2xDMSimpleType	0..*	Definition of simple types within a V2x message as a choice of simple types.
V2xDMStructuredType	0..*	Definition of structured types in a V2x message

⌋

[ECUC_V2xDM_00088] Definition of EcucIntegerParamDef V2xDMMsgId ⌈

Parameter Name	V2xDMMsgId		
Parent Container	V2xDMMessage		
Description	Identifier of the message. The set of V2x message identifiers shall be consecutive and gapless.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 4294967295		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00012] Definition of EcucChoiceReferenceDef V2xDMMsgRootRef ⌈

Parameter Name	V2xDMMsgRootRef		
Parent Container	V2xDMMessage		
Description	This element links to the first structured element within the V2x message.		
Multiplicity	1		
Type	Choice reference to [V2xDMSimpleType, V2xDMStructuredType]		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

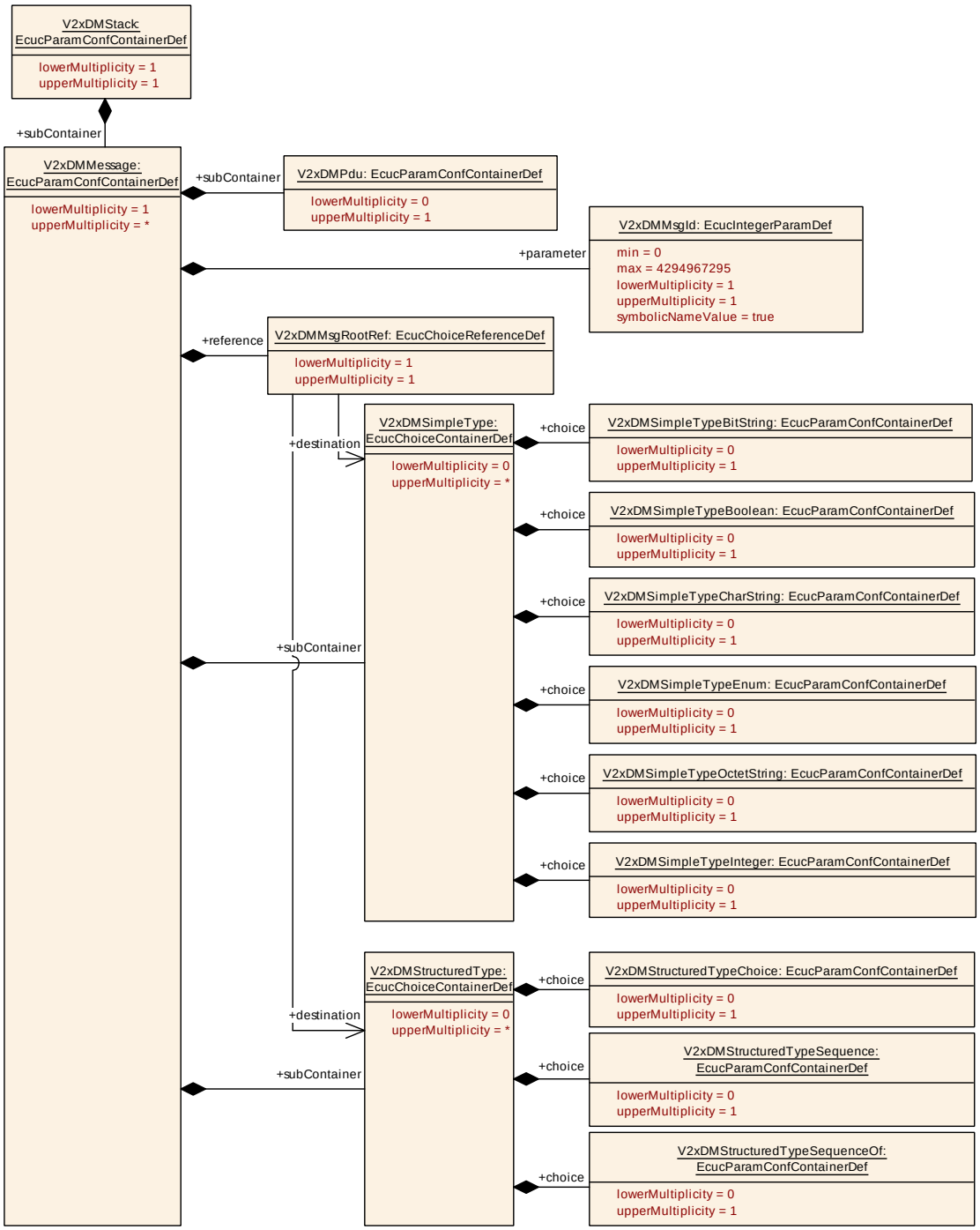

Figure 10.7: V2xDMMessage

10.1.14 V2xDMPdu

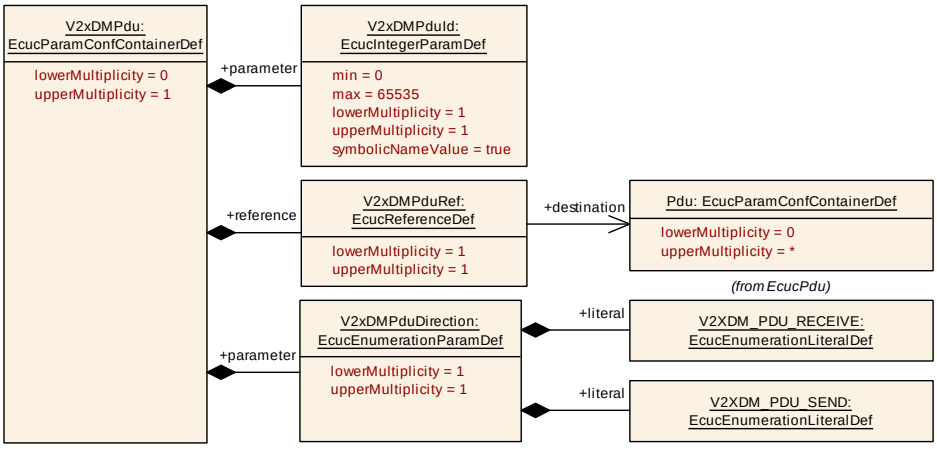

Figure 10.8: V2xDMPdu

[ECUC_V2xDM_00087] Definition of EcucParamConfContainerDef V2xDMPdu ⌈

Container Name	V2xDMPdu		
Parent Container	V2xDMMessage		
Description	Container for parameters that are necessary for the configuration of the V2xDM to serve as the UpperLayer of the PDU-Router module.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMPduDirection	1	[ECUC_V2xDM_00091]
V2xDMPduId	1	[ECUC_V2xDM_00089]
V2xDMPduRef	1	[ECUC_V2xDM_00090]

No Included Containers

⌋

[ECUC_V2xDM_00091] Definition of EcucEnumerationParamDef V2xDMPduDirection ⌈

Parameter Name	V2xDMPduDirection		
Parent Container	V2xDMPdu		
Description	Defines the direction of the PDU: V2XDM_PDU_SEND - V2xDM passes on the V2x message as raw data to the PduR. V2XDM_PDU_RECEIVE - V2xDM receives the V2x message through the PduR (no V2x stack present in the ECU).		
Multiplicity	1		
Type	EcucEnumerationParamDef		
Range	V2XDM_PDU_RECEIVE	–	
	V2XDM_PDU_SEND	–	
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00089] Definition of EcucIntegerParamDef V2xDMPduId ⌈

Parameter Name	V2xDMPduId		
Parent Container	V2xDMPdu		
Description	The numerical value used as the ID of this I-PDU. The ComIPduHandleId is required by the API calls PduR_V2xDMRxIndication to receive I-PDUs from the PduR (ComIP-du Direction: Receive) For Tx-I-PDUs (ComIPduDirection: Send), this handle Id is used for the APIs call Pdu R_V2xDMTransmit to transmit I-PDUs.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

[ECUC_V2xDM_00090] Definition of EcucReferenceDef V2xDMPduRef ⌈

Parameter Name	V2xDMPduRef
Parent Container	V2xDMPdu
Description	Reference to the global Pdu structure.
Multiplicity	1
Type	Reference to Pdu

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

⌋

10.1.15 V2xDMMsgQueue

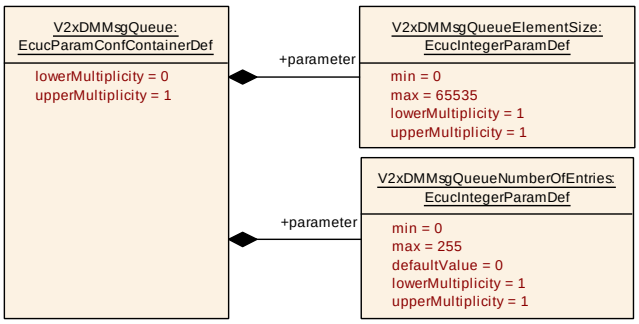

Figure 10.9: V2xDMMsgQueue

[ECUC_V2xDM_00102] Definition of EcucParamConfContainerDef V2xDMMsgQueue ⌈

Container Name	V2xDMMsgQueue		
Parent Container	V2xDMConfigSet		
Description	Specifies a message queue for incoming V2x messages of the data manager. If this container is not present, no queue is used for incoming V2x messages. If it is present, the elements of the container specifies the queue depth and its elements.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMMsgQueueElementSize	1	[ECUC_V2xDM_00097]
V2xDMMsgQueueNumberOfEntries	1	[ECUC_V2xDM_00096]

No Included Containers

⌋

[ECUC_V2xDM_00097] Definition of EcucIntegerParamDef V2xDMMsgQueueElementSize ⌈

Parameter Name	V2xDMMsgQueueElementSize		
Parent Container	V2xDMMsgQueue		
Description	Size of a queue entry in bytes. All queue entries have the same size. The value shall be large enough to store the largest V2x message.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local dependency: This value shall be set if V2xDMQueueNumberOfEntries > 0.		

⌋

[ECUC_V2xDM_00096] Definition of EcucIntegerParamDef V2xDMMsgQueueNumberOfEntries ⌈

Parameter Name	V2xDMMsgQueueNumberOfEntries		
Parent Container	V2xDMMsgQueue		
Description	Specifies the number of Queue entries for incoming V2x messages. One entry per V2x message. A number of 0 in this field disables the queue and actions are performed only in the V2xDM_RxIndication.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 255		
Default value	0		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.16 V2xDMStructuredType

[ECUC_V2xDM_00007] Definition of EcucChoiceContainerDef V2xDMStructuredType ⌈

Choice Container Name	V2xDMStructuredType		
Parent Container	V2xDMMessage		
Description	Definition of structured types in a V2x message		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	

No Included Parameters

Container Choices		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMStructuredTypeChoice	0..1	Defines a choice of elements within a V2x message.
V2xDMStructuredTypeSequence	0..1	Defines a sequence of elements within a V2x message.
V2xDMStructuredTypeSequenceOf	0..1	Defines a list of elements within a V2x message. Comparable to an array.

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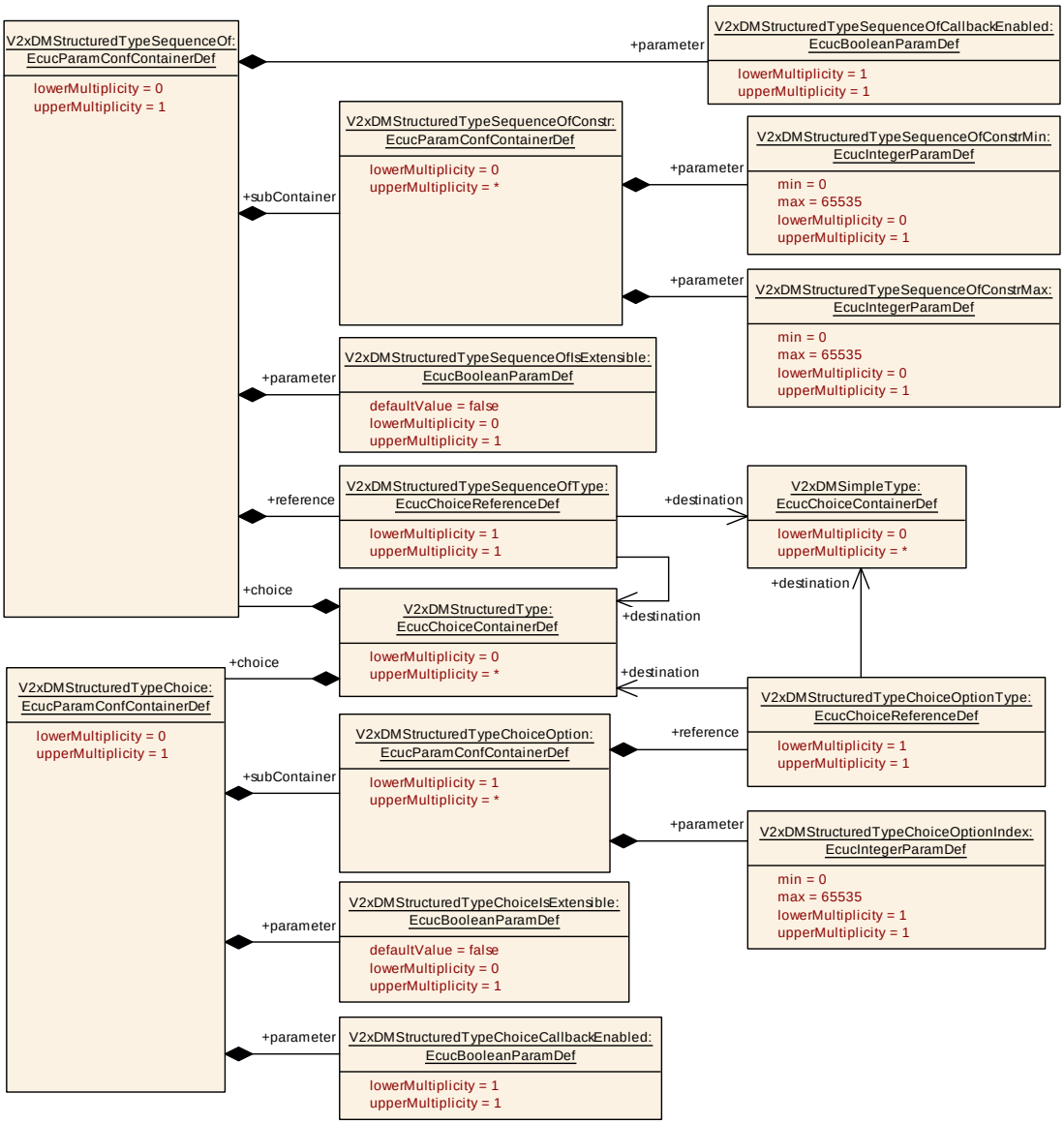

Figure 10.10: V2xDMMessageStructuredTypes

10.1.17 V2xDMStructuredTypeSequence

[ECUC_V2xDM_00010] Definition of EcucParamConfContainerDef V2xDMStructuredTypeSequence ⌈

Container Name	V2xDMStructuredTypeSequence
Parent Container	V2xDMStructuredType
Description	Defines a sequence of elements within a V2x message.
Post-Build Variant Multiplicity	false

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Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMStructuredTypeSequenceCallbackEnabled	1	[ECUC_V2xDM_00094]
V2xDMStructuredTypeSequenceIsExtensible	1	[ECUC_V2xDM_00025]

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMStructuredTypeSequence Child	1..*	Declares all attributes for a child element in the ASN.1 structured type sequence element.

⌋

[ECUC_V2xDM_00094] Definition of EcucBooleanParamDef V2xDMStructured TypeSequenceCallbackEnabled ⌈

Parameter Name	V2xDMStructuredTypeSequenceCallbackEnabled		
Parent Container	V2xDMStructuredTypeSequence		
Description	Enables a callback when the structure has been decoded.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00025] Definition of EcucBooleanParamDef V2xDMStructured TypeSequenceIsExtensible ⌈

Parameter Name	V2xDMStructuredTypeSequenceIsExtensible		
Parent Container	V2xDMStructuredTypeSequence		
Description	Defines if this sequence can be extended in the future (typically declared in ASN.1 with '...').		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants

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	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

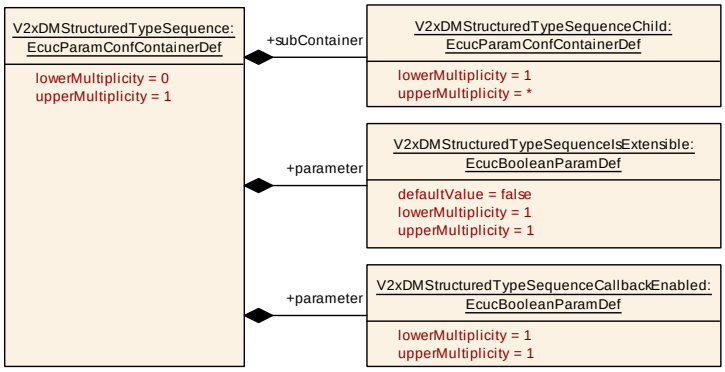

Figure 10.11: V2xDMMessageStructuredOf- and Choice Types

10.1.18 V2xDMStructuredTypeSequenceChild

[ECUC_V2xDM_00021] Definition of EcucParamConfContainerDef V2xDMStructuredTypeSequenceChild ⌈

Container Name	V2xDMStructuredTypeSequenceChild		
Parent Container	V2xDMStructuredTypeSequence		
Description	Declares all attributes for a child element in the ASN.1 structured type sequence element.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMStructuredTypeSequenceChildAttribute	1	[ECUC_V2xDM_00022]
V2xDMStructuredTypeSequenceChildDefault	0..1	[ECUC_V2xDM_00092]
V2xDMStructuredTypeSequenceChildIndex	1	[ECUC_V2xDM_00023]
V2xDMStructuredTypeSequenceChildType	1	[ECUC_V2xDM_00024]

No Included Containers

⌋

[ECUC_V2xDM_00022] Definition of EcucEnumerationParamDef V2xDMStructuredTypeSequenceChildAttribute ⌈

Parameter Name	V2xDMStructuredTypeSequenceChildAttribute		
Parent Container	V2xDMStructuredTypeSequenceChild		
Description	Select the attribute of a sequence element.		
Multiplicity	1		
Type	EcucEnumerationParamDef		
Range	V2XDM_STRUCTURED_TYPE_SEQUENCE_CHILD_ATTRIBUTE_DEFAULT	–	
	V2XDM_STRUCTURED_TYPE_SEQUENCE_CHILD_ATTRIBUTE_NONE	–	
	V2XDM_STRUCTURED_TYPE_SEQUENCE_CHILD_ATTRIBUTE_OPTIONAL	–	
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00092] Definition of EcucStringParamDef V2xDMStructuredTypeSequenceChildDefault ⌈

Parameter Name	V2xDMStructuredTypeSequenceChildDefault		
Parent Container	V2xDMStructuredTypeSequenceChild		
Description	Default values of the structure.		
Multiplicity	0..1		
Type	EcucStringParamDef		
Default value	–		
Regular Expression	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00023] Definition of EcucIntegerParamDef V2xDMStructuredTypeSequenceChildIndex ⌈

Parameter Name	V2xDMStructuredTypeSequenceChildIndex		
Parent Container	V2xDMStructuredTypeSequenceChild		
Description	Define the index of the element within the structure.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

[ECUC_V2xDM_00024] Definition of EcucChoiceReferenceDef V2xDMStructuredTypeSequenceChildType ⌈

Parameter Name	V2xDMStructuredTypeSequenceChildType		
Parent Container	V2xDMStructuredTypeSequenceChild		
Description	Reference to the child element in the structure as a simple or structured type.		
Multiplicity	1		
Type	Choice reference to [V2xDMSimpleType, V2xDMStructuredType]		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

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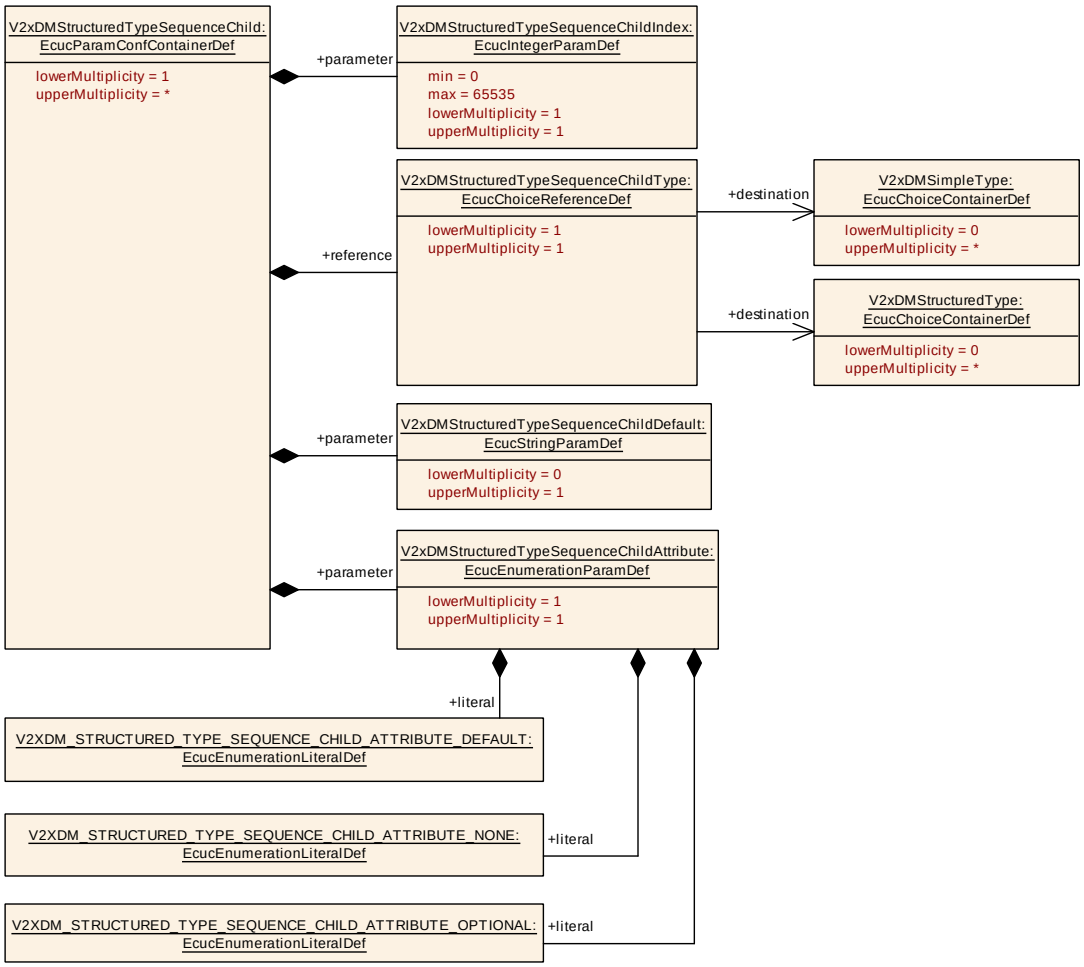

Figure 10.12: V2xDMStructuredTypeSequenceChild

10.1.19 V2xDMStructuredTypeSequenceOf

[ECUC_V2xDM_00009] Definition of EcucParamConfContainerDef V2xDMStructuredTypeSequenceOf ⌈

Container Name	V2xDMStructuredTypeSequenceOf		
Parent Container	V2xDMStructuredType		
Description	Defines a list of elements within a V2x message. Comparable to an array.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMStructuredTypeSequenceOfCallbackEnabled	1	[ECUC_V2xDM_00093]
V2xDMStructuredTypeSequenceOfIsExtensible	0..1	[ECUC_V2xDM_00027]
V2xDMStructuredTypeSequenceOfType	1	[ECUC_V2xDM_00026]

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMStructuredTypeSequenceOfConstr	0..*	This container defines the constraints of the SequenceOf parent container.

⌋

[ECUC_V2xDM_00093] Definition of EcucBooleanParamDef V2xDMStructuredTypeSequenceOfCallbackEnabled ⌈

Parameter Name	V2xDMStructuredTypeSequenceOfCallbackEnabled		
Parent Container	V2xDMStructuredTypeSequenceOf		
Description	Enables a generated callback when the structure is decoded.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00027] Definition of EcucBooleanParamDef V2xDMStructuredTypeSequenceOfIsExtensible ⌈

Parameter Name	V2xDMStructuredTypeSequenceOfIsExtensible		
Parent Container	V2xDMStructuredTypeSequenceOf		
Description	Defines if the SequenceOf is extensible in the future (marked as '...' in ASN.1)		
Multiplicity	0..1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	

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Scope / Dependency	

⌋

[ECUC_V2xDM_00026] Definition of EcucChoiceReferenceDef V2xDMStructuredTypeSequenceOfType ⌈

Parameter Name	V2xDMStructuredTypeSequenceOfType		
Parent Container	V2xDMStructuredTypeSequenceOf		
Description	Reference to the next structured or simple type.		
Multiplicity	1		
Type	Choice reference to [V2xDMSimpleType, V2xDMStructuredType]		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.20 V2xDMStructuredTypeSequenceOfConstr

[ECUC_V2xDM_00028] Definition of EcucParamConfContainerDef V2xDMStructuredTypeSequenceOfConstr ⌈

Container Name	V2xDMStructuredTypeSequenceOfConstr		
Parent Container	V2xDMStructuredTypeSequenceOf		
Description	This container defines the constraints of the SequenceOf parent container.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	Multiplicity	ECUC ID
V2xDMStructuredTypeSequenceOfConstrMax	0..1	[ECUC_V2xDM_00030]
V2xDMStructuredTypeSequenceOfConstrMin	0..1	[ECUC_V2xDM_00029]

No Included Containers

⌋

[ECUC_V2xDM_00030] Definition of EcucIntegerParamDef V2xDMStructuredTypeSequenceOfConstrMax ⌈

Parameter Name	V2xDMStructuredTypeSequenceOfConstrMax		
Parent Container	V2xDMStructuredTypeSequenceOfConstr		
Description	Defines the max. number of SequenceOf values.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

[ECUC_V2xDM_00029] Definition of EcucIntegerParamDef V2xDMStructuredTypeSequenceOfConstrMin ⌈

Parameter Name	V2xDMStructuredTypeSequenceOfConstrMin		
Parent Container	V2xDMStructuredTypeSequenceOfConstr		
Description	Defines the minimum number of the SequenceOf container.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.21 V2xDMStructuredTypeChoice

[ECUC_V2xDM_00011] Definition of EcucParamConfContainerDef V2xDMStructuredTypeChoice ⌈

Container Name	V2xDMStructuredTypeChoice		
Parent Container	V2xDMStructuredType		
Description	Defines a choice of elements within a V2x message.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMStructuredTypeChoiceCallbackEnabled	1	[ECUC_V2xDM_00095]
V2xDMStructuredTypeChoiceIsExtensible	0..1	[ECUC_V2xDM_00031]

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMStructuredTypeChoiceOption	1..*	Defines the reference and order of types in this choice element.

⌋

[ECUC_V2xDM_00095] Definition of EcucBooleanParamDef V2xDMStructuredTypeChoiceCallbackEnabled ⌈

Parameter Name	V2xDMStructuredTypeChoiceCallbackEnabled		
Parent Container	V2xDMStructuredTypeChoice		
Description	Enables a callback when the structure has been decoded.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00031] Definition of EcucBooleanParamDef V2xDMStructuredTypeChoiceIsExtensible ⌈

Parameter Name	V2xDMStructuredTypeChoiceIsExtensible		
Parent Container	V2xDMStructuredTypeChoice		
Description	Indicates if the choice container can be extended in future releases (marked with '...' in ASN.1)		
Multiplicity	0..1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.22 V2xDMStructuredTypeChoiceOption

[ECUC_V2xDM_00032] Definition of EcucParamConfContainerDef V2xDMStructuredTypeChoiceOption ⌈

Container Name	V2xDMStructuredTypeChoiceOption		
Parent Container	V2xDMStructuredTypeChoice		
Description	Defines the reference and order of types in this choice element.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMStructuredTypeChoiceOptionIndex	1	[ECUC_V2xDM_00033]
V2xDMStructuredTypeChoiceOptionType	1	[ECUC_V2xDM_00034]

No Included Containers

⌋

[ECUC_V2xDM_00033] Definition of EcucIntegerParamDef V2xDMStructuredTypeChoiceOptionIndex ⌈

Parameter Name	V2xDMStructuredTypeChoiceOptionIndex		
Parent Container	V2xDMStructuredTypeChoiceOption		
Description	Defines the order of elements inside the choice container.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

[ECUC_V2xDM_00034] Definition of EcucChoiceReferenceDef V2xDMStructuredTypeChoiceOptionType ⌈

Parameter Name	V2xDMStructuredTypeChoiceOptionType		
Parent Container	V2xDMStructuredTypeChoiceOption		
Description	Define a link to a simple or structured type that is present in this choice container.		
Multiplicity	1		
Type	Choice reference to [V2xDMSimpleType, V2xDMStructuredType]		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.23 V2xDMSimpleType

[ECUC_V2xDM_00008] Definition of EcucChoiceContainerDef V2xDMSimpleType ⌈

Choice Container Name	V2xDMSimpleType
Parent Container	V2xDMMessage
Description	Definition of simple types within a V2x message as a choice of simple types.
Post-Build Variant Multiplicity	false

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Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	

No Included Parameters

Container Choices		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMSimpleTypeBitString	0..1	Definition of the ASN.1 Bit String
V2xDMSimpleTypeBoolean	0..1	Definition of the ASN.1 boolean type
V2xDMSimpleTypeCharString	0..1	Definition of the ASN.1 type character string
V2xDMSimpleTypeEnum	0..1	Definition of the ASN.1 enumeration type
V2xDMSimpleTypeInteger	0..1	Definition of the ASN.1 integer type
V2xDMSimpleTypeOctetString	0..1	Definition of the ASN.1 Octet String.

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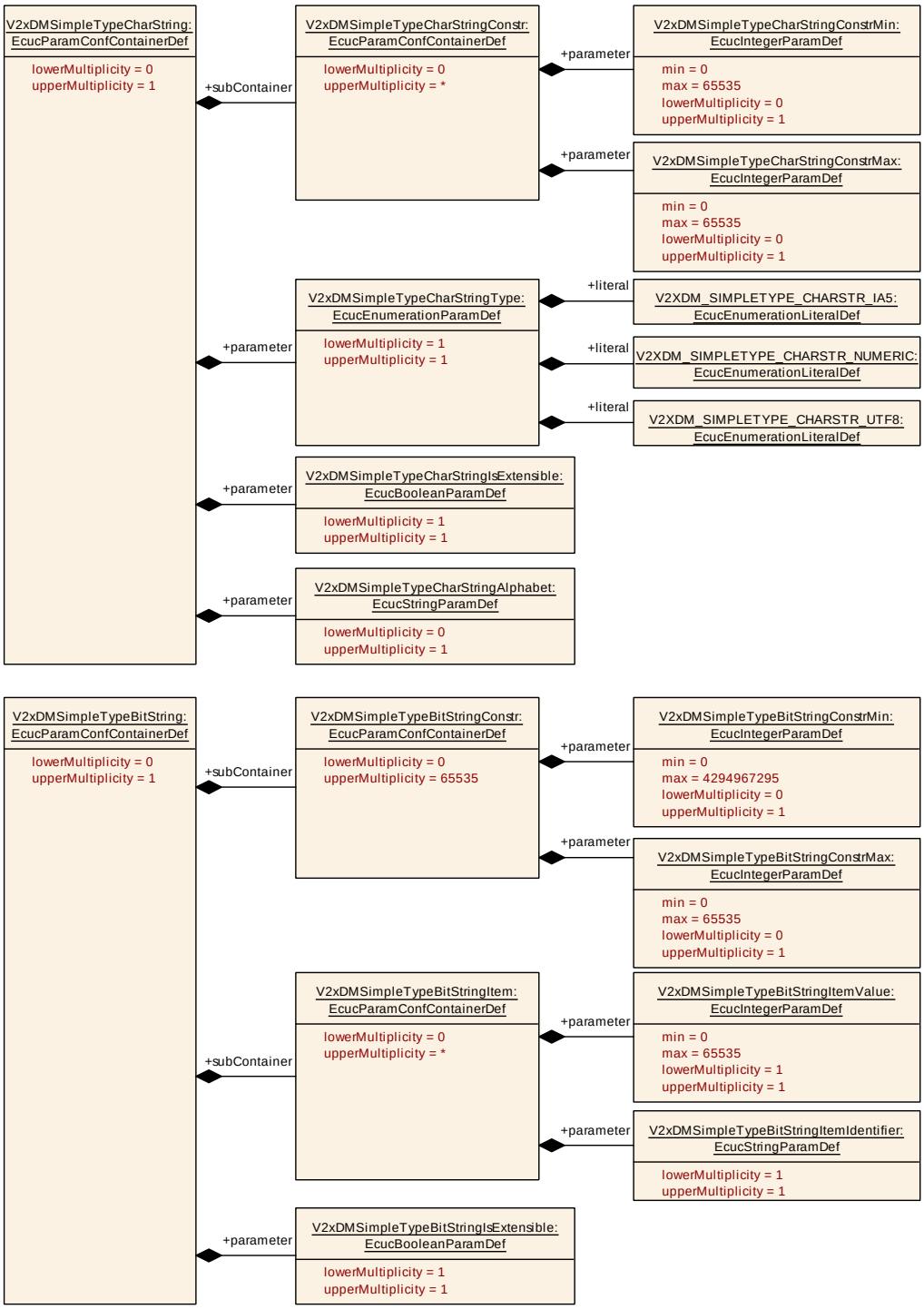

Figure 10.13: V2xDMMessageSimpleTypes

10.1.24 V2xDMSimpleTypeBitString

[ECUC_V2xDM_00013] Definition of EcucParamConfContainerDef V2xDMSimple TypeBitString ⌈

Container Name	V2xDMSimpleTypeBitString		
Parent Container	V2xDMSimpleType		
Description	Definition of the ASN.1 Bit String		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	Multiplicity	ECUC ID
V2xDMSimpleTypeBitStringIsExtensible	1	[ECUC_V2xDM_00062]

Included Containers		
Container Name	Multiplicity	Scope / Dependency
V2xDMSimpleTypeBitStringConstr	0..65535	Container defines the constraints for the length of the bit string (Min/Max).
V2xDMSimpleTypeBitStringItem	0..*	Defines item values as Key-Pair-Values for the BitString.

⌋

[ECUC_V2xDM_00062] Definition of EcucBooleanParamDef V2xDMSimpleTypeBitStringIsExtensible ⌈

Parameter Name	V2xDMSimpleTypeBitStringIsExtensible		
Parent Container	V2xDMSimpleTypeBitString		
Description	Defines if the item is extensible in future releases.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.25 V2xDMSimpleTypeBitStringConstr

[ECUC_V2xDM_00056] Definition of EcucParamConfContainerDef V2xDMSimpleTypeBitStringConstr ⌈

Container Name	V2xDMSimpleTypeBitStringConstr		
Parent Container	V2xDMSimpleTypeBitString		
Description	Container defines the constraints for the length of the bit string (Min/Max).		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMSimpleTypeBitStringConstrMax	0..1	[ECUC_V2xDM_00058]
V2xDMSimpleTypeBitStringConstrMin	0..1	[ECUC_V2xDM_00057]

No Included Containers

⌋

[ECUC_V2xDM_00058] Definition of EcucIntegerParamDef V2xDMSimpleTypeBitStringConstrMax ⌈

Parameter Name	V2xDMSimpleTypeBitStringConstrMax		
Parent Container	V2xDMSimpleTypeBitStringConstr		
Description	Max length of the BitString parameter.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00057] Definition of EcucIntegerParamDef V2xDMSimpleTypeBitStringConstrMin ⌈

Parameter Name	V2xDMSimpleTypeBitStringConstrMin		
Parent Container	V2xDMSimpleTypeBitStringConstr		
Description	Min length of the BitString parameter.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 4294967295		
Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.26 V2xDMSimpleTypeBitStringItem

[ECUC_V2xDM_00059] Definition of EcucParamConfContainerDef V2xDMSimpleTypeBitStringItem ⌈

Container Name	V2xDMSimpleTypeBitStringItem		
Parent Container	V2xDMSimpleTypeBitString		
Description	Defines item values as Key-Pair-Values for the BitString.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMSimpleTypeBitStringItemIdentifier	1	[ECUC_V2xDM_00061]
V2xDMSimpleTypeBitStringItemValue	1	[ECUC_V2xDM_00060]

No Included Containers

⌋

[ECUC_V2xDM_00061] Definition of EcucStringParamDef V2xDMSimpleTypeBitStringItemIdentifier ⌈

Parameter Name	V2xDMSimpleTypeBitStringItemIdentifier		
Parent Container	V2xDMSimpleTypeBitStringItem		
Description	Defines the name for the Key-Pair-Values for the BitString.		
Multiplicity	1		
Type	EcucStringParamDef		
Default value	–		
Regular Expression	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

[ECUC_V2xDM_00060] Definition of EcucIntegerParamDef V2xDMSimpleTypeBitStringItemValue ⌈

Parameter Name	V2xDMSimpleTypeBitStringItemValue		
Parent Container	V2xDMSimpleTypeBitStringItem		
Description	Defines the value representation for the Key-Pair-Values for the BitString.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.27 V2xDMSimpleTypeCharString

[ECUC_V2xDM_00015] Definition of EcucParamConfContainerDef V2xDMSimpleTypeCharString ⌈

Container Name	V2xDMSimpleTypeCharString		
Parent Container	V2xDMSimpleType		
Description	Definition of the ASN.1 type character string		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	Multiplicity	ECUC ID
V2xDMSimpleTypeCharStringAlphabet	0..1	[ECUC_V2xDM_00055]
V2xDMSimpleTypeCharStringIsExtensible	1	[ECUC_V2xDM_00054]
V2xDMSimpleTypeCharStringType	1	[ECUC_V2xDM_00053]

Included Containers		
Container Name	Multiplicity	Scope / Dependency
V2xDMSimpleTypeCharString Constr	0..*	Container defines the constraints for the character string (Min/ Max).

⌋

[ECUC_V2xDM_00055] Definition of EcucStringParamDef V2xDMSimpleType CharStringAlphabet ⌈

Parameter Name	V2xDMSimpleTypeCharStringAlphabet		
Parent Container	V2xDMSimpleTypeCharString		
Description	Defines the character set that is used and allowed for this CharString.		
Multiplicity	0..1		
Type	EcucStringParamDef		
Default value	–		
Regular Expression	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

[ECUC_V2xDM_00054] Definition of EcucBooleanParamDef V2xDMSimpleTypeCharStringIsExtensible ⌈

Parameter Name	V2xDMSimpleTypeCharStringIsExtensible		
Parent Container	V2xDMSimpleTypeCharString		
Description	Defines if future extensions of this parameter shall be considered.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

[ECUC_V2xDM_00053] Definition of EcucEnumerationParamDef V2xDMSimpleTypeCharStringType ⌈

Parameter Name	V2xDMSimpleTypeCharStringType		
Parent Container	V2xDMSimpleTypeCharString		
Description	Defines the type of CharString SimpleType.		
Multiplicity	1		
Type	EcucEnumerationParamDef		
Range	V2XDM_SIMPLETYPE_CHARSTR_IA5	Defines all catalog items.	
	V2XDM_SIMPLETYPE_CHARSTR_NUMERIC	–	
	V2XDM_SIMPLETYPE_CHARSTR_UTF8	–	
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.28 V2xDMSimpleTypeCharStringConstr

[ECUC_V2xDM_00050] Definition of EcucParamConfContainerDef V2xDMSimpleTypeCharStringConstr ⌈

Container Name	V2xDMSimpleTypeCharStringConstr		
Parent Container	V2xDMSimpleTypeCharString		
Description	Container defines the constraints for the character string (Min/Max).		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMSimpleTypeCharStringConstrMax	0..1	[ECUC_V2xDM_00052]
V2xDMSimpleTypeCharStringConstrMin	0..1	[ECUC_V2xDM_00051]

No Included Containers

⌋

[ECUC_V2xDM_00052] Definition of EcucIntegerParamDef V2xDMSimpleTypeCharStringConstrMax ⌈

Parameter Name	V2xDMSimpleTypeCharStringConstrMax		
Parent Container	V2xDMSimpleTypeCharStringConstr		
Description	Max number of values for the char string parameter.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

[ECUC_V2xDM_00051] Definition of EcucIntegerParamDef V2xDMSimpleType CharStringConstrMin ⌈

Parameter Name	V2xDMSimpleTypeCharStringConstrMin		
Parent Container	V2xDMSimpleTypeCharStringConstr		
Description	Min number of values for the char string parameter.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

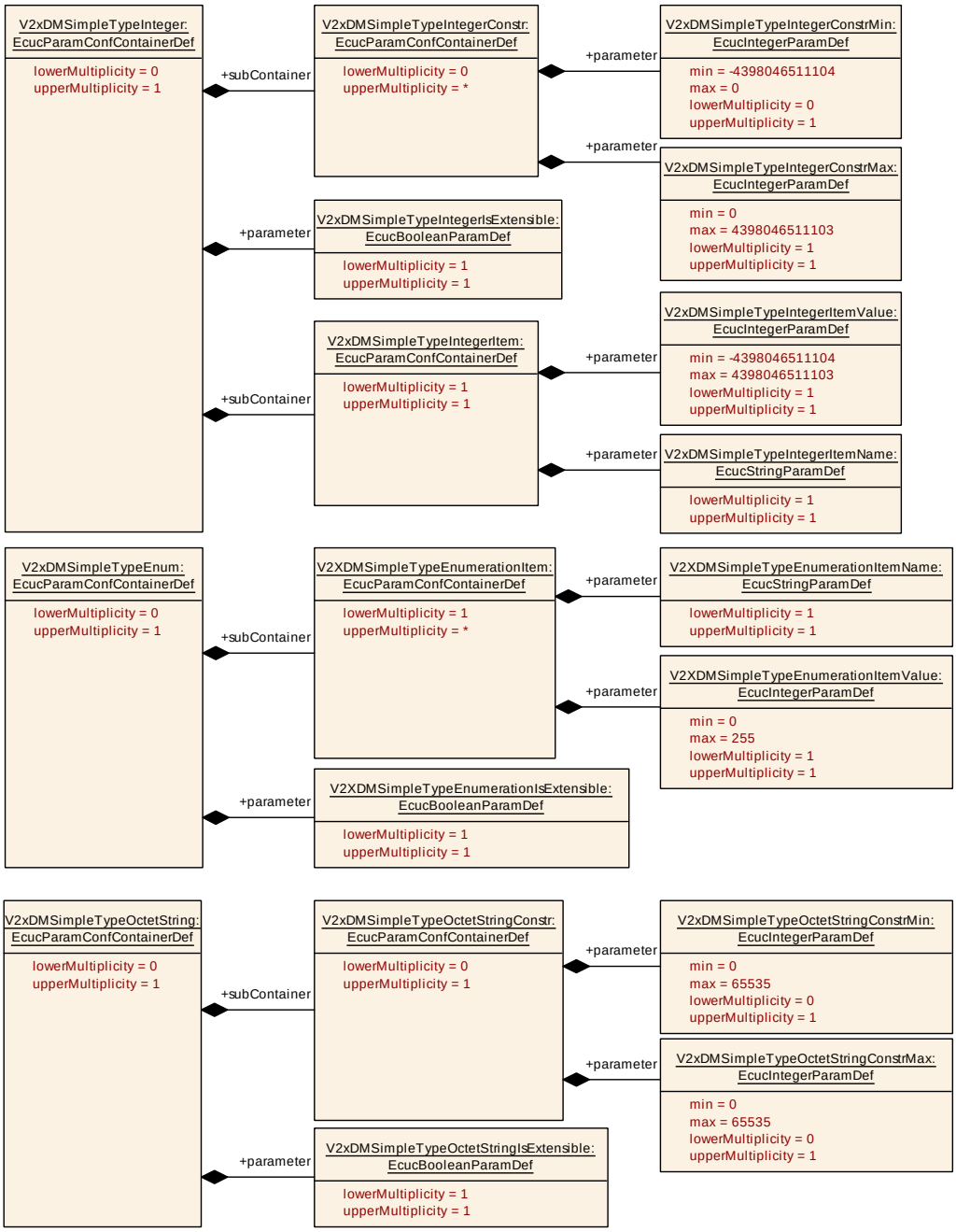

Figure 10.14: V2xDMMessageSimpleTypes2

10.1.29 V2xDMSimpleTypeBoolean

[ECUC_V2xDM_00014] Definition of EcucParamConfContainerDef V2xDMSimple TypeBoolean ⌈

Container Name	V2xDMSimpleTypeBoolean		
Parent Container	V2xDMSimpleType		
Description	Definition of the ASN.1 boolean type		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

No Included Parameters

No Included Containers

⌋

10.1.30 V2xDMSimpleTypeEnum

[ECUC_V2xDM_00016] Definition of EcucParamConfContainerDef V2xDMSimpleTypeEnum ⌈

Container Name	V2xDMSimpleTypeEnum		
Parent Container	V2xDMSimpleType		
Description	Definition of the ASN.1 enumeration type		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	Multiplicity	ECUC ID
V2XDMSimpleTypeEnumerationIsExtensible	1	[ECUC_V2xDM_00045]

Included Containers		
Container Name	Multiplicity	Scope / Dependency
V2XDMSimpleTypeEnumerationItem	1..*	Parameter description for the enumeration simple type.

⌋

[ECUC_V2xDM_00045] Definition of EcucBooleanParamDef V2XDMSimpleTypeEnumerationIsExtensible ⌈

Parameter Name	V2XDMSimpleTypeEnumerationIsExtensible		
Parent Container	V2xDMSimpleTypeEnum		
Description	Defines if the enumeration can be extended in future releases (...).		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.31 V2xDMSimpleTypeEnumerationItem

[ECUC_V2xDM_00042] Definition of EcucParamConfContainerDef V2XDMSimpleTypeEnumerationItem ⌈

Container Name	V2XDMSimpleTypeEnumerationItem		
Parent Container	V2xDMSimpleTypeEnum		
Description	Parameter description for the enumeration simple type.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2XDMSimpleTypeEnumerationItemName	1	[ECUC_V2xDM_00043]
V2XDMSimpleTypeEnumerationItemValue	1	[ECUC_V2xDM_00044]

No Included Containers

⌋

[ECUC_V2xDM_00043] Definition of EcucStringParamDef V2XDMSimpleType EnumerationItemName ⌈

Parameter Name	V2XDMSimpleTypeEnumerationItemName		
Parent Container	V2XDMSimpleTypeEnumerationItem		
Description	Defines the name of the enumeration item.		
Multiplicity	1		
Type	EcucStringParamDef		
Default value	–		
Regular Expression	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00044] Definition of EcucIntegerParamDef V2XDMSimpleType EnumerationItemValue ⌈

Parameter Name	V2XDMSimpleTypeEnumerationItemValue		
Parent Container	V2XDMSimpleTypeEnumerationItem		
Description	Definition of the item value of the enumeration.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 255		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.32 V2xDMSimpleTypeInteger

[ECUC_V2xDM_00017] Definition of EcucParamConfContainerDef V2xDMSimple TypeInteger ⌈

Container Name	V2xDMSimpleTypeInteger		
Parent Container	V2xDMSimpleType		
Description	Definition of the ASN.1 integer type		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	Multiplicity	ECUC ID
V2xDMSimpleTypeIntegerIsExtensible	1	[ECUC_V2xDM_00037]

Included Containers		
Container Name	Multiplicity	Scope / Dependency
V2xDMSimpleTypeIntegerConstr	0..*	Defines the constraints for the integer simple type
V2xDMSimpleTypeIntegerItem	1	Descriptor parameters of the simple type integer item.

⌋

[ECUC_V2xDM_00037] Definition of EcucBooleanParamDef V2xDMSimpleTypeIntegerIsExtensible ⌈

Parameter Name	V2xDMSimpleTypeIntegerIsExtensible		
Parent Container	V2xDMSimpleTypeInteger		
Description	Indicates if data for the integer simple types can be extended in the future (...).		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.33 V2xDMSimpleTypeIntegerConstr

[ECUC_V2xDM_00035] Definition of EcucParamConfContainerDef V2xDMSimpleTypeIntegerConstr ⌈

Container Name	V2xDMSimpleTypeIntegerConstr		
Parent Container	V2xDMSimpleTypeInteger		
Description	Defines the constraints for the integer simple type		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	Multiplicity	ECUC ID
V2xDMSimpleTypeIntegerConstrMax	1	[ECUC_V2xDM_00039]
V2xDMSimpleTypeIntegerConstrMin	0..1	[ECUC_V2xDM_00038]

No Included Containers

⌋

[ECUC_V2xDM_00039] Definition of EcucIntegerParamDef V2xDMSimpleTypeIntegerConstrMax ⌈

Parameter Name	V2xDMSimpleTypeIntegerConstrMax		
Parent Container	V2xDMSimpleTypeIntegerConstr		
Description	Defines the max value for this integer simple type.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 4398046511103		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	Pre-compile time	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00038] Definition of EcucIntegerParamDef V2xDMSimpleTypeIntegerConstrMin ⌈

Parameter Name	V2xDMSimpleTypeIntegerConstrMin	
Parent Container	V2xDMSimpleTypeIntegerConstr	
Description	Defines the min value for this integer simple type.	
Multiplicity	0..1	
Type	EcucIntegerParamDef	
Range	-4398046511104 .. 0	

▽

△

Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.34 V2xDMSimpleTypeIntegerItem

[ECUC_V2xDM_00036] Definition of EcucParamConfContainerDef V2xDMSimpleTypeIntegerItem ⌈

Container Name	V2xDMSimpleTypeIntegerItem
Parent Container	V2xDMSimpleTypeInteger
Description	Descriptor parameters of the simple type integer item.
Configuration Parameters	

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMSimpleTypeIntegerItemName	1	[ECUC_V2xDM_00041]
V2xDMSimpleTypeIntegerItemValue	1	[ECUC_V2xDM_00040]

No Included Containers

⌋

[ECUC_V2xDM_00041] Definition of EcucStringParamDef V2xDMSimpleTypeIntegerItemName ⌈

Parameter Name	V2xDMSimpleTypeIntegerItemName
Parent Container	V2xDMSimpleTypeIntegerItem
Description	Provide a name for this integer item.
Multiplicity	1
Type	EcucStringParamDef
Default value	–
Regular Expression	–

▽

△

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

⌋

[ECUC_V2xDM_00040] Definition of EcucIntegerParamDef V2xDMSimpleTypeIntegerItemValue ⌈

Parameter Name	V2xDMSimpleTypeIntegerItemValue		
Parent Container	V2xDMSimpleTypeIntegerItem		
Description	The default value for this integer		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	-4398046511104 .. 4398046511103		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.1.35 V2xDMSimpleTypeOctetString

[ECUC_V2xDM_00018] Definition of EcucParamConfContainerDef V2xDMSimpleTypeOctetString ⌈

Container Name	V2xDMSimpleTypeOctetString		
Parent Container	V2xDMSimpleType		
Description	Definition of the ASN.1 Octet String.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMSimpleTypeOctetStringIsExtensible	1	[ECUC_V2xDM_00049]

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
V2xDMSimpleTypeOctetString Constr	0..1	Defines the constraint for the octet string as simple type according to ASN.1.

⌋

[ECUC_V2xDM_00049] Definition of EcucBooleanParamDef V2xDMSimpleType OctetStringIsExtensible ⌈

Parameter Name	V2xDMSimpleTypeOctetStringIsExtensible		
Parent Container	V2xDMSimpleTypeOctetString		
Description	Defines if the octet string can be extended in future releases (...).		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	–		
Post-Build Variant Value	false		
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency			

⌋

10.1.36 V2xDMSimpleTypeOctetStringConstr

[ECUC_V2xDM_00046] Definition of EcucParamConfContainerDef V2xDMSimple TypeOctetStringConstr ⌈

Container Name	V2xDMSimpleTypeOctetStringConstr		
Parent Container	V2xDMSimpleTypeOctetString		
Description	Defines the constraint for the octet string as simple type according to ASN.1.		
Post-Build Variant Multiplicity	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Configuration Parameters			

Included Parameters		
Parameter Name	**Multiplicity**	**ECUC ID**
V2xDMSimpleTypeOctetStringConstrMax	0..1	[ECUC_V2xDM_00048]
V2xDMSimpleTypeOctetStringConstrMin	0..1	[ECUC_V2xDM_00047]

No Included Containers

⌋

[ECUC_V2xDM_00048] Definition of EcucIntegerParamDef V2xDMSimpleType OctetStringConstrMax ⌈

Parameter Name	V2xDMSimpleTypeOctetStringConstrMax		
Parent Container	V2xDMSimpleTypeOctetStringConstr		
Description	Defines the max length for the octet string.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

[ECUC_V2xDM_00047] Definition of EcucIntegerParamDef V2xDMSimpleType OctetStringConstrMin ⌈

Parameter Name	V2xDMSimpleTypeOctetStringConstrMin		
Parent Container	V2xDMSimpleTypeOctetStringConstr		
Description	Defines the min length for the octet string.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	–		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Value Configuration Class	**Pre-compile time**	X	All Variants
	Link time	–	
	Post-build time	–	
Scope / Dependency	scope: local		

⌋

10.2 Published Information

For details refer to the chapter 10.3 “Published Information” in [3, SWS BSW General].

A History of Specification Items

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

A.1 Specification Item History of this document compared to AUTOSAR R23-11.

A.1.1 Added Specification Items in R24-11

none

A.1.2 Changed Specification Items in R24-11

Number	Heading
[CP_SWS_V2xDM_-01003]	Definition of imported datatypes of module V2xDM

Table A.1: Changed Specification Items in R24-11

A.1.3 Deleted Specification Items in R24-11

none

A.2 Constraint Item History of this document compared to AUTOSAR R23-11.

A.2.1 Added Constraints in R24-11

none

A.2.2 Changed Constraints in R24-11

none

A.2.3 Deleted Constraints in R24-11

none

A.3 Specification Item History of this document compared to AUTOSAR R22-11.

A.3.1 Added Specification Items in R23-11

Number	Heading
[CP_SWS_V2xDM_-NA]	

Table A.2: Added Specification Items in R23-11

A.3.2 Changed Specification Items in R23-11

none

A.3.3 Deleted Specification Items in R23-11

none

A.4 Constraint Item History of this document compared to AUTOSAR R22-11.

A.4.1 Added Constraints in R23-11

none

A.4.2 Changed Constraints in R23-11

none

A.4.3 Deleted Constraints in R23-11

none

B Not Applicable Requirements

[CP_SWS_V2xDM_NA]

Upstream requirements: SRS_V2X_00232, SRS_V2X_00245, SRS_V2X_00391, SRS_V2X_00451, SRS_V2X_00010, SRS_V2X_00160, SRS_V2X_00163, SRS_V2X_00164, SRS_V2X_00406, SRS_V2X_00407, SRS_V2X_00174, SRS_V2X_00412, SRS_V2X_00413, SRS_V2X_00184, SRS_V2X_00161, SRS_V2X_10101, SRS_V2X_00190, SRS_V2X_00207, SRS_V2X_00193, SRS_V2X_00214, SRS_V2X_00531, SRS_V2X_00631, SRS_V2X_00279, SRS_V2X_00280, SRS_V2X_00711, SRS_V2X_00291, SRS_V2X_00741, SRS_V2X_00301, SRS_V2X_00318, SRS_V2X_10001, SRS_V2X_10002, SRS_V2X_10003, SRS_V2X_10004, SRS_V2X_00242, SRS_V2X_00259, SRS_V2X_00693, SRS_V2X_00176, SRS_V2X_00405, SRS_V2X_00189, SRS_V2X_00322, SRS_V2X_00323, SRS_V2X_00511, SRS_V2X_25001, SRS_V2X_25002, SRS_V2X_25003

⌈These requirements are not applicable to this specification.⌋