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Disclaimer

Table of Contents

1 Introduction and functional overview

This document specifies the functionality, API and the configuration of the AUTOSAR Basic Software module Vehicle-2-X Facilities (V2xFac). The Vehicle-2-X Facilities layer together with the Vehicle-2-X Basic Transport (V2xBtp), the Vehicle-2-X GeoNetworking (V2xGn), Vehicle-2-X Management (V2xM) and the communication driver layer forms the V2X stack within the AUTOSAR architecture.

The V2xFac module is designed to be hardware independent.

The V2xFac module is dependent on services of V2X entities in the application layer and on lower V2xBtp module.

1.1 Architectural overview

Positioning of the V2xFac module within the AUTOSAR BSW and the Layered Software architecture is shown in below.

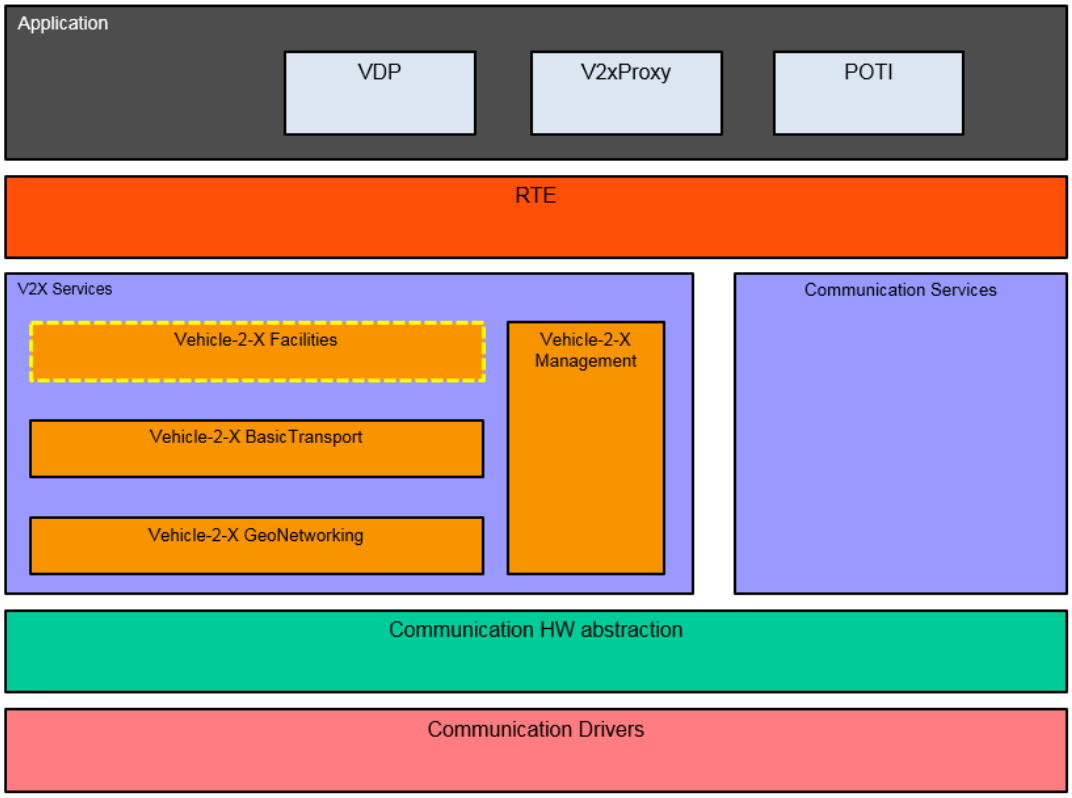


Figure 1 – AUTOSAR BSW software architecture - V2xFac scope

The V2xFac module supports common message management for data exchange between V2X applications.
It provides the basic services (BS) Cooperative Awareness (CA) and Decentralized Environmental Notification (DEN).

1.2 Functional overview

The V2xFac module implements the basic services CA and DEN.

1.2.1 Cooperative Awareness (CA)

1.2.1.1 CA basic service in the AUTOSAR architecture

The CA basic service is a facilities layer entity that operates the CAM protocol.
It provides two services: sending and receiving of CAMs.
The CA basic service generates and sends CAMs to other ITS-Ss or it receives CAMs from ITS-Ss and provides them to the V2x-Applications in the application layer (see [10] chapter 4).

The CA basic service uses the services provided by the protocol entities of the lower layers of the V2X stack to disseminate the CAM.

Upon receiving a CAM, the CA basic service makes the content of the CAM available to the V2X Applications.

Received CAMs are given to the upper Application layer via their standardized AUTOSAR service interface V2xApplRxIndicationCam.

It may interface with the AUTOSAR application layer in order to collect relevant information for CAM generation (Vehicle Data Provider - VDP) and to forward the received CAM content for further processing (V2x Receiver).

1.2.1.2 CA basic service functional architecture

“The CA basic service is part of the Application Support domain of the Facilities Layer according to ETSI TS 102 894-1 [12] shows the functional block diagram with the functional blocks of the CA basic service and interfaces to other facilities and layers.”

For sending and receiving CAMs, the CA basic service part of the V2xFac shall provide the following sub-functions

- Encode CAM
- Decode CAM
- CAM transmission management
- CAM reception management

For details see [10] chapter 5.2.

1.2.2 Decentralized Environmental Notification (DEN)

1.2.2.1 DEN basic service in the AUTOSAR architecture

The DEN basic service is a facilities layer entity that operates the DENM protocol. It provides services to entities at the AUTOSAR application layer.(refer to [11] chapter 4.2)
The DEN basic service generates and sends DENMs to other ITS-Ss or it receives DENMs from other ITS-Ss and provides them to the V2x-Applications in the application layer (see [11] chapter 5 and 6).

Upon receiving a DENM, the DEN basic service makes the content of the DENM available to the V2X Applications.

1.2.2.2 DEN basic service functional architecture

For sending and receiving DENMs, the DEN basic service shall provide the following sub-functions

- Encode DEN
- Decode DEN
- DEN transmission management
- DEN reception management
- Keep-Alive forwarding

For Details see [11] chapter 5.3. Position and Time management (POTI)
The POTI, as specified in ETSI TS 102 890-3 [14], provides the position of the ITS-S and time information.
Within the AUTOSAR architecture POTI service is a V2X Application within the Application layer and is not part of V2xFac.
For details See [11] chapter 5.1.

1.2.3 Vehicle Data Provider (VDP)

"The VDP is connected with the vehicle network and provides the vehicle status information."
Within the AUTOSAR architecture VDP service is a V2X Application within the Application layer and is not part of V2xFac.

The VDP provides an interface to the lower layer (V2X Services).
The facilities basic services CA and DEN get vehicle relevant data from this interface.
The V2xM gets e.g. position and time information from this interface.

1.2.4 Local Dynamic Map (LDM)

The LDM as outlined in [15] is a database in the ITS-S, which may be updated with received CAM or DENM data.

V2x applications may retrieve information from the LDM for further processing.
Within the AUTOSAR architecture LDM service is a V2X Application within the Application layer and is not part of the V2xFac module.

For details see [15] chapter 5.1.

2 Acronyms and abbreviations

Abbreviation / Acronym:	*Description:*
DEM	Diagnostic Event Manager
DET	Default Error Tracer
API	Application Programming Interface
BS	Basic Service
BSW	Basic Software
BTP	Basic Transport Protocol
CA	Cooperative Awareness
CAM	Cooperative Awareness Message
DCC	Decentralized Congestion Control
DE	Data Element
DEN	Decentralized Environmental Notification
DENM	Decentralized Environmental Notification Messages
DF	Data Frame
EcuM	Electronic Control Unit Manager
ETSI	European Telecommunications Standards Institute
IF	Interface
ITS	Intelligent Transport System
ITS-S	ITS-Station
KAF	DENM Keep Alive Forwarding
LDM	Local Dynamic Map
POTI	Position and Time management
RSU	Road Side Unit
VDP	Vehicle Data Provider
VOD	Verification on Demand
V2X	Either vehicle to vehicle (V2V), or vehicle to infrastructure (V2I) and/or infrastructure to vehicle (I2V)
V2xM	Vehicle-2-X Management
V2xFac	Vehicle-2-X Facilities
V2xBtp	Vehicle-2-X Basic Transport
V2xGn	Vehicle-2-X Geo Networking

3 Related documentation

3.1 Input documents

[1] AUTOSAR Layered Software Architecture
AUTOSAR_EXP_LayeredSoftwareArchitecture.pdf

[2] AUTOSAR General Requirements on Basic Software Modules
AUTOSAR_SRS_BSWGeneral.pdf

[3] AUTOSAR General Specification for Basic Software Modules
AUTOSAR_SWS_BSWGeneral.pdf

[4] Specification of Default Error Tracer
AUTOSAR_SWS_DefaultErrorTracer.pdf

[5] Specification of ECU State Manager
AUTOSAR_SWS_ECUStateManager.pdf

[6] Specification of V2XBasicTransport
AUTOSAR_SWS_Vehicle-2-X BasicTransport.pdf

[7] Specification of Module V2X Communication Stack Types
AUTOSAR_SWS_V2XComStackTypes.pdf

3.2 Related standards and norms

[8] IEC 7498-1 The Basic Model, IEC Norm, 1994

[9] Intelligent Transport Systems (ITS); Communications Architecture
ETSI EN 302 665 V1.1.1 (2010-09)

[10] Intelligent Transport Systems (ITS); Vehicular Communications;
Basic Set of Applications;
Part 2: Specification of Cooperative Awareness Basic Service
ETSI EN 302 637-2 V1.3.2 (2014-11)

[11] Intelligent Transport Systems (ITS); Vehicular Communications;
Basic Set of Applications;
Part 3: Specifications of Decentralized Environmental Notification Basic Service
ETSI EN 302 637-3 V1.2.2 (2014-11)

[12] Intelligent Transport Systems (ITS); Users and applications requirements;
Part 1: Facility layer structure, functional requirements and specifications
ETSI TS 102 894-1 V1.1.1 (2013-08)

[13] Intelligent Transport Systems (ITS); Users and applications requirements;
Part 2: Applications and facilities layer common data dictionary
ETSI TS 102 894-2 V1.2.1 (2014-09)

[14] Intelligent Transport System (ITS); Facilities layer function;
Part 3: Position and time facility specification"
ETSI TS 102 890-3

[15] Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM)
ETSI EN 302 895 (V1.1.1) (2014-09)

[16] Intelligent Transport Systems (ITS); OSI cross-layer topics;
Part 11: Interface between networking and transport layer and facilities layer
ETSI TS 102 723-11 V1.1.1 (2013-11)

[17] Intelligent Transport Systems (ITS); Vehicular Communications;
GeoNetworking;
Part 5: Transport Protocols;
Sub-part 1: Basic Transport Protocol
ETSI EN 302 636-5-1 V1.2.1 (2014-08)

[18] Intelligent Transport Systems (ITS); Vehicular Communications;
GeoNetworking Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality
ETSI EN 302 636-4-1 V1.2.1 (2014-07)

[19] C2C-CC BSP Requirement
C2CCC_RS_2037_BSP_Requirements.docx

3.3 Related specification

AUTOSAR provides a General Specification on Basic Software (SWS BSW General) [3] which is also valid for V2xFac.

Thus, the specification SWS BSW General [3] shall be considered as additional and required specification for V2xFac.

4 Constraints and assumptions

4.1 Limitations

- Wireless Communication supports IEEE 802.11p only. Other 802.11 standards (e.g. for infrastructure networks and integration with TCP/IP) can be extended in future releases of the AUTOSAR standard.
- The V2X modules follow the guidance regarding the Day-1 scenarios defined by the Basic System Standards Profile from Car-2-Car-Consortium.
- AUTOSAR R4.3.0 only focuses on the European version of car-to-car communication as defined by ETSI. Extension to other regions are planned for future releases of the AUTOSAR standard.

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 V2xFac module to other modules within the AUTOSAR basic software architecture. It outlines the modules that are required or optional for the realization of the V2xFac module and the V2xFac services that these modules use.

5.1 AUTOSAR DET (Default Error Tracer)

In development mode, the V2xFac module reports errors through the Det_ReportError function of the DET Module [4].

5.2 AUTOSAR EcuM (Ecu State Manager)

The EcuM [5] initializes the V2xFac module by calling `V2xFac_Init` specified in 8.3.1.

5.3 V2x Vehicle Data Provider

The V2xFac module retrieves vehicle relevant data from the VDP application by using the Sender-Receiver-Interface V2xFacVdp (see **[SWS_V2xFac_00094]**).

5.4 V2x Proxy

The V2x Proxy is an Application that listens to every CAM and DENM via the Sender-Receiver-Interfaces V2xApplRxIndicationCam and V2xApplRxIndicationDenm and transmits it to one or more ECU's via in-vehicle networks. The transmission via the in-vehicle network is implementation specific.

5.5 V2x Applications

The V2xFac module delivers received DENM data to the V2x Applications by using the Sender-Receiver-Interface V2xApplRxIndicationDenm (see **[SWS_V2xFac_00100]**).

The V2xFac module delivers received CAM data to the V2x Applications by using the Sender-Receiver-Interface V2xApplRxIndicationCam (see **[SWS_V2xFac_00100]**).

The V2xFac module provides the Client-Server-Interface V2xFacDenBs for using the DEN basic service. The operations TriggerEvent, UpdateEvent or TerminateEvent are provided.

5.6 AUTOSAR V2xBtp

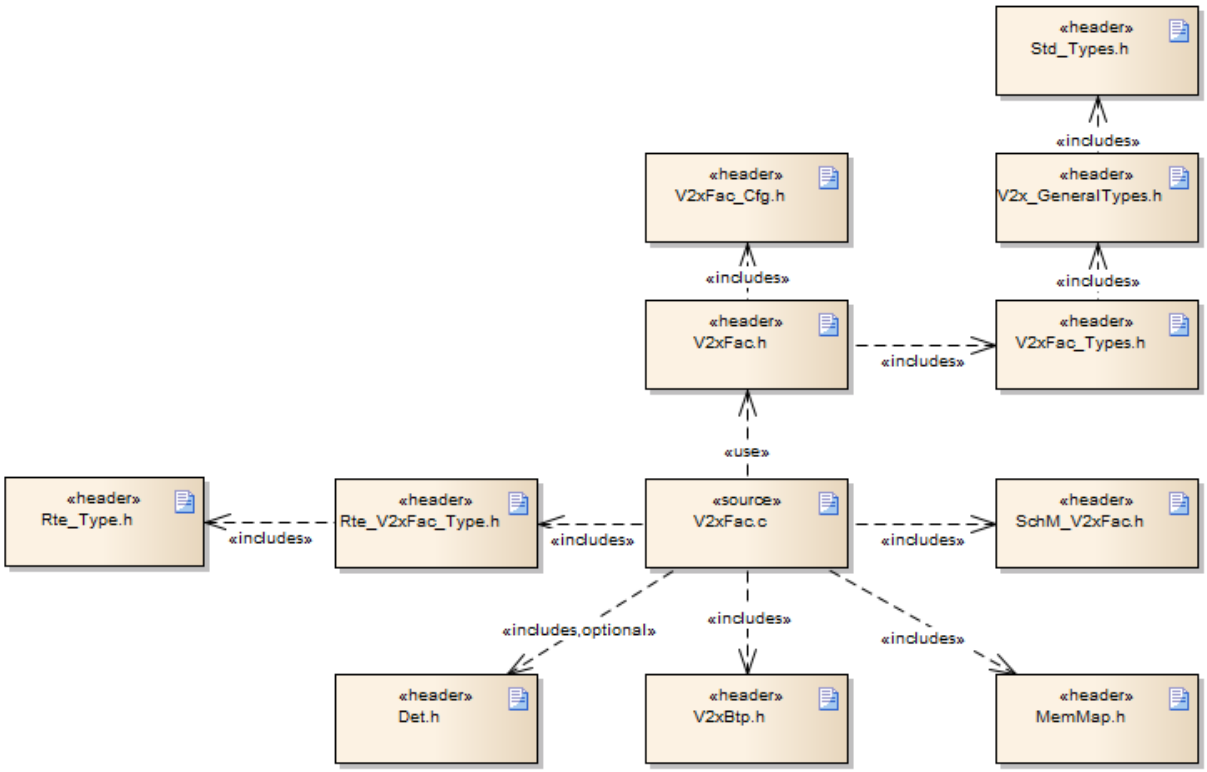
The V2xFac module assumes a transmit request primitive (V2xBtp_Transmit [6], see **[SWS_V2xFac_00092]**) to be provided by the V2xBtp module.

5.7 AUTOSAR V2xM

The V2xFac module assumes a request primitive (see **[SWS_V2xFac_00092]**) to be provided by the Vehicle-2-X Management (V2xM) module.

5.8 File structure

5.8.1 Header file structure



[SWS_V2xFac_00121] ⌈ Generic type definitions of the V2xFac module which are described in section 8.2 shall be located in the header file V2xFac_Types.h. ⌋ ( )

[SWS_V2xFac_00122]⌈ The V2xFac module shall include V2x_GeneralTypes.h⌋ (SRS_BSW_00301, SRS_BSW_00456)

6 Requirements traceability

Requirement	Description	Satisfied by
SRS_BSW_00301	All AUTOSAR Basic Software Modules shall only import the necessary information	SWS_V2xFac_00122
SRS_BSW_00345	BSW Modules shall support pre-compile configuration	SWS_V2xFac_00238
SRS_BSW_00456	- A Header file shall be defined in order to harmonize BSW Modules	SWS_V2xFac_00122
SRS_V2X_00010	The implementation of the V2X system shall follow additional guidance given by C2C-CC requirements	SWS_V2xFac_20168, SWS_V2xFac_20185, SWS_V2xFac_20215, SWS_V2xFac_20256, SWS_V2xFac_20257, SWS_V2xFac_20313
SRS_V2X_00214	The V2X system shall allow applications to deactivate transmission of CAMs	SWS_V2xFac_00006
SRS_V2X_00259	The V2X system shall manage the life time of all DENM packets	SWS_V2xFac_20259
SRS_V2X_00291	The V2X system shall only send messages with valid postion and time	SWS_V2xFac_20215, SWS_V2xFac_20291
SRS_V2X_00301	The V2X system's Facility Layer shall handle DENM repetition	SWS_V2xFac_00029
SRS_V2X_00318	The V2X system's Facility Layer shall generate traces and path histories	SWS_V2xFac_20318
SRS_V2X_00693	The V2X system shall provide functionality for generating traces and path histories	SWS_V2xFac_20285, SWS_V2xFac_20286, SWS_V2xFac_20287, SWS_V2xFac_20288, SWS_V2xFac_20289, SWS_V2xFac_20302, SWS_V2xFac_20303, SWS_V2xFac_20304, SWS_V2xFac_20305, SWS_V2xFac_20306, SWS_V2xFac_20307, SWS_V2xFac_20308
SRS_V2X_00711	The V2X system's CA basic service shall be compliant to ETSI Specification of Cooperative Awareness Basic Service	SWS_V2xFac_00231, SWS_V2xFac_20292, SWS_V2xFac_20294, SWS_V2xFac_20295, SWS_V2xFac_20296, SWS_V2xFac_20297
SRS_V2X_00741	The V2X system's DEN basic service shall be compliant to ETSI Specifications of Decentralized Environmental Notification Basic Service	SWS_V2xFac_00232

7 Functional specification

The V2xFac module operates the basic services Cooperative Awareness (CA) and Decentralized Environmental Notification (DEN).

[SWS_V2xFac_00231] ⌈ The V2xFac module shall implement the CA Basic Service as specified in [10] unless specified otherwise in this document ⌋ (SRS_V2X_00711)

[SWS_V2xFac_00232] ⌈ The V2xFac module shall implement the DEN Basic Service as specified in [11] unless specified otherwise in this document ⌋ (SRS_V2X_00741)

7.1 Startup behavior

[SWS_V2xFac_00001]⌈
The function V2xFac_Init (refer to chapter 8.3.2) of the V2xFac shall initialize the internal states of the V2xFac module.
⌋ ()

Note: The function V2xFac_Init shall not be called before the Vehicle-2-X Management (V2xM) is initialized by the Electronic Control Unit Manager (EcuM).

[SWS_V2xFac_00004] ⌈
The function V2xFac_Init shall initialize the basic services CA and DEN.
⌋ ( )

7.2 General Format Specification

[SWS_V2xFac_20313]⌈
The data elements which constitute the content of the CAM and DENM shall be compliant to [13] ⌋ (SRS_V2X_00010)

7.3 CA Functional Specification

For details see [10] chapter 6.1.

7.3.1 CA Initialization, Activation and Deactivation

[SWS_V2xFac_00116] ⌈

The path history shall be cleared when the sending functionality is enabled via the V2xFac_V2xM_SetCaBsOperation API.⌋ ( )

[SWS_V2xFac_00006] ⌈

CA basic service initialization shall enable the transmission of CAM messages⌋ (SRS_V2X_00214)

[SWS_V2xFac_00008] ⌈

The function V2xFac_Init shall initialize the parameter T_GenCam_DCC [10] needed for the frequency management for CAMs according to T_GenCamMax [10].

For details see[10] chapter 5.3.5

⌋ ( )

[SWS_V2xFac_00009] ⌈

The function V2xFac_Init shall initialize the parameter T_GenCam [10] to the default value T_GenCamMax.

For details see [10] chapter 6.1.3

⌋ ( )

[SWS_V2xFac_00010] ⌈

The function V2xFac_Init shall initialize the parameter N_GenCam [10] to the default value 0.

⌋ ( )

[SWS_V2xFac_00011] ⌈

The function V2xFac_Init shall initialize the parameter T_CheckCamGen [10] to the default value equal to the configuration parameter T_GenCamMax [10].

For details see [10] chapter 6.1.3

⌋ ( )

7.3.2 CAM Generation, Sending and Receiving, Frequency Management

[SWS_V2xFac_00014] ⌈

The CA basic service shall periodically generate CAMs controlled by a CAM frequency management (For details see [10] chapter 6.1.3.)
⌋ ( )

[SWS_V2xFac_00015] ⌈

The generated CAMs shall be transmitted by the V2xBtp using the API function V2xBtp_Transmit (see chapter 8.6.1).

] ( )

[SWS_V2xFac_00016] [

The CA basic service shall receive CAMs via the callback function V2xFac_RxIndication (see chapter 8.4).

] ( )

[SWS_V2xFac_20294][
The MAX_DANGLE [19] representing the delta angle (in degrees) between two generation rules checks shall use a value of 4°.] (SRS_V2X_00711)

[SWS_V2xFac_20295][
The MAX_DDISTANCE [19] representing the delta distance (in meters) between two generation rules checks shall use a value of 4 meters.] (SRS_V2X_00711)

[SWS_V2xFac_20296][
The MAX_DSPEED [19] representing the delta speed between two generation rules checks shall use a value of 0,5 m/s.] (SRS_V2X_00711)

[SWS_V2xFac_20297][
The adjustable N_GenCam parameter (see [10]) specified in the CAM Generation Frequency Management shall be set to 0 for the V2xFac module.] (SRS_V2X_00711)

[SWS_V2xFac_20291][
The V2xFac module shall transmit CAM messages as long as position and time information are available.] (SRS_V2X_00291)

7.3.3 CAM Generation Frequency Management for RSU ITS-Ss

RSU is out of scope of the document.

7.3.4 CAM Time Requirement

[SWS_V2xFac_00019] [
The CAM generation shall follow time requirements according to [10] chapter 6.1.5.
] ( )

[SWS_V2xFac_20168] [
The V2xFac module shall check the timestamp in the security envelope compared to the reception time and accept only CAMs in the last time of 2 seconds and other messages within the last time of 10 minutes.
] (SRS_V2X_00010)

7.3.5 CAM Format Specification

For details about CAM data format refer to to the following ETSI documents:
See [10] chapter 7
See [10] Annex A: ASN.1 specification of CAM
See [10] Annex B: Description for data elements and data frames
See [13] Annex A, Annex B

[SWS_V2xFac_20285] ⌈

The path history field inside the CAM low frequency (LF) container shall contain a PathHistory data element covering a distance of at least 200 m (K_PHDISTANCE_M parameter [19]).
An exception to the minimum covered distance by PathHistory shall be only made if either of the following conditions is fulfilled:

- the vehicle has not yet physically covered the distance with its current pseudonym (e.g., after vehicle startup or right after pseudonym change when driving)
- the maximum number of PathPoints is used while the overall length covered by the PathHistory still does not reach 200m.

Only in the above two cases the vehicle may send PathHistory information covering a distance below the 200 m lower limit.
⌋ (SRS_V2X_00693)

[SWS_V2xFac_20286] ⌈

The PathHistory in CAMs shall cover at most 500 m.
⌋ (SRS_V2X_00693)

[SWS_V2xFac_20287] ⌈

The V2xFac module shall send PathDeltaTime in every PathPoint of the PathHistory. Therefore, the PathHistory shall describe a time-ordered list of actually travelled geographical locations leading to the current vehicle position.
⌋ (SRS_V2X_00693)

[SWS_V2xFac_20288] ⌈

In cases where the vehicle does not move, i.e. PathPoint position information does not change, the PathDeltaTime of the first PathPoint shall still be updated with every CAM.
⌋ (SRS_V2X_00693)

[SWS_V2xFac_20289] ⌈

When the V2xFac module is stationary for a duration longer than the maximum value of PathDeltaTime (specified in [13]) the PathDeltaTime of the first PathPoint in the CAM shall be fixed to the maximum value..
⌋ (SRS_V2X_00693)

[SWS_V2xFac_20292]⌈

The traffic class value for CAM messages shall be set to 2. ⌋ (SRS_V2X_00711)

[SWS_V2xFac_20256]⌈
The V2xFac module shall use a Single Hop Broadcasting (SHB) header on all CAM packets it sends. Therefore, the value of the transportType parameter shall be set to 0x50 ⌋ (SRS_V2X_00010)

7.4 DEN Functional Specification

As defined in ETSI documents (See [11] chapter 5.2) the DEN basic service is a facilities layer entity that implements the DEN protocol. It interfaces with ITS-S applications in order to receive the application request for DENM transmission and to provide the received DENM content to the ITS-S applications.

7.4.1 DEN Initialization

[SWS_V2xFac_00025]⌈
The function V2xFac_Init shall initialize an empty originating ITS-S message table.
For details see [11] chapter 8.2.1.6
⌋ ( )

7.4.2 DENM Transmission Management

[SWS_V2xFac_00027]⌈
The DEN basic service is triggered by the V2x-Application via its service operations TriggerEvent, UpdateEvent or TerminateEvent from the service interface V2xFacDenBs (see chapter 8.7.2.1).
The function parameter “EventID” given by the above mentioned operations shall be mapped by the DEN basic service to the actionID generated for DENMs.
For details see [11] chapter 5.3 and 8.2
⌋ ()

7.4.3 DENM Reception Management

[SWS_V2xFac_00028]⌈
Upon receiving a DENM, the DEN basic service makes the content of the DENM available to the V2X Applications.
Received DENMs shall be sent to the upper application layer via their standardized AUTOSAR service interface V2xApplRxIndicationDenm.
For Details see [11] chapter 5.3 and 8.4
⌋ ( )

7.4.4 DENM Repetition

[SWS_V2xFac_00029]⌈

In between two consequent DENM updates, a DENM may be repeated by the DEN basic service.
For details see [11] chapter 6.1.2.3
] (SRS_V2X_00301)

7.4.5 DENM Keep Alive Forwarding (KAF)

KAF functionality for the DEN basic service as defined by ETSI is not supported.
See [11] chapter 5.3 and 8.3

7.4.6 DENM Format Specification

For details about DENM data format refer to to the following ETSI documents:

See [11] chapter 7,
See [11] Annex A: ASN.1 specification of DENM
See [11] Annex B: Description for data elements and data frames
See [13] Annex A, Annex B

[SWS_V2xFac_20302] [
The path history field inside the DEN messages shall contain Trace data elements covering a distance of at least 600 m (K_PHDISTANCE_M parameter).
An exception to the minimum covered distance by Traces shall be only made if either of the following conditions is fulfilled:

- the vehicle has not yet physically covered the distance with its current pseudonym (e.g., after vehicle startup or right after pseudonym change when driving)
- the maximum number of PathPoints is used while the overall length covered by the PathHistory still does not reach 200m.

Only in the above two cases the vehicle may send Traces information covering a distance below the 600 m lower limit.
] (SRS_V2X_00693)

[SWS_V2xFac_20303] [
The Traces in the DENMs shall cover at most 1000 m**.**
] (SRS_V2X_00693)

[SWS_V2xFac_20304] [

The V2xFac module shall use the DENM traces as follow: The PathDeltaTime shall be sent in every PathPoint in the first DENM traces element. Therefore, the first element of the traces shall describe a time-ordered list of actually travelled geographical locations leading to the event position. In its simplest form this is the same as the PathHistory at that time instant, which is recommended to be used.
] (SRS_V2X_00693)

[SWS_V2xFac_20305] [

The PathDeltaTime data elements of the PathPoints in the first DENM traces element shall only be updated if the DENM is updated. Furthermore, the cases in which DENM Updates are triggered shall be specified on a case-by-case basis in the corresponding Triggering Conditions [17].
] (SRS_V2X_00693)

[SWS_V2xFac_20306] [
In cases where the event detecting vehicle does not move, i.e. PathPoint position information does not change, the PathDeltaTime of the first PathPoint of the first DENM traces element shall still be updated with every DEN_Update.
] (SRS_V2X_00693)

NOTE: This is only the case for stationary events where the detecting vehicle is identical to the event, e.g. a stationary vehicle warning. For dynamic events, e.g. dangerous situations, or events, where the event is not identical to the vehicle, e.g. adverse weather warning, this is not the case.

[SWS_V2xFac_20307] [
When standing for a long time, the PathDeltaTime of the first PathPoint of the first DENM traces element shall be fixed to the maximum value specified in [8]. Therefore, PathPoints do not “fall out” of the first DENM traces element when standing for a long time.
] (SRS_V2X_00693)

[SWS_V2xFac_20308] [
Additional PathHistory elements may be present in the DENM traces. However, unlike the first element, these shall describe alternative routes to the event location. These routes may or may not be available at the time of detecting the event. In the alternative routes, the PathPoints shall be position-ordered (i.e. shortest-path routes) and they shall not include the PathDeltaTime.
] (SRS_V2X_00693)

[SWS_V2xFac_20318] [

The traces and path histories used by the V2xFac module shall be generated using the Design Method One as specified in the VSC-A Final Report [18]: Appendix B-2. The V2xFac module shall use the generation method with the following settings:

- $K\_PHALLOWABLEERROR\_M = 0{,}47\ m$, where $PH\_ActualError < K\_PHALLOWABLEERROR\_M$
- Maximum distance between concise path points, $K\_PH\_CHORDLENGTHTHRESHOLD = 22{,}5\ m$
- $K\_PH\_MAXESTIMATEDRADIUS = REarthMeridian$
- $K\_PHSMALLDELTAPHI\_R = 1\ degree$
- $REarthMeridian = 6378.137\ km$ (according to IUGG - International Union of Geodesy and Geophysics), used for great-circle or orthodromic distance calculation:

$$PH\_ActualChordLength = REarthMerdian * cos^{-1}[cos(lat1)cos(lat1)cos(long1 - long2) + sin(lat1)sin(lat2)]$$

] (SRS_V2X_00318)

[SWS_V2xFac_20257][
The V2xFac module shall use GeoBroadcast (GBC) headers on all DENM packets it sends. Therefore, the value of the transportType parameter shall be set to 0x40] (SRS_V2X_00010)

[SWS_V2xFac_20259][
The V2xFac module shall set the maxPacketLifetime parameter of the packets transport parameters TxParams of all GBC packets to the minimum of ValidityDuration and RepetitionInterval (LifeTime=min(ValidityDuration, RepetitionInterval)), where ValidityDuration and RepetitionInterval are defined inside C2C-CC White Paper Information quality/event detection] (SRS_V2X_00259)

7.5 Path History

[SWS_V2xFac_20185] [
Facilities layer shall clear the own station's path history cache (used to fill into new messages) when the security entity changes its pseudonym identity.
] (SRS_V2X_00010)

[SWS_V2xFac_20215] [
Traces and path history data shall only be generated when position confidence and ITS time information are available] (SRS_V2X_00010,SRS_V2X_00291)

7.6 Error classification

7.6.1 Development Errors

[SWS_V2xFac_00031]
[

Type of error	*Related error code*	*Value [hex]*
API service called with wrong parameter	V2XFAC_E_PARAM	0x01
API service called with invalid pointer	V2XFAC_E_PARAM_POINTER	0x02
V2xFac initialization failed	V2XFAC_E_INIT_FAILED	0x03
API function called before the V2xFac module has been fully initialized	V2XFAC_E_UNINIT	0x04

] ( )

7.6.2 Runtime Errors

There are no runtime errors.

7.6.3 Transient Faults

There are no transient faults.

7.6.4 Production Errors

There are no production errors.

7.6.5 Extended Production Errors

There are no extended production errors.

8 API specification

8.1 Imported types

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

[SWS_V2xFac_00032] [

Module	*Imported Type*
Std_Types	Std_ReturnType
	Std_VersionInfoType
V2xBtp	V2xBtp_TxParamsType
V2x_GeneralTypes	V2x_GnAddressType
	V2x_GnDestinationAreaType
	V2x_GnDestinationType
	V2x_GnLocalPositionVectorType
	V2x_GnLongPositionVectorType
	V2x_PseudonymType
	V2x_SecReportType
	V2x_TrafficClassIdType

] ()

8.2 Type definitions

8.2.1 V2xFac_RxParamsType

[SWS_V2xFac_00034] [

Name:	V2xFac_RxParamsType		
Type:	Structure		
Element:	uint16	destinationPort	Identifies the protocol entity at the ITS facilities layer at the destination of a BTP packet.
	V2x_GnAddressType	destinationAddress	Destination address for GeoUnicast packet
	V2x_GnDestinationAreaType	destinationArea	Destination area for GeoBroadcast/GeoAnycast packet.
	V2x_GnDestinationType	destinationType	Select which destination type (destinationAddress or destinationArea is used for this packet).
	V2x_GnLongPositionVectorType	sourcePositionVector	Geographical position for the source of the received GeoNetworking packet.
	V2x_SecReportType	securityReport	Result information from the security operations for decryption and verification. This parameter is supplied by the V2xM module and forwarded up to the ITS

			Facilities layer passing through the GeoNetworking and BTP layers.
	uint64	certificateId	Identification of source certificate, for example the certificate hash. This parameter is supplied by the V2xM and forwarded up to the ITS Facilities layer passing through the GeoNetworking and BTP layers.
	uint8[4]	SspBits	Sender permissions
	uint8	SspLength	Sender permissions length
	V2x_TrafficClassIdType	trafficClass	Traffic class, with which the GeoNetworking packet was generated by the source.
	uint16	remPacketLifetime	Remaining lifetime of the packet in [s].
Description:	Wraps GeoNetworking parameters from V2xBtp		

] ()

8.3 Function definitions

8.3.1 V2xFac_Init

[SWS_V2xFac_00082] [

Service name:	V2xFac_Init

Syntax:	`void V2xFac_Init(`
	`  void`
	`)`

Service ID[hex]:	0x01
Sync/Async:	Synchronous
Reentrancy:	Non Reentrant
Parameters (in):	None
Parameters (inout):	None
Parameters (out):	None
Return value:	None
Description:	Initializes the V2xFac module.

] ()

8.3.2 V2xFac_GetVersionInfo

[SWS_V2xFac_00084] [

Service name:	V2xFac_GetVersionInfo

Syntax:	`void V2xFac_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 of this module.
Return value:	None	
Description:	Returns the version information of this module.	

⌋ ()

[SWS_V2xFac_00085] ⌈
If V2xFacDevErrorDetect is enabled: If the VersionInfoPtr pointer parameter is invalid (e.g. NULL), the error-code V2XFAC_E_PARAM_POINTER shall be reported to the DET module. ⌋ ( )

8.3.3 V2xFac_V2xM_PreparePseudonymChange

[SWS_V2xFac_00086] ⌈

Service name:	V2xFac_V2xM_PreparePseudonymChange	
Syntax:	`Std_ReturnType V2xFac_V2xM_PreparePseudonymChange( const V2x_PseudonymType* PseudonymPtr )`	
Service ID[hex]:	0x03	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	PseudonymPtr	The Pseudonym provided by V2xM
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: operation successful E_NOT_OK: operation failed
Description:	By this API primitive the V2xFac module gets an indication that the Pseudonym and hereby the StationId has changed.	

⌋ ()

[SWS_V2xFac_00136] ⌈
The function V2xFac_V2xM_PreparePseudonymChange shall prepare the setting of the pseudonym specific part of the StationId being used for packet transmission. ⌋()

[SWS_V2xFac_00137] ⌈
If development error detection is enabled: the function shall check that the service V2xFac_Init was previously called. If the check fails, the function shall raise the development error V2XFAC_E_UNINIT otherwise (if DET is disabled) return E_NOT_OK. ⌋()

[SWS_V2xFac_00138] ⌈
If development error detection is enabled: the function shall check the parameter PseudonymPtr for being valid. If the check fails, the function shall raise the development error V2XFAC_E_PARAM_POINTER otherwise (if DET is disabled) return E_NOT_OK. ⌋()

8.3.4 V2xFac_V2xM_CommitPseudonymChange

[SWS_V2xFac_00140] ⌈

Service name:	V2xFac_V2xM_CommitPseudonymChange	
Syntax:	`Std_ReturnType V2xFac_V2xM_CommitPseudonymChange( void )`	
Service ID[hex]:	0x04	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	None	
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: operation successful E_NOT_OK: operation failed
Description:	This function is called by the V2xM when all modules are OK with the pseudonym change and the change is to be committed.	

⌋ ()

[SWS_V2xFac_00141] ⌈
The function V2xFac_V2xM_CommitPseudonymChange shall set the pseudonym specific part of the GeoNetworking Address being used for packet transmission and clean the path history. V2xFac shall store the access of the GeoNetworking Address for subsequent API calls. ⌋()

[SWS_V2xFac_00142] ⌈
If development error detection is enabled: the function shall check that the service V2xFac_Init was previously called. If the check fails, the function shall raise the development error V2XFAC_E_UNINIT otherwise (if DET is disabled) return E_NOT_OK. ⌋()

Note: The function requires previous preparation of the pseudonym via an API call to V2xFac_V2xM_PreparePseudonymChange.

8.3.5 V2xFac_V2xM_AbortPseudonymChange

[SWS_V2xFac_00144] ⌈

Service name:	V2xFac_V2xM_AbortPseudonymChange	
Syntax:	`Std_ReturnType V2xFac_V2xM_AbortPseudonymChange( void )`	
Service ID[hex]:	0x05	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	None	
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: operation successful E_NOT_OK: operation failed
Description:	This function is called by the V2xM when not all modules are OK with the	

	pseudonym change and the change is to be rolled back.

] ()

[SWS_V2xFac_00145] ⌈
The function V2xFac_V2xM_AbortPseudonymChange shall roll back the prepared pseudonym change. ⌋()

[SWS_V2xFac_00146] ⌈
If development error detection is enabled: the function shall check that the service V2xFac_Init was previously called. If the check fails, the function shall raise the development error V2XFAC_E_UNINIT otherwise (if DET is disabled) return E_NOT_OK. ⌋()

Note: The function requires previous preparation of the pseudonym via an API call to V2xFac_V2xM_PreparePseudonymChange.

8.3.6 V2xFac_V2xM_SetTGenCamDcc

[SWS_V2xFac_00148] ⌈

Service name:	V2xFac_V2xM_SetTGenCamDcc	
Syntax:	`void V2xFac_V2xM_SetTGenCamDcc( uint16 TGenCamDcc )`	
Service ID[hex]:	0x06	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	TGenCamDcc	The TGenCamDcc in [ms], provided by V2xM
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	By this API primitive the V2xFac module gets an indication of the current TGenCamDcc value.	

] ()

[SWS_V2xFac_00149] ⌈
The function V2xFac_V2xM_SetTGenCamDcc shall set the TGenCamDcc for subsequent API calls. ⌋()

[SWS_V2xFac_00150] ⌈
If development error detection is enabled: the function shall check that the service V2xFac_Init was previously called. If the check fails, the function shall raise the development error V2XFAC_E_UNINIT otherwise (if DET is disabled) return E_NOT_OK. ⌋()

8.3.7 V2xFac_V2xM_SetCaBsOperation

[SWS_V2xFac_00152] ⌈

Service name:	V2xFac_V2xM_SetCaBsOperation

Syntax:	`void V2xFac_V2xM_SetCaBsOperation(`
	`  boolean OperationState`
	`)`	

Service ID[hex]:	0x07	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	OperationState	FALSE: CaBs disabled TRUE: CaBs enbaled
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	By this API primitive the V2xFac module gets an indication of the current operation state of the CA Basic Service.	

] ()

[SWS_V2xFac_00153] [
The function V2xFac_V2xM_SetCaBsOperation shall enable or disable the CA Basic Service.]()

[SWS_V2xFac_00154] [
If development error detection is enabled: the function shall check that the service V2xFac_Init was previously called. If the check fails, the function shall raise the development error V2XFAC_E_UNINIT otherwise (if DET is disabled) return E_NOT_OK.]()

8.4 Call-back notifications

This is a list of functions provided for other modules. The function prototypes of the callback functions shall be provided in the file V2xFac_Cbk.h

8.4.1 V2xFac_TxConfirmation

[SWS_V2xFac_00087] [

Service name:	V2xFac_TxConfirmation	

Syntax:	`void V2xFac_TxConfirmation(`
	`  uint16 TransactionId16`
	`)`	

Service ID[hex]:	0x08	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	TransactionId16	TransactionId of the packet that has been transmitted
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	By this API primitive the V2xFac module gets a confirmation that the V2X message with a certain ID was send successfully.	

] ()

[SWS_V2xFac_00156] [

If development error detection is enabled: the function shall check that the service V2xFac_Init was previously called. If the check fails, the function shall raise the development error V2XFAC_E_UNINIT.]()

8.4.2 V2xFac_RxIndication

[SWS_V2xFac_00088] [

Service name:	V2xFac_RxIndication	

Syntax:	`void V2xFac_RxIndication(`
	`  uint32 TransactionId32,`
	`  const V2xFac_RxParamsType* ReceiveParams,`
	`  uint16 Length,`
	`  const uint8* DataPtr`
	`)`	

Service ID[hex]:	0x09	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	TransactionId32	ID of the received packet. This ID is created in the V2xGn module and handed up in the protocol stack to be used for verification on demand.
	ReceiveParams	Wraps RxIndication parameters
	Length	Length of the data pointed by DataPtr.
	DataPtr	Payload of the received BTP packet.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	This API primitive is called by the V2xBtp module providing the data and the GeoNetworking parameters of a received BTP packet to V2xFac module.	

] ()

[SWS_V2xFac_00158] [
If development error detection is enabled: the function shall check that the service V2xFac_Init was previously called. If the check fails, the function shall raise the development error V2XFAC_E_UNINIT.]()

[SWS_V2xFac_00159] [
If development error detection is enabled: the function shall check the parameter ReceiveParams for being valid. If the check fails, the function shall raise the development error V2XFAC_E_PARAM_POINTER.]()

[SWS_V2xFac_00160] [
If development error detection is enabled: the function shall check the parameter DataPtr for being valid. If the check fails, the function shall raise the development error V2XFAC_E_PARAM_POINTER.]()

8.5 Scheduled functions

8.5.1 V2xFac_CaBs_MainFunction

[SWS_V2xFac_00090] ⌈

Service name:	V2xFac_CaBs_MainFunction
Syntax:	`void V2xFac_CaBs_MainFunction( void )`
Service ID[hex]:	0x0a
Description:	This is the main processing function of the CA basic service

⌋ ()

8.5.2 V2xFac_DenBs_MainFunction

[SWS_V2xFac_00091] ⌈

Service name:	V2xFac_DenBs_MainFunction
Syntax:	`void V2xFac_DenBs_MainFunction( void )`
Service ID[hex]:	0x0b
Description:	This is the main processing function of the DEN basic service.

⌋ ()

8.6 Expected Interfaces

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

8.6.1 Mandatory Interfaces

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

[SWS_V2xFac_00092] ⌈

API function	***Description***
V2xBtp_Transmit	This API is called by the V2xFac module to request sending a BTP-PDU to the peer BTP entity.
V2xM_CalcDistance	Calculates the distance between two geographical points on earth with the assumption that they are on elevation 0.
V2xM_CalcHeadingInTolerance	Calculates if difference of heading values are within a tolerance value
V2xM_GetPositionAndTime	Provides the instantaneous position information.
V2xM_GetRefTimePtr	Provides a pointer to the time reference of the V2X-Stack.
V2xM_SetTollingZoneInformation	Set available tolling zone information. This is done from V2xFac that receives this information via CAM messages.

⌋ ()

8.6.2 Optional Interfaces

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

[SWS_V2xFac_00093] ⌈

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

⌋ ()

8.7 Service Interfaces

8.7.1 Sender-Receiver-Interfaces

8.7.1.1 V2xFacVdp

[SWS_V2xFac_00094] ⌈
The V2xFac requires an interface V2xFacVdp as defined below to get data from the VDP application.
⌋ ()

[SWS_V2xFac_00095] ⌈

Name	V2xFacVdp	
Comment	Interface to receive data from VDP application	
IsService	false	
Variation	--	
Data Elements	vdpData	
	Type	V2xFac_CoopAwarenessType
	Variation	--

⌋ ()

8.7.1.2 V2xApplRxIndicationCam

[SWS_V2xFac_00100] ⌈
For the V2X_Facilities an interface V2xApplRxIndicationCam shall be provided as defined below to provide the capability of delivering received CAMs to applications.
⌋ ()

[SWS_V2xFac_00101] ⌈

Name	V2xApplRxIndicationCam
Comment	Deliver received CAMs Applications
IsService	true

Variation	--	
Data Elements	CamData	
	Type	V2xFac_CamMessageRootType
	Variation	--

] ()

8.7.1.1 V2xApplRxIndicationDenm

[SWS_V2xFac_00234] [
For the V2X_Facilities an interface V2xApplRxIndicationDenm shall be provided as defined below to provide the capability of delivering received DENMs to applications.
] ()

[SWS_V2xFac_00235] [

Name	V2xApplRxIndicationDenm	
Comment	Deliver received DENMs to Applications	
IsService	true	
Variation	--	
Data Elements	DenmData	
	Type	V2xFac_DenmMessageRootType
	Variation	--

] ()

8.7.2 Client-Server-Interfaces

8.7.2.1 V2xFacDenBs

The V2xFac module provides the Client-Server service Interface V2xFacDenBs to the application layer. The service Interface V2xFacDenBs shall implement the following operations.

- TriggerEvent
- UpdateEvent
- TerminateEvent

[SWS_V2xFac_00098] [
The V2X_Facilities shall provide an interface V2xFacDenBs as defined below to provide tha capability of event handling (triggering, updating and terminating DENMs).
] ()

[SWS_V2xFac_00099] [

Name	V2xFacDenBs	
Comment	Service of V2xFac module basic service DEN	
IsService	true	
Variation	--	
Possible Errors	0	E_OK
	1	E_NOT_OK
	2	E_ACTION_ID_NONEXISTENT
	3	E_DENM_UNCONSTRUCTABLE
	4	E_DENM_TIME_OUT

Operations

TerminateEvent			
Comments	Requests termination of an existing DENM (see [11] chapter 4 and 5.4.1.4)		
Variation	--		
Parameters	EventData	Comment	Pre-filled DENM message structure, including the ActionID from TriggerEvent
		Type	V2xFac_DenMsgType
		Variation	--
		Direction	IN
	RepetitionDuration	Comment	Duration of the DENM repetition in units of milliseconds
		Type	uint32
		Variation	--
		Direction	IN
	RepetitionInterval	Comment	Interval of DENM repetition in units of milliseconds
		Type	uint16
		Variation	--
		Direction	IN
	DestinationArea	Comment	Destination area for DENM dissemination as specified in ETSI EN 302 931.
		Type	V2xFac_GnDestinationAreaType

		Variation	--
		Direction	IN
	TrafficClass	Comment	GN traffic class of the DENM as defined in ETSI EN 302 636-4-1
		Type	V2xFac_TrafficClassIdType
		Variation	--
		Direction	IN
	ActionID	Comment	The DEN basic service returns the actionID or other applicable identifier created by the DEN basic service to the requesting ITS-S application
		Type	V2xFac_ActionIdType
		Variation	--
		Direction	OUT
Possible Errors	E_OK	Operation successful	
	E_NOT_OK	--	
	E_ACTION_ID_NONEXISTENT	ActionID provided for Update/Termination does not exist	
	E_DENM_UNCONSTRUCTABLE	DENM couldn't be constructed	
	E_DENM_TIME_OUT	DENM hasn't been sent before timeout of DENM has been reached	

TriggerEvent			
Comments	Requests creation of a new DENM (see [11] chapter 4 and 5.4.1.2)		
Variation	--		
Parameters	EventData	Comment	Pre-filled DENM message structure
		Type	V2xFac_DenMsgType
		Variation	--
		Direction	IN
	RepetitionDuration	Comment	Duration of the DENM repetition in units of milliseconds
		Type	uint32
		Variation	--
		Direction	IN

	RepetitionInterval	Comment	Interval of DENM repetition in units of milliseconds
		Type	uint16
		Variation	--
		Direction	IN
	DestinationArea	Comment	Destination area for DENM dissemination as specified in ETSI EN 302 931.
		Type	V2xFac_GnDestinationAreaType
		Variation	--
		Direction	IN
	TrafficClass	Comment	GN traffic class of the DENM as defined in ETSI EN 302 636-4-1
		Type	V2xFac_TrafficClassIdType
		Variation	--
		Direction	IN
	ActionID	Comment	The DEN basic service returns the actionID or other applicable identifier created by the DEN basic service to the requesting ITS-S application
		Type	V2xFac_ActionIdType
		Variation	--
		Direction	OUT
Possible Errors	E_OK	Operation successful	
	E_NOT_OK	--	
	E_DENM_UNCONSTRUCTABLE	DENM couldn't be constructed	
	E_DENM_TIME_OUT	DENM hasn't been sent before timeout of DENM has been reached	

UpdateEvent			
Comments	Requests update of an existing DENM (see [11] chapter 4 and 5.4.1.3)		
Variation	--		
Parameters	EventData	Comment	Pre-filled DENM message structure, including the ActionID from TriggerEvent
		Type	V2xFac_DenMsgType

		Variation	--
		Direction	IN
	RepetitionDuration	Comment	Duration of the DENM repetition in units of milliseconds
		Type	uint32
		Variation	--
		Direction	IN
	RepetitionInterval	Comment	Interval of DENM repetition in units of milliseconds
		Type	uint16
		Variation	--
		Direction	IN
	DestinationArea	Comment	Destination area for DENM dissemination as specified in ETSI EN 302 931.
		Type	V2xFac_GnDestinationAreaType
		Variation	--
		Direction	IN
	TrafficClass	Comment	GN traffic class of the DENM as defined in ETSI EN 302 636-4-1
		Type	V2xFac_TrafficClassIdType
		Variation	--
		Direction	IN
	ActionID	Comment	The DEN basic service returns the actionID or other applicable identifier created by the DEN basic service to the requesting ITS-S application
		Type	V2xFac_ActionIdType
		Variation	--
		Direction	OUT
Possible Errors	E_OK	Operation successful	
	E_NOT_OK	--	
	E_ACTION_ID_NONEXISTENT	ActionID provided for Update/Termination does not exist	
	E_DENM_UNCONSTRUCTABLE	DENM couldn't be constructed	

	E_DENM_TIME_OUT	DENM hasn't been sent before timeout of DENM has been reached

] ()

8.7.3 Implementation Data Types

8.7.3.1 V2xFac specific Implementation DataTypes

[SWS_V2xFac_00162] [

Name	V2xFac_TrafficClassIdType
Kind	Type
Derived from	uint8
Description	Traffic class for sending DENMs
Variation	--

] ()

[SWS_V2xFac_00163] [

Name	V2xFac_GnDestinationAreaType		
Kind	Structure		
Elements	latitude	sint32	Latitude [1/10 microdegree]
	longitude	sint32	Longitude [1/10 microdegree]
	distanceA	uint16	Distance a of the geometric shape [meters]
	distanceB	uint16	Distance b of the geometric shape [meters]
	angle	uint16	Angle of the geometric shape [degrees from North]
	shape	V2xFac_GnAreaShapeType	Shape type of the geometric area
Description	Destination area for DENM dissemination as specified in ETSI EN 302 931.		
Variation	--		

] ()

[SWS_V2xFac_00164] [

Name	V2xFac_GnAreaShapeType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of a GeoNetworking Area Shape		
Range	V2XFAC_GNAREASHAPE_CIRCLE	0x00	Circle

	V2XFAC_GNAREASHAPE_RECT	0x01	Rectangle
	V2XFAC_GNAREASHAPE_ELLIPSE	0x02	Ellipsis
Variation	--		

] ()

8.7.3.2 CAM/DENM common Implementation DataTypes

[SWS_V2xFac_00036] [

Name	V2xFac_ItsPduHeaderType		
Kind	Structure		
Elements	protocolVersion	uint8	Version of ITS message and/or communication protocol
	messageId	uint8	Type of the ITS message.
	stationId	uint32	Identifier of originating ITS-S
Description	DF_ItsPduHeader as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00224] [

Name	V2xFac_DeltaReferencePositionType		
Kind	Structure		
Elements	deltaLatitude	sint32	Defines offset latitude with regards to a referred latitude value.
	deltaLongitude	sint32	Defines an offset longitude with regards to a referred longitude value.
	deltaAltitude	sint16	Defines an offset altitude with regards to a referred altitude value.
Description	DF_DeltaReferencePosition as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00037] [

Name	V2xFac_AltitudeType		
Kind	Structure		
Elements	altitudeValue	sint32	Altitude in a WGS84 co-ordinate system

	altitudeConfidence	V2xFac_AltitudeConfidenceType	Absolute accuracy of a reported altitude value
Description	DF_Altitude as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00165] [

Name	V2xFac_AltitudeConfidenceType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_AltitudeConfidence as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_ALTITUDECONFIDENCE_ALT_000_01	0x00	the altitude accuracy is equal to or less than 0.01 meter
	V2XFAC_ALTITUDECONFIDENCE_ALT_000_02	0x01	the altitude accuracy is equal to or less than 0.02 meter
	V2XFAC_ALTITUDECONFIDENCE_ALT_000_05	0x02	the altitude accuracy is equal to or less than 0.05 meter
	V2XFAC_ALTITUDECONFIDENCE_ALT_000_10	0x03	the altitude accuracy is equal to or less than 0.1 meter
	V2XFAC_ALTITUDECONFIDENCE_ALT_000_20	0x04	the altitude accuracy is equal to or less than 0.2 meter
	V2XFAC_ALTITUDECONFIDENCE_ALT_000_50	0x05	the altitude accuracy is equal to or less than 0.5 meter
	V2XFAC_ALTITUDECONFIDENCE_ALT_001_00	0x06	the altitude accuracy is equal to or less than 1 meter
	V2XFAC_ALTITUDECONFIDENCE_ALT_002_00	0x07	the altitude accuracy is equal to or less than 2 meters

	V2XFAC_ALTITUDECONFIDENCE_ALT_005_00	0x08	the altitude accuracy is equal to or less than 5 meters
	V2XFAC_ALTITUDECONFIDENCE_ALT_010_00	0x09	the altitude accuracy is equal to or less than 10 meters
	V2XFAC_ALTITUDECONFIDENCE_ALT_020_00	0x0a	the altitude accuracy is equal to or less than 20 meters
	V2XFAC_ALTITUDECONFIDENCE_ALT_050_00	0x0b	the altitude accuracy is equal to or less than 50 meters
	V2XFAC_ALTITUDECONFIDENCE_ALT_100_00	0x0c	the altitude accuracy is equal to or less than 100 meters
	V2XFAC_ALTITUDECONFIDENCE_ALT_200_00	0x0d	the altitude accuracy is equal to or less than 200 meters
	V2XFAC_ALTITUDECONFIDENCE_ALT_OUTOFRANGE	0x0e	the altitude accuracy is out of range, i.e. greater than 200 meters
	V2XFAC_ALTITUDECONFIDENCE_ALT_UNAVAILABLE	0x0f	the altitude accuracy information is unavailable
Variation	--		

] ()

[SWS_V2xFac_00038] [

Name	V2xFac_PosConfidenceEllipseType		
Kind	Structure		
Elements	semiMajorConfidence	uint16	Half of length of the major axis
	semiMinorConfidence	uint16	Half of length of the minor axis
	semiMajorOrientation	V2xFac_HeadingType	Orientation direction of the ellipse major axis
Description	DF_PosConfidenceEllipse as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		

Variation	--

⌋ ()

[SWS_V2xFac_00039] ⌈

Name	V2xFac_HeadingType		
Kind	Structure		
Elements	headingValue	uint16	Altitude in a WGS84 co-ordinate system
	headingConfidence	uint8	Absolute accuracy of a reported heading value
Description	DF_Heading as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

⌋ ()

[SWS_V2xFac_00040] ⌈

Name	V2xFac_SpeedType		
Kind	Structure		
Elements	speedValue	uint16	Speed value
	speedConfidence	uint8	The absolute accuracy of a speed value
Description	DF_Speed as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

⌋ ()

[SWS_V2xFac_00047] ⌈

Name	V2xFac_ReferencePositionType		
Kind	Structure		
Elements	latitude	sint32	Latitude of the geographical point
	longitude	sint32	Longitude of the geographical point
	posConfidenceEllipse	V2xFac_PosConfidenceEllipseType	Accuracy of the geographical position
	altitude	V2xFac_AltitudeType	Altitude and altitude accuracy of the geographical point
Description	DF_ReferencePosition as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00225] [

Name	V2xFac_ActionIdType		
Kind	Structure		
Elements	originatingStationID	uint32	Identifier for an ITS-S
	sequenceNumber	uint16	sequenceNumber
Description	DF_ActionID as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00059] [

Name	V2xFac_PathHistoryType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of V2xFac_PathPointType	--
		Size	23
Description	DF_PathHistory as defined in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 23 as defined in ETSI EN 302 637-2 V1.3.2.		
Variation	--		

] ()

[SWS_V2xFac_00226] [

Name	V2xFac_ClosedLanesType		
Kind	Structure		
Elements	presence	V2xFac_ClosedLanesPresenceType	Mark optional children present or not
	hardShoulderStatus	V2xFac_HardShoulderStatusType	Indicates the open/closing status of hard shoulder lanes
	drivingLaneStatus	V2xFac_DrivingLaneStatusType	Indicates whether a driving lane is open to traffic
Description	DF_ClosedLanes as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00166] ⌈

Name	V2xFac_ClosedLanesPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	hardShoulderStatus	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_ClosedLanesTypet			

⌋ ()

[SWS_V2xFac_00167] ⌈

Name	V2xFac_HardShoulderStatusType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_HardShoulderStatus as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_HARDSHOULDERSTATUS_AVAILABLE_FOR_STOPPING	0x00	Hard shoulder lane available for stopping
	V2XFAC_HARDSHOULDERSTATUS_CLOSED	0x01	Hard shoulder lane closed
	V2XFAC_HARDSHOULDERSTATUS_AVAILABLE_FOR_DRIVING	0x02	Hard shoulder lane available for driving
Variation	--		

⌋ ()

[SWS_V2xFac_00168] ⌈

Name	V2xFac_DrivingLaneStatusType			
Kind	Bitfield			
Derived from	uint16			
Elements	Kind	Name	Mask	Description
	bit	outermostLaneClosed	0x2000	Bit 13: Outermost lane is closed

	bit	secondLaneFromOutsideClosed	0x1000	Bit 12: Second lane from the outside is closed
	bit	thirdLaneFromOutsideClosed	0x800	Bit 11: Third lane from the outside is closed
	bit	fourthLaneFromOutsideClosed	0x400	Bit 10: Fourth lane from the outside is closed
	bit	fifthLaneFromOutsideClosed	0x200	Bit 9: Fifth lane from the outside is closed
	bit	sixthLaneFromOutsideClosed	0x100	Bit 8: Sixth lane from the outside is closed
	bit	seventhLaneFromOutsideClosed	0x80	Bit 7: Seventh lane from the outside is closed
	bit	eighthLaneFromOutsideClosed	0x40	Bit 6: Eighth lane from the outside is closed
	bit	ninthLaneFromOutsideClosed	0x20	Bit 5: Ninth lane from the outside is closed
	bit	tenthLaneFromOutsideClosed	0x10	Bit 4: Tenth lane from the outside is closed
	bit	eleventhLaneFromOutsideClosed	0x08	Bit 3: Eleventh lane from the outside is closed
	bit	twelfthLaneFromOutsideClosed	0x04	Bit 2: Twelfth lane from the outside is closed
	bit	thirteenthLaneFromOutsideClosed	0x02	Bit 1: Thirteenth lane from the outside is closed
	bit	fourteenthLaneFromOutsideClosed	0x01	Bit 0 (LSB): Fourteenth lane from the outside is closed
Description	BitString DE_DrivingLaneStatus as defined in ETSI TS 102 894-2 V1.2.1.			

] ()

[SWS_V2xFac_00074] [

Name	V2xFac_CauseCodeType		
Kind	Structure		
Elements	causeCode	uint8	Encoded value of a traffic event type
	subCauseCode	uint8	Type of sub cause of a detected event
Description	DF_CauseCode as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

8.7.3.3 CAM specific Implementation DataTypes

[SWS_V2xFac_00041] ⌈

Name	V2xFac_CamMessageRootType		
Kind	Structure		
Elements	itsPduHeader	V2xFac_ItsPduHeaderType	Structure of the ItsPduHeader
	coopAwareness	V2xFac_CoopAwarenessType	Structure of the CoopAwareness data
	transactionId	uint32	TransactionId for received CAM
Description	CAM root message as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

⌋ ()

[SWS_V2xFac_00042] ⌈

Name	V2xFac_CoopAwarenessType		
Kind	Structure		
Elements	generationDeltaTime	uint16	Time corresponding to the time of the reference position in the CAM
	camParameters	V2xFac_CamParametersType	Structure of V2X CAM-Parameters
Description	CoopAwareness as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

⌋ ()

[SWS_V2xFac_00045] ⌈

Name	V2xFac_CamParametersType		
Kind	Structure		
Elements	presence	V2xFac_CamParametersPresenceType	Mark optional childs present or not
	basicContainer	V2xFac_BasicContainerType	Basic container of CAM
	highFrequencyContainer	V2xFac_HighFrequencyContainerType	High frequency container of CAM

	lowFrequencyContainer	V2xFac_LowFrequencyContainerType	Low frequency container of CAM
	specialVehicleContainer	V2xFac_SpecialVehicleContainerType	Special container of the CAM
Description	CamParameters as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00169] ⌈

Name	V2xFac_CamParametersPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	lowFrequencyContainer	0x02	Bit 1: Optional child present
	bit	specialVehicleContainer	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_CamParametersType			

] ()

[SWS_V2xFac_00170] ⌈

Name	V2xFac_SpecialVehicleContainerType		
Kind	Structure		
Elements	choice	V2xFac_SpecialVehicleContainerChoiceType	Marks which element is filled
	publicTransportContainer	V2xFac_PublicTransportContainerType	--
	specialTransportContainer	V2xFac_SpecialTransportContainerType	--
	dangerousGoodsContainer	V2xFac_DangerousGoodsContainerType	--
	roadWorksContainerBasic	V2xFac_RoadWorksContainerBasicType	--
	rescueContainer	V2xFac_RescueContainerType	--
	emergencyContainer	V2xFac_EmergencyContainerType	--
	safetyCarContainer	V2xFac_SafetyCarContainerType	--
Description	SpecialVehicleContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00171] [

Name	V2xFac_SpecialVehicleContainerChoiceType		
Kind	Type		
Derived from	uint8		
Description	Enumeration for Choice V2xFac_SpecialVehicleContainerType		
Range	V2XFAC_SPECIALVEHICLECONTAINER_PUBLIC_TRANSPORT_CONTAINER	0x01	Public transport container chosen
	V2XFAC_SPECIALVEHICLECONTAINER_DANGEROUS_GOODS_CONTAINER	0x02	Dangerous goods container chosen
	V2XFAC_SPECIALVEHICLECONTAINER_ROAD_WORKS_CONTAINER_BASIC	0x03	Road works container basic chosen
	V2XFAC_SPECIALVEHICLECONTAINER_RESCUE_CONTAINER	0x04	Rescue container chosen
	V2XFAC_SPECIALVEHICLECONTAINER_EMERGENCY_CONTAINER	0x05	Emergency container chosen
	V2XFAC_SPECIALVEHICLECONTAINER_SAFETY_CAR_CONTAINER	0x06	Safety car container chosen
Variation	--		

] ()

[SWS_V2xFac_00046] [

Name	V2xFac_BasicContainerType		
Kind	Structure		
Elements	stationType	uint8	Station type of the originating ITS-S
	referencePosition	V2xFac_ReferencePositionType	Position and position accuracy measured at the reference point of the originating ITS-S
Description	BasicContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements		

	within this structure shall be used according that document.
Variation	--

] ()

[SWS_V2xFac_00048] [

Name	V2xFac_HighFrequencyContainerType		
Kind	Structure		
Elements	choice	V2xFac_HighFrequencyContainerChoiceType	Mark which element is filled
	basicVehicleContainerHighFrequency	V2xFac_BasicVehicleContainerHighFrequencyType	--
	rsuContainerHighFrequency	V2xFac_RSUContainerHighFrequencyType	--
Description	HighFrequencyContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00172] [

Name	V2xFac_HighFrequencyContainerChoiceType		
Kind	Type		
Derived from	uint8		
Description	Enumeration for Choice V2xFac_HighFrequencyContainerType		
Range	V2XFAC_HIGHFREQCONTAINER_BASICVEHICLECONTAINER	0x01	High Frequency basic vehicle container chosen
	V2XFAC_HIGHFREQCONTAINER_RSUCONTAINERHIGHFREQ	0x02	HIgh frequency RSU container high freq chosen
Variation	--		

] ()

[SWS_V2xFac_00173] [

Name	V2xFac_BasicVehicleContainerHighFrequencyType

Kind	Structure		
Elements	presence	V2xFac_BasicVehicleContainerHighFrequencyPresenceType	Mark optional childs present or not
	heading	V2xFac_HeadingType	Heading and heading accuracy of the vehicle movement
	speed	V2xFac_SpeedType	Driving speed and speed accuracy of the originating ITS-S
	driveDirection	V2xFac_DriveDirectionType	Vehicle drive direction
	vehicleLength	V2xFac_VehicleLengthType	Vehicle length and accuracy of the vehicle that originates the CAM
	vehicleWidth	uint8	Width of a vehicle, including side mirrors
	longitudinalAcceleration	V2xFac_LongitudinalAccelerationType	Vehicle longitudinal acceleration and accuracy
	curvature	V2xFac_CurvatureType	Actual trajectory curvature and accuracy
	curvatureCalculationMode	V2xFac_CurvatureCalculationModeType	Flag indicating whether vehicle yaw-rate is used

	yawRate	V2xFac_YawRateType	YawRate and accuracy
	accelerationControl	V2xFac_AccelerationControlType	Current status of the vehicle mechanisms controlling the longitudinal movement
	lanePosition	sint8	Lane position of the vehicle
	steeringWheelAngle	V2xFac_SteeringWheelAngleType	Steering wheel angle and accuracy
	lateralAcceleration	V2xFac_LateralAccelerationType	Vehicle lateral acceleration and accuracy
	verticalAcceleration	V2xFac_VerticalAccelerationType	Vertical Acceleration of the originating ITS-S
	performanceClass	uint8	Characterizes the maximum age of the CAM data elements
	cenDsrcTollingZone	V2xFac_CenDsrcTollingZoneType	Information about the position of a CEN DSRC Tolling Station
Description	BasicVehicleContainerHighFrequency as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00174] [

Name	V2xFac_BasicVehicleContainerHighFrequencyPresenceType

Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	accelerationControl	0x40	Bit 6: Optional child present
	bit	lanePosition	0x20	Bit 5: Optional child present
	bit	steeringWheelAngle	0x10	Bit 4: Optional child present
	bit	lateralAcceleration	0x08	Bit 3: Optional child present
	bit	verticalAcceleration	0x04	Bit 2: Optional child present
	bit	performanceClass	0x02	Bit 1: Optional child present
	bit	cenDsrcTollingZone	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_BasicVehicleContainerHighFrequencyType			

] ()

[SWS_V2xFac_00175] [

Name	V2xFac_DriveDirectionType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_DrivingDirection as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_DRIVINGDIRECTION_FORWARD	0x00	Driving direction forward
	V2XFAC_DRIVINGDIRECTION_BACKWARD	0x01	Driving direction backward
	V2XFAC_DRIVINGDIRECTION_UNAVAILABLE	0x02	Driving direction unavailable
Variation	--		

] ()

[SWS_V2xFac_00176] [

Name	V2xFac_CurvatureCalculationModeType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_CurvatureCalculationMode as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_CURVATURECALCMODE_YAWRATE_USED	0x00	Calc mode Yawrate used
	V2XFAC_CURVATURECALCMODE_YAWRATE_NOT_USED	0x01	Calc mode

			Yawrate not used
	V2XFAC_CURVATURECALCMODE_UNAVAILABLE	0x02	Calc mode unavailable
Variation	--		

] ()

[SWS_V2xFac_00177] [

Name	V2xFac_AccelerationControlType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	brakePedalEngaged	0x40	Bit 6: Driver is stepping on the brake pedal
	bit	gasPedalEngaged	0x20	Bit 5: Driver is stepping on the gas pedal
	bit	emergencyBrakeEngaged	0x10	Bit 4: Emergency brake system is engaged
	bit	collisionWarningEngaged	0x08	Bit 3: Collision warning system is engaged
	bit	accEngaged	0x04	Bit 2: ACC is engaged
	bit	cruiseControlEngaged	0x02	Bit 1: Cruise control is engaged
	bit	speedLimiterEngaged	0x01	Bit 0 (LSB): Speed limiter is engaged
Description	BitString DE_AccelerationControl as defined in ETSI TS 102 894-2 V1.2.1.			

] ()

[SWS_V2xFac_00178] [

Name	V2xFac_RSUContainerHighFrequencyType		
Kind	Structure		
Elements	presence	V2xFac_RSUContainerHighFrequencyPresenceType	Mark optional childs present or not
	protectedCommunicationZonesRSU	V2xFac_ProtectedCommunicationZonesRSUType	Describes a list of protected communication zones by a road side ITS-S (Road Side Unit RSU)
Description	DF_VehicleLength as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		

Variation	--

] ()

[SWS_V2xFac_00179] [

Name	V2xFac_RSUContainerHighFrequencyPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	protectedCommunicationZonesRSU	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_RSUContainerHighFrequencyType			

] ()

[SWS_V2xFac_00180] [

Name	V2xFac_ProtectedCommunicationZonesRSUType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of V2xFac_ProtectedCommunicationZoneType	--
		Size	16
Description	DF_ProtectedCommunicationZonesRSU as defined in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 16.		
Variation	--		

] ()

[SWS_V2xFac_00181] [

Name	V2xFac_ProtectedCommunicationZoneType		
Kind	Structure		
Elements	presence	V2xFac_ProtectedCommunicationZonePresenceType	Mark optional children present or not
	protectedZoneType	V2xFac_ProtectedZoneTypeType	type of the protected zone
	expiryTime	uint64	time at which the validity of the protected

			communication zone will expire
	protectedZoneLatitude	sint16	latitude of the center point of the protected communication zone.
	protectedZoneLongitude	sint16	longitude of the center point of the protected communication zone
	protectedZoneRadius	uint8	Radius of a protected communication zone in meters
	protectedZoneID	uint32	ID of a protected communication zone
Description	DF_VehicleLength as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00182] [

Name	V2xFac_ProtectedCommunicationZonePresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	expiryTime	0x04	Bit 2: Optional child present
	bit	protectedZoneRadius	0x02	Bit 1: Optional child present
	bit	protectedZoneID	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_ProtectedCommunicationZoneType			

] ()

[SWS_V2xFac_00183] [

Name	V2xFac_ProtectedZoneTypeType
Kind	Type

Derived from	uint8		
Description	Enumeration of DE_ProtectedZoneType as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_PROTECTEDZONETYPE_CEN_DSRC_TOLLING	0x00	CenDscrTollingZone
Variation	--		

] ()

[SWS_V2xFac_00050] [

Name	V2xFac_VehicleLengthType		
Kind	Structure		
Elements	vehicleLengthValue	uint16	Length of a vehicle
	vehicleLengthConfidenceIndication	V2xFac_VehicleLengthConfidenceIndicationType	Indication of whether trailer is detected to be present and whether the length of the trailer is known.
Description	DF_VehicleLength as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00239] [

Name	V2xFac_VehicleLengthConfidenceIndicationType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_VehicleLengthConfidenceIndication as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_VEHICLELENGTHCONFIDENCEINDICATION_NOTRAILERPRESENT	0x00	no trailer present
	V2XFAC_VEHICLELENGTHCONFIDENCEINDICATION_TRAILERPRES	0x	trailer

	ENTWITHKNOWNLENGTH	01	present with known length
	V2XFAC_VEHICLELENGTHCONFIDENCEINDICATION_TRAILERPRESENTWITHUNKNOWNLENGTH	0x02	trailer present with unknown length
	V2XFAC_VEHICLELENGTHCONFIDENCEINDICATION_TRAILERPRESENCEISUNKNOWN	0x03	trailer presence is unknown
	V2XFAC_VEHICLELENGTHCONFIDENCEINDICATION_UNAVAILABLE	0x04	information is not known
Variation	--		

] ()

[SWS_V2xFac_00051] [

Name	V2xFac_LongitudinalAccelerationType		
Kind	Structure		
Elements	longitudinalAccelerationValue	sint16	Vehicle acceleration at longitudinal direction
	longitudinalAccelerationConfidence	uint8	The absolute accuracy of a reported vehicle acceleration
Description	DF_LongitudinalAcceleration as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00052] [

Name	V2xFac_CurvatureType		
Kind	Structure		
Elements	curvatureValue	sint16	Describes the inverse of a detected vehicle turning curve radius
	curvatureConfidence	V2xFac_CurvartureConfidenceType	Describes the absolute accuracy range of a reported curvature value
Description	DF_Curvature as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within		

	this structure shall be used according that document.
Variation	--

] ()

[SWS_V2xFac_00184] [

Name	V2xFac_CurvartureConfidenceType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_CurvatureConfidence as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_CURVATURECONFIDENCE_ONE_PER_METER_0_00002	0x00	The accuracy is less than or equal to 0,00002 m-1
	V2XFAC_CURVATURECONFIDENCE_ONE_PER_METER_0_0001	0x01	The accuracy is less than or equal to 0,0001 m-1
	V2XFAC_CURVATURECONFIDENCE_ONE_PER_METER_0_0005	0x02	The accuracy is less than or equal to 0,0005 m-1
	V2XFAC_CURVATURECONFIDENCE_ONE_PER_METER_0_002	0x03	The accuracy is less than or equal to 0,002 m-1
	V2XFAC_CURVATURECONFIDENCE_ONE_PER_METER_0_01	0x04	The accuracy is less than or equal to 0,01 m-1
	V2XFAC_CURVATURECONFIDENCE_ONE_PER_METER_0_1	0x05	The accuracy is less than or equal to

			0,1 m-1
	V2XFAC_CURVATURECONFIDENCE_OUT_OF_RANGE	0x06	The accuracy is out of range, i.e. greater than 0,1 m-1
	V2XFAC_CURVATURECONFIDENCE_UNAVAILABLE	0x07	The information is not available
Variation	--		

] ()

[SWS_V2xFac_00053] [

Name	V2xFac_YawRateType		
Kind	Structure		
Elements	yawRateValue	sint16	Vehicle rotation around z-axis
	yawRateConfidence	V2xFac_YawRateConfidenceType	Absolute accuracy range for reported yaw rate value
Description	DF_YawRate as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00245] [

Name	V2xFac_YawRateConfidenceType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_YawRateConfidence as defined in ETSI TS 102 894-2 V1.2.1.		
Range	YAWRATECONFIDENCE_DEGSEC_000_01	0x00	0 if the accuracy is equal to or less than 0,01 degree/second
	YAWRATECONFIDENCE_DEGSEC_000_05	0x01	1 if the accuracy is equal to or less than 0,05 degrees/second
	YAWRATECONFIDENCE_DEGSEC_000_10	0x02	2 if the accuracy is equal to or less than 0,1 degree/second
	YAWRATECONFIDENCE_DEGSEC_001_00	0x03	3 if the accuracy is equal to or less than 1 degree/second

	YAWRATECONFIDENCE_DEGSEC_005_00	0x04	4 if the accuracy is equal to or less than 5 degrees/second
	YAWRATECONFIDENCE_DEGSEC_010_00	0x05	5 if the accuracy is equal to or less than 10 degrees/second
	YAWRATECONFIDENCE_DEGSEC_100_00	0x06	6 if the accuracy is equal to or less than 100 degrees/second
	YAWRATECONFIDENCE_OUTOFRANGE	0x07	7 if the accuracy is out of range, i.e. greater than 100 degrees/second
	YAWRATECONFIDENCE_UNAVAILABLE	0x08	8 if the accuracy information is unavailable
Variation	--		

⌋ ()

[SWS_V2xFac_00054] ⌈

Name	V2xFac_SteeringWheelAngleType		
Kind	Structure		
Elements	steeringWheelAngleValue	uint16	Steering wheel angle of the vehicle at certain point in time.
	steeringWheelAngleConfidence	uint8	Absolute accuracy for a reported steering wheel angle value.
Description	DF_SteeringWheelAngle as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

⌋ ()

[SWS_V2xFac_00055] ⌈

Name	V2xFac_LateralAccelerationType		
Kind	Structure		
Elements	lateralAccelerationValue	sint16	Vehicle acceleration at lateral direction
	lateralAccelerationConfidence	uint8	The absolute accuracy of a reported vehicle acceleration
Description	DF_LateralAcceleration as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

⌋ ()

[SWS_V2xFac_00056] ⌈

Name	V2xFac_VerticalAccelerationType
Kind	Structure

Elements	verticalAccelerationValue	sint16	Vehicle acceleration at vertival direction
	verticalAccelerationConfidence	uint8	The absolute accuracy of a reported vehicle acceleration
Description	DF_VerticalAcceleration as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00057] [

Name	V2xFac_CenDsrcTollingZoneType		
Kind	Structure		
Elements	presence	V2xFac_CenDsrcTollingZonePresenceType	Marks optional children present or not
	protectedZoneLatitude	sint32	The latitude of the CEN DSRC road side equipment
	protectedZoneLongitude	sint32	The longitude of the CEN DSRC road side equipment
	cenDsrcTollingZoneID	sint32	The ID of the CEN DSRC road side equipment
Description	DF_CenDsrcTollingZone as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00185] [

Name	V2xFac_CenDsrcTollingZonePresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	cenDsrcTollingZoneID	0x01	Bit 0 (LSB): Optional child present

Description	Presence flags for V2xFac_CenDsrcTollingZoneType

] ()

[SWS_V2xFac_00058] [

Name	V2xFac_LowFrequencyContainerType		
Kind	Structure		
Elements	choice	V2xFac_LowFrequencyContainerChoiceType	Mark which element is filled
	basicVehicleContainerLowFrequency	V2xFac_BasicVehicleContainerLowFrequencyType	--
Description	LowFrequencyContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00186] [

Name	V2xFac_LowFrequencyContainerChoiceType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of Choice V2xFac_LowFrequencyContainerType		
Range	V2XFAC_LOWFREQCONTAINER_BASIC_VEHICLE_CONTAINER_LOW_FREQ	0x01	Element choosen
Variation	--		

] ()

[SWS_V2xFac_00187] [

Name	V2xFac_BasicVehicleContainerLowFrequencyType		
Kind	Structure		
Elements	vehicleRole	V2xFac_VehicleRoleType	Vehicle role
	exteriorLights	V2xFac_ExteriorLightsType	Exterior Lights
	pathHistory	V2xFac_PathHistoryType	Path History
Description	BasicVehicleLowFrequencyContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		

Variation	--

] ()

[SWS_V2xFac_00188] [

Name	V2xFac_VehicleRoleType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_VehicleRole as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_VEHICLEROLE_DEFAULT	0x00	default vehicle role as indicated by the vehicle type
	V2XFAC_VEHICLEROLE_PUBLIC_TRANSPORT	0x01	vehicle is used to operate public transport service
	V2XFAC_VEHICLEROLE_SPECIAL_TRANSPORT	0x02	vehicle is used for special transport purpose, e.g. oversized trucks
	V2XFAC_VEHICLEROLE_DANGEROUS_GOODS	0x03	vehicle is used for dangerous goods transportation
	V2XFAC_VEHICLEROLE_ROAD_WORK	0x04	vehicle is used to realize roadwork or road maintenance mission
	V2XFAC_VEHICLEROLE_RESCUE	0x05	vehicle is used for rescue purpose in case of an accident, e.g. as a towing service
	V2XFAC_VEHICLEROLE_EMERGENCY	0x06	vehicle is used for emergency mission, e.g. ambulance, fire brigade
	V2XFAC_VEHICLEROLE_SAFETY_CAR	0x07	vehicle is used for public safety, e.g. patrol
	V2XFAC_VEHICLEROLE_AGRICULTURAL	0x08	vehicle is used for agriculture, e.g. farm tractor
	V2XFAC_VEHICLEROLE_COMMERCIAL	0x09	vehicle is used for transportation of commercial goods
	V2XFAC_VEHICLEROLE_MILITARY	0x0a	vehicle is used for military purpose
	V2XFAC_VEHICLEROLE_ROAD_OPERATOR	0x0b	vehicle is used in road operator missions
	V2XFAC_VEHICLEROLE_TAXI	0x0c	vehicle is used to provide

			an authorized taxi service
	V2XFAC_VEHICLEROLE_RESERVED_1	0x0d	reserved for future usage
	V2XFAC_VEHICLEROLE_RESERVED_2	0x0e	reserved for future usage
	V2XFAC_VEHICLEROLE_RESERVED_3	0x0f	reserved for future usage
Variation	--		

] ()

[SWS_V2xFac_00189] [

Name	V2xFac_ExteriorLightsType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	lowBeamHeadlightsOn	0x80	Bit 7: low beam headlights on
	bit	highBeamHeadlightsOn	0x40	Bit 6: high beam headlights on
	bit	leftTurnSignalOn	0x20	Bit 5: left turn signal on
	bit	rightTurnSignalOn	0x10	Bit 4: right turn signal on
	bit	daytimeRunningLightsOn	0x08	Bit 3: daytime running lights on
	bit	reverseLightOn	0x04	Bit 2: reverse light on
	bit	fogLightOn	0x02	Bit 1: fog light on
	bit	parkingLightsOn	0x01	Bit 0: parking lights on
Description	BitString DE_ExteriorLights as defined in ETSI TS 102 894-2 V1.2.1.			

] ()

[SWS_V2xFac_00060] [

Name	V2xFac_PathPointType		
Kind	Structure		
Elements	presence	V2xFac_PathPointPresenceType	Mark optional children present or not
	pathPosition	V2xFac_DeltaReferencePositionType	Defines a geographical point position as offset position to a reference geographical point.
	pathDeltaTime	uint16	Presents the time difference when two consecutive PathPoint values are measured.
Description	DF_PathPoint as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within		

	this structure shall be used according that document.
Variation	--

] ()

[SWS_V2xFac_00190] [

Name	V2xFac_PathPointPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	pathDeltaTime	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_PathPointType			

] ()

[SWS_V2xFac_00061] [

Name	V2xFac_PublicTransportContainerType		
Kind	Structure		
Elements	presence	V2xFac_PublicTransportContainerPresenceType	Mark optional childs present or not
	embarkationStatus	boolean	Indicates whether the passenger embarkation is currently ongoing
	ptActivation	V2xFac_PtActivationType	Used by public transport vehicles for controlling traffic lights, barriers, bollards, etc.
Description	PublicTransportContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00191] [

Name	V2xFac_PublicTransportContainerPresenceType
Kind	Bitfield
Derived from	uint8

Elements	Kind	Name	Mask	Description
	bit	ptActivation	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_PublicTransportContainerType			

] ()

[SWS_V2xFac_00229] [

Name	V2xFac_PtActivationType		
Kind	Structure		
Elements	ptActivationType	uint8	Indicates a certain coding type of the PtActivationData
	ptActivationData	V2xFac_PtActivationDataType	Controlling traffic signal systems to prioritize and speed up public transportation
Description	DF_PtActivation as defined in ETSI TS 102 894-2 V1.2.1.		
Variation	--		

] ()

[SWS_V2xFac_00237] [

Name	V2xFac_PtActivationDataType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of uint8	--
		Size	20
Description	DF_PtActivationData as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00062] [

Name	V2xFac_SpecialTransportContainerType		
Kind	Structure		
Elements	specialTransportType	V2xFac_SpecialTransportTypeType	Indicates whether the originating ITS-S is mounted on a special transport vehicle
	lightBarSirenInUse	V2xFac_LightBarSirenInUseType	Indicates whether light-bar or a siren is in use
Description	SpecialTransportContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		

Variation	--

] ()

[SWS_V2xFac_00192] [

Name	V2xFac_SpecialTransportTypeType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	heavyLoad	0x08	Bit 3: heavy load
	bit	excessWidth	0x04	Bit 2: excess width
	bit	excessLength	0x02	Bit 1: excess length
	bit	excessHeight	0x01	Bit 0 (LSB): excess height
Description	BitString DE_SpecialTransportType as defined in ETSI TS 102 894-2 V1.2.1.			

] ()

[SWS_V2xFac_00193] [

Name	V2xFac_LightBarSirenInUseType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	lightBarActivated	0x02	Bit 1: light bar activated
	bit	sirenActivated	0x01	Bit 0 (LSB): siren activated
Description	BitString DE_LightBarSirenInUse as defined in ETSI TS 102 894-2 V1.2.1.			

] ()

[SWS_V2xFac_00064] [

Name	V2xFac_DangerousGoodsContainerType		
Kind	Structure		
Elements	dangerousGoodsBasic	V2xFac_DangerousGoodsBasicType	Identifies the type of the dangerous goods transported
Description	DangerousGoodsContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00194] [

Name	V2xFac_DangerousGoodsBasicType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_DangerousGoodsBasic as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_DANGEROUSGOODSBASIC_EXPLOSIVES_1	0x00	explosives 1
	V2XFAC_DANGEROUSGOODSBASIC_EXPLOSIVES_2	0x01	explosives 2
	V2XFAC_DANGEROUSGOODSBASIC_EXPLOSIVES_3	0x02	explosives 3
	V2XFAC_DANGEROUSGOODSBASIC_EXPLOSIVES_4	0x03	explosives 4
	V2XFAC_DANGEROUSGOODSBASIC_EXPLOSIVES_5	0x04	explosives 5
	V2XFAC_DANGEROUSGOODSBASIC_EXPLOSIVES_6	0x05	explosives 6
	V2XFAC_DANGEROUSGOODSBASIC_FLAMMABLE_GASES	0x06	flammable gases
	V2XFAC_DANGEROUSGOODSBASIC_NON_FLAMMABLE_GASES	0x07	non flammable gases
	V2XFAC_DANGEROUSGOODSBASIC_TOXIC_GASES	0x08	toxic gases
	V2XFAC_DANGEROUSGOODSBASIC_FLAMMABLE_LIQUIDS	0x09	flammable liquids
	V2XFAC_DANGEROUSGOODSBASIC_FLAMMABLE_SOLIDS	0x0a	flammable solids
	V2XFAC_DANGEROUSGOODSBASIC_SUBSTANCES_LIBLE_TO_SPONTANEOUS_COMBUSTION	0x0b	substances lible to spontaneous combustion
	V2XFAC_DANGEROUSGOODSBASIC_SUBSTANCES_EMITTING_FLAMMABLE_GASES_UPON_CONTACT_WITH_WATER	0x0c	substances emitting flamma

			ble gases upon contact with water
	V2XFAC_DANGEROUSGOODSBASIC_OXIDIZING_SUBSTANCES	0x 0d	oxidizing substances
	V2XFAC_DANGEROUSGOODSBASIC_ORGANIC_PEROXIDES	0x 0e	organic peroxides
	V2XFAC_DANGEROUSGOODSBASIC_TOXIC_SUBSTANCES	0x 0f	toxic substances
	V2XFAC_DANGEROUSGOODSBASIC_INFECTIOUS_SUBSTANCES	0x 10	infectious substances
	V2XFAC_DANGEROUSGOODSBASIC_RADIOACTIVE_MATERIAL	0x 11	radioactive material
	V2XFAC_DANGEROUSGOODSBASIC_CORROSIVE_SUBSTANCES	0x 12	corrosive substances
	V2XFAC_DANGEROUSGOODSBASIC_MISCELLANEOUS_DANGEROUS_SUBSTANCES	0x 13	miscellaneous dangerous substances
Variation	--		

] ()

[SWS_V2xFac_00065] [

Name	V2xFac_RoadWorksContainerBasicType		
Kind	Structure		
Elements	presence	V2xFac_RoadWorksContainerBasicPresenceType	Mark optional childs present or not
	roadworksSubCauseCode	uint8	Information on the type of roadwork
	lightBarSirenInUse	V2xFac_LightBarSirenInUseType	Indicates

			whether light-bar or a siren is in use
	closedLanes	V2xFac_ClosedLanesType	Information about the opening/closure status of the lanes ahead
Description	RoadWorksContainerBasic as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00195] [

Name	V2xFac_RoadWorksContainerBasicPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	roadworksSubCauseCode	0x02	Bit 1: Optional child present
	bit	closedLanes	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_RoadWorksContainerBasicType			

] ()

[SWS_V2xFac_00066] [

Name	V2xFac_RescueContainerType		
Kind	Structure		
Elements	lightBarSirenInUse	V2xFac_LightBarSirenInUseType	Indicates whether light-bar or a siren is in use
Description	RescueContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00067] [

Name	V2xFac_EmergencyContainerType		
Kind	Structure		
Elements	presence	V2xFac_EmergencyContainerPresenceType	Mark optional childs present or not

	lightBarSirenInUse	V2xFac_LightBarSirenInUseType	Indicates whether light-bar or a siren is in use
	incidentIndication	V2xFac_CauseCodeType	Describes the event type of the emergency or safety mission
	emergencyPriority	V2xFac_EmergencyPriorityType	Right of way indicator of the vehicle
Description	EmergencyContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00196] [

Name	V2xFac_EmergencyPriorityType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	requestForRightOfWay	0x02	Bit 1: request for right of way
	bit	requestForFreeCrossingAtATrafficLight	0x01	Bit 0 (LSB): request for free crossing at a traffic light
Description	BitString DE_EmergencyPriority as defined in ETSI TS 102 894-2			

] ()

[SWS_V2xFac_00197] [

Name	V2xFac_EmergencyContainerPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	incidentIndication	0x02	Bit 1: Optional child present
	bit	emergencyPriority	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_EmergencyContainerType			

] ()

[SWS_V2xFac_00068] [

Name	V2xFac_SafetyCarContainerType

Kind	Structure		
Elements	presence	V2xFac_SafetyCarContainerPresenceType	Mark optional childs present or not
	lightBarSirenInUse	V2xFac_LightBarSirenInUseType	Indicates whether light-bar or a siren is in use
	incidentIndication	V2xFac_CauseCodeType	Describes the event type of the emergency or safety mission
	trafficRule	V2xFac_TrafficRuleType	Indicates whether vehicles are allowed to overtake a safety car
	speedLimit	uint8	Indicates whether a speed limit is applied to vehicles following the safety car
Description	SafetyCarContainer as defined in ETSI EN 302 637-2 V1.3.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00198] [

Name	V2xFac_SafetyCarContainerPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	incidentIndication	0x04	Bit 2: Optional child present
	bit	trafficRule	0x02	Bit 1: Optional child present
	bit	speedLimit	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_SafetyCarContainerType			

] ()

8.7.3.4 DENM specific Implementation DataTypes

[SWS_V2xFac_00069] [

Name	V2xFac_DenmMessageRootType		
Kind	Structure		
Elements	itsPduHeader	V2xFac_ItsPduHeaderType	Structure of the

			ItsPduHeader
	denm	V2xFac_DenMsgType	Structure of the DEN data
	transactionId	uint32	TransactionId for received DENM
Description	DENM root message as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00070] [

Name	V2xFac_DenMsgType		
Kind	Structure		
Elements	presence	V2xFac_DenMsgPresenceType	Mark optional childs present or not
	management	V2xFac_ManagementContainerType	management container
	situation	V2xFac_SituationContainerType	situation container
	location	V2xFac_LocationContainerType	location container
	alacarte	V2xFac_AlacarteContainerType	alacarte container
Description	DecentralizedEnvironmentalNotificationMessage as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00199] [

Name	V2xFac_DenMsgPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	situation	0x04	Bit 2: Optional child present
	bit	location	0x02	Bit 1: Optional child present
	bit	alacarte	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_DenMsgType			

] ()

[SWS_V2xFac_00071] [

Name	V2xFac_ManagementContainerType

Kind	Structure		
Elements	presence	V2xFac_ManagementContainerPresenceType	Mark optional childs present or not
	actionId	V2xFac_ActionIdType	Action identifier
	detectionTime	uint64	Time at which the event is detected
	referenceTime	uint64	Refers to the time at which a new DENM, an update DENM or a cancellation DENM is generated
	termination	V2xFac_TerminationType	Indicates if the type of generated DENM is a cancellation DENM or a negation DENM.
	eventPosition	V2xFac_ReferencePositionType	Geographical position of the detected event
	relevanceDistance	V2xFac_RelevanceDistanceType	The distance in which event information is relevant for the receiving ITS-S
	relevanceTrafficDirection	V2xFac_RelevanceTrafficDirectionType	Traffic direction that is relevant to information indicated in a message
	validityDuration	uint32	estimation of how long the event may persist
	transmissionInterval	uint16	Time interval

			between two consecutive message transmissions
	stationType	uint8	Station type information of the originating ITS-S
Description	ManagementContainer as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00240] [

Name	V2xFac_TerminationType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of Termination as defined in ETSI EN 302 637-3 V1.2.2.		
Range	V2XFAC_TERMINATION_ISCANCELLATION	0x00	Cancellation
	V2XFAC_TERMINATION_ISNEGATION	0x01	--
Variation	--		

] ()

[SWS_V2xFac_00200] [

Name	V2xFac_RelevanceDistanceType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_RelevanceDistance as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_RELEVANCEDISTANCE_LESS_THAN_50_M	0x00	less than 50 m
	V2XFAC_RELEVANCEDISTANCE_LESS_THAN_100_M	0x01	less than 100 m
	V2XFAC_RELEVANCEDISTANCE_LESS_THAN_200_M	0x02	less than 200 m
	V2XFAC_RELEVANCEDISTANCE_LESS_THAN_500_M	0x03	less than 500 m
	V2XFAC_RELEVANCEDISTANCE_LESS_THAN_1000_M	0x04	less than 1000 m
	V2XFAC_RELEVANCEDISTANCE_LESS_THAN_5_KM	0x05	less than 5 km
	V2XFAC_RELEVANCEDISTANCE_LESS_THAN_10_KM	0x06	less than 10 km

	V2XFAC_RELEVANCEDISTANCE_OVER_10_KM	0x07	over 10 km
Variation	--		

] ()

[SWS_V2xFac_00201] [

Name	V2xFac_RelevanceTrafficDirectionType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_RelevanceTrafficDirection as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_RELEVANCETRAFFICDIRECTION_ALL_TRAFFIC_DIRECTIONS	0x00	all traffic directions
	V2XFAC_RELEVANCETRAFFICDIRECTION_UPSTREAM_TRAFFIC	0x01	upstream traffic
	V2XFAC_RELEVANCETRAFFICDIRECTION_DOWNSTREAM_TRAFFIC	0x02	downstream traffic
	V2XFAC_RELEVANCETRAFFICDIRECTION_OPPOSITE_TRAFFIC	0x03	opposite traffic
Variation	--		

] ()

[SWS_V2xFac_00202] [

Name	V2xFac_ManagementContainerPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	termination	0x08	Bit 3: Optional child present
	bit	relevanceDistance	0x04	Bit 2: Optional child present
	bit	relevanceTrafficDirection	0x02	Bit 1: Optional child present
	bit	transmissionInterval	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_ManagementContainerType			

] ()

[SWS_V2xFac_00073] [

Name	V2xFac_SituationContainerType
Kind	Structure

Elements	presence	V2xFac_SituationContainerPresenceType	Mark optional childs present or not
	informationQuality	uint8	Quality level of the information provided by the ITS-S application
	eventType	V2xFac_CauseCodeType	Encoded value of a traffic event type
	linkedCause	V2xFac_CauseCodeType	Encoded value of a traffic event type
	eventHistory	V2xFac_EventHistoryType	EventHistory
Description	SituationContainer as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00203] [

Name	V2xFac_SituationContainerPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	linkedCause	0x02	Bit 1: Optional child present
	bit	eventHistory	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_SituationContainerType			

] ()

[SWS_V2xFac_00075] [

Name	V2xFac_EventHistoryType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of V2xFac_EventPointType	--
		Size	23
Description	DF_EventHistory as defined in ETSI TS 102 894-2 V1.2.1.		
Variation	--		

] ()

[SWS_V2xFac_00076] [

Name	V2xFac_EventPointType

Kind	Structure		
Elements	presence	V2xFac_EventPointPresenceType	Mark optional childs present or not
	eventPosition	V2xFac_DeltaReferencePositionType	Offset position of a detected event point.
	eventDeltaTime	uint16	Time travelled by the detecting ITS-S since the previous detected event point.
	informationQuality	uint8	Information quality of the detection for this event point.
Description	DF_EventPoint as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00204] [

Name	V2xFac_EventPointPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	eventDeltaTime	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_EventPointType			

] ()

[SWS_V2xFac_00077] [

Name	V2xFac_LocationContainerType		
Kind	Structure		
Elements	presence	V2xFac_LocationContainerPresenceType	Mark optional childs present or not
	eventSpeed	V2xFac_SpeedType	Moving speed of a detected event
	eventPositionHeading	V2xFac_HeadingType	The heading direction of the event
	traces	V2xFac_TracesType	One or more paths

	roadType	V2xFac_RoadTypeType	Type of a road segment.
Description	LocationContainer as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00241] [

Name	V2xFac_RoadTypeType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_RoadType as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_ROADTYPE_URBAN_NOSTRUCTURALSEPARATIONTOOPPOSITELANES	0x00	Urban road without structural separation to opposite lanes.
	V2XFAC_ROADTYPE_URBAN_WITHSTRUCTURALSEPARATIONTOOPPOSITELANES	0x01	Urban road with structural separation to opposite lanes.
	V2XFAC_ROADTYPE_NONURBAN_NOSTRUCTURALSEPARATIONTOOPPOSITELANES	0x02	Non-urban road without structural separation to opposite lanes.
	V2XFAC_ROADTYPE_ONURBAN_WITHSTRUCTURALSEPARATIONTOOPPOSITELANES	0x03	Non-urban road with structural separati

			on to opposite lanes.
Variation	--		

] ()

[SWS_V2xFac_00205] [

Name	V2xFac_TracesType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of V2xFac_PathHistoryType	--
		Size	7
Description	DF_Traces as defined in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 7.		
Variation	--		

] ()

[SWS_V2xFac_00206] [

Name	V2xFac_LocationContainerPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	eventSpeed	0x04	Bit 2: Optional child present
	bit	eventPositionHeading	0x02	Bit 1: Optional child present
	bit	roadType	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_LocationContainerType			

] ()

[SWS_V2xFac_00078] [

Name	V2xFac_AlacarteContainerType		
Kind	Structure		
Elements	presence	V2xFac_AlacarteContainerPresenceType	Mark optional childs present or not
	lanePosition	sint8	The lane position of the event position
	impactReduction	V2xFac_ImpactReductionContainerType	--

	externalTemperature	sint8	Indicates the ambient temperature at the event position
	roadWorks	V2xFac_RoadWorksContainerExtendedType	--
	positioningSolution	V2xFac_PositioningSolutionTypeType	Indicates the positioning technology being used to estimate a geographical position
	stationaryVehicle	V2xFac_StationaryVehicleContainerType	--
Description	AlacarteContainer as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00207] [

Name	V2xFac_PositioningSolutionTypeType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_PositioningSolutionType as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_POSITIONINGSOLUTIONTYPE_NO_POSITIONING_SOLUTION	0x00	No GNSS
	V2XFAC_POSITIONINGSOLUTIONTYPE_SGNSS	0x01	Global Navigation Satellite System
	V2XFAC_POSITIONINGSOLUTIONTYPE_DGNSS	0x02	Differential GNSS
	V2XFAC_POSITIONINGSOLUTIONTYPE_SGNSSPLUSDR	0x03	GNSS and dead reckoning
	V2XFAC_POSITIONINGSOLUTIONTYPE_DGNSSPLUSDR	0x04	Differential GNSS and dead reckoning
	V2XFAC_POSITIONINGSOLUTIONTYPE_DR	0x05	dead reckoning
Variation	--		

] ()

[SWS_V2xFac_00208] [

Name	V2xFac_AlacarteContainerPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	lanePosition	0x20	Bit 5: Optional child present
	bit	impactReduction	0x10	Bit 4: Optional child present
	bit	externalTemperature	0x08	Bit 3: Optional child present
	bit	roadWorks	0x04	Bit 2: Optional child present
	bit	positioningSolution	0x02	Bit 1: Optional child present
	bit	stationaryVehicle	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_AlacarteContainerType			

] ()

[SWS_V2xFac_00079] [

Name	V2xFac_ImpactReductionContainerType		
Kind	Structure		
Elements	heightLonCarrLeft	uint8	Height of left longitudinal carrier of the vehicle from base to top
	heightLonCarrRight	uint8	Height of right longitudinal carrier of the vehicle from base to top
	posLonCarrLeft	uint8	Distance from the centre of vehicle front bumper to the front of the left longitudinal carrier of vehicle
	posLonCarrRight	uint8	Distance from the centre of vehicle front bumper to the front of the right longitudinal

			carrier of vehicle
	positionOfPillars	V2xFac_PositionOfPillarsType	Indicates the perpendicular inter-distance of neighbouring pillar
	posCentMass	uint8	Indicates the perpendicular distance from the centre of mass of an empty load vehicle
	wheelBaseVehicle	uint8	Perpendicular distance between front and rear axle of the wheel base of vehicle
	turningRadius	uint8	The smallest circular turn (i.e. U-turn) that the vehicle is capable of making
	posFrontAx	uint8	Perpendicular distance between the vehicle front line of the bounding box and the front wheel axle in 10 centimetres
	positionOfOccupants	V2xFac_PositionOfOccupantsType	indicates whether a in vehicle seat is occupied at the moment when the impactReduction is generated
	vehicleMass	uint16	Mass of an empty loaded vehicle in multiple of 100 kg
	requestResponseIndication	V2xFac_RequestResponseIndicationType	This DE includes whether an ITS message is

			transmitted as request from ITS-S or a response transmitted from ITS-S after receiving request from other ITS-Ss
Description	ImpactReductionContainer as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00209] [

Name	V2xFac_PositionOfPillarsType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of uint8	--
		Size	3
Description	DF_PositionOfPillars as defined in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 3.		
Variation	--		

] ()

[SWS_V2xFac_00210] [

Name	V2xFac_PositionOfOccupantsType			
Kind	Bitfield			
Derived from	uint32			
Elements	Kind	Name	Mask	Description
	bit	row1LeftOccupied	0x80000	Bit 19: row 1 left occupied
	bit	row1RightOccupied	0x40000	Bit 18: row 1 right occupied
	bit	row1MidOccupied	0x20000	Bit 17: row 1 mid occupied
	bit	row1NotDetectable	0x10000	Bit 16: row 1 not detectable
	bit	row1NotPresent	0x8000	Bit 15: row 1 not present
	bit	row2LeftOccupied	0x4000	Bit 14: row 2 left occupied
	bit	row2RightOccupied	0x2000	Bit 13: row 2 right occupied
	bit	row2MidOccupied	0x1000	Bit 12: row 2 mid occupied

	bit	row2NotDetectable	0x800	Bit 11: row 2 not detectable
	bit	row2NotPresent	0x400	Bit 10: row 2 not present
	bit	row3LeftOccupied	0x200	Bit 9: row 3 left occupied
	bit	row3RightOccupied	0x100	Bit 8: row 3 right occupied
	bit	row3MidOccupied	0x80	Bit 7: row 3 mid occupied
	bit	row3NotDetectable	0x40	Bit 6: row 3 not detectable
	bit	row3NotPresent	0x20	Bit 5: row 3 not present
	bit	row4LeftOccupied	0x10	Bit 4: row 4 left occupied
	bit	row4RightOccupied	0x08	Bit 3: row 4 right occupied
	bit	row4MidOccupied	0x04	Bit 2: row 4 mid occupied
	bit	row4NotDetectable	0x02	Bit 1: row 4 not detectable
	bit	row4NotPresent	0x01	Bit 0 (LSB): row 4 not present
Description	BitString DE_PositionOfOccupants as defined in ETSI TS 102 894-2 V1.2.1.			

] ()

[SWS_V2xFac_00242] [

Name	V2xFac_RequestResponseIndicationType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_RequestResponseIndication as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_REQUESTRESPONSEINDICATION_REQUEST	0x00	Request
	V2XFAC_REQUESTRESPONSEINDICATION_RESPONSE	0x01	Response
Variation	--		

] ()

[SWS_V2xFac_00080] [

Name	V2xFac_RoadWorksContainerExtendedType		
Kind	Structure		
Elements	presence	V2xFac_RoadWorksContainerExtendedPresenceType	Mark optional childs present or not
	lightBarSirenInUse	V2xFac_LightBarSirenInUseType	Indicates whether light-bar or a siren

			is in use
	closedLanes	V2xFac_ClosedLanesType	Indicates the opening/closure status of a lane or a set of lanes
	restriction	V2xFac_RestrictedTypesType	List of ITS-S types to which a certain traffic restriction e.g. the speed limit, applies
	speedLimit	uint8	Speed limitation applied to a geographical position, a road section or a geographical region
	incidentIndication	V2xFac_CauseCodeType	Describes the event type of the emergency or safety mission
	recommendedPath	V2xFac_ItineraryPathType	--
	startingPointSpeedLimit	V2xFac_DeltaReferencePositionType	--
	trafficFlowRule	V2xFac_TrafficRuleType	Indicates traffic rules that apply to vehicles at a certain position
	referenceDenms	V2xFac_ReferenceDenmsType	Indicates a sequence of actionIDs for different DENMs that describe the same event
Description	RoadWorksContainerExtended as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00211] [

Name	V2xFac_RestrictedTypesType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array
	values	Array of uint8	--
		Size	3
Description	DF_RestrictedTypes as defined in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 3.		
Variation	--		

⌋ ()

[SWS_V2xFac_00212] ⌈

Name	V2xFac_ItineraryPathType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of V2xFac_ReferencePositionType	--
		Size	40
Description	DF_ItineraryPath as defined in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 40.		
Variation	--		

⌋ ()

[SWS_V2xFac_00213] ⌈

Name	V2xFac_TrafficRuleType		
Kind	Type		
Derived from	uint8		
Description	Enumeration of DE_TrafficRule as defined in ETSI TS 102 894-2 V1.2.1.		
Range	V2XFAC_TRAFFICRULE_NO_PASSING	0x00	Overtaking is prohibited for all vehicles
	V2XFAC_TRAFFICRULE_NO_PASSING_FOR_TRUCKS	0x01	Overtaking is prohibited for trucks
	V2XFAC_TRAFFICRULE_PASS_TO_RIGHT	0x02	Vehicles should pass to the right lane
	V2XFAC_TRAFFICRULE_PASS_TO_LEFT	0x03	Vehicles should pass to the left lane

Variation	--

] ()

[SWS_V2xFac_00214] [

Name	V2xFac_ReferenceDenmsType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of V2xFac_ActionIdType	--
		Size	8
Description	ReferenceDenms as defined in ETSI EN 302 637-3 V1.2.2. Size of the Array shall be 8.		
Variation	--		

] ()

[SWS_V2xFac_00215] [

Name	V2xFac_RoadWorksContainerExtendedPresenceType			
Kind	Bitfield			
Derived from	uint16			
Elements	Kind	Name	Mask	Description
	bit	lightBarSirenInUse	0x100	Bit 8: Optional child present
	bit	closedLanes	0x80	Bit 7: Optional child present
	bit	restriction	0x40	Bit 6: Optional child present
	bit	speedLimit	0x20	Bit 5: Optional child present
	bit	incidentIndication	0x10	Bit 4: Optional child present
	bit	recommendedPath	0x08	Bit 3: Optional child present
	bit	startingPointSpeedLimit	0x04	Bit 2: Optional child present
	bit	trafficFlowRule	0x02	Bit 1: Optional child present
	bit	referenceDenms	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_RoadWorksContainerExtendedType			

] ()

[SWS_V2xFac_00081] [

Name	V2xFac_StationaryVehicleContainerType		
Kind	Structure		
Elements	presence	V2xFac_StationaryVehicleContainerPresenceType	Mark optional

			childs present or not
	stationarySince	V2xFac_StationarySinceType	Duration in minutes of a vehicle being stationary
	stationaryCause	V2xFac_CauseCodeType	Additional information to describe causes of the stationary vehicle
	carryingDangerousGoods	V2xFac_DangerousGoodsExtendedType	In case the stationary vehicle is carrying dangerous goods
	numberOfOccupants	uint8	Number of occupants in a vehicle
	vehicleIdentification	V2xFac_VehicleIdentificationType	Provides information related to the identification of a vehicle
	energyStorageType	V2xFac_EnergyStorageType	Type of energy being used and stored
Description	StationaryVehicleContainer as defined in ETSI EN 302 637-3 V1.2.2. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00216] [

Name	V2xFac_StationarySinceType
Kind	Type
Derived from	uint8
Description	Enumeration of DE_StationarySince as defined in ETSI TS 102 894-2 V1.2.1.

Range	V2XFAC_STATIONARYSINCE_LESS_THAN_1_MINUTE	0x00	less than 1 minute
	V2XFAC_STATIONARYSINCE_LESS_THAN_2_MINUTES	0x01	less than 2 minutes
	V2XFAC_STATIONARYSINCE_LESS_THAN_15_MINUTES	0x02	less than 15 minutes
	V2XFAC_STATIONARYSINCE_EQUAL_OR_GREATER_15_MINUTES	0x03	equal or greater 15 minutes
Variation	--		

⌋ ()

[SWS_V2xFac_00217] ⌈

Name	V2xFac_EnergyStorageType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	hydrogenStorage	0x40	Bit 6: hydrogen storage
	bit	electricEnergyStorage	0x20	Bit 5: electric energy storage
	bit	liquidPropaneGas	0x10	Bit 4: liquid propane gas
	bit	compressedNaturalGas	0x08	Bit 3: compressed natural gas
	bit	diesel	0x04	Bit 2: diesel
	bit	gasoline	0x02	Bit 1: gasoline
	bit	ammonia	0x01	Bit 0 (LSB): ammonia
Description	BitString DE_EnergyStorage as defined in ETSI TS 102 894-2 V1.2.1.			

⌋ ()

[SWS_V2xFac_00218] ⌈

Name	V2xFac_StationaryVehicleContainerPresenceType
Kind	Bitfield
Derived from	uint8

	Kind	Name	Mask	Description
Elements	bit	stationarySince	0x20	Bit 5: Optional child present
	bit	stationaryCause	0x10	Bit 4: Optional child present
	bit	carryingDangerousGoods	0x08	Bit 3: Optional child present
	bit	numberOfOccupants	0x04	Bit 2: Optional child present
	bit	vehicleIdentification	0x02	Bit 1: Optional child present
	bit	energyStorageType	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_StationaryVehicleContainerType			

] ()

[SWS_V2xFac_00236] [

Name	V2xFac_DangerousGoodsExtendedType		
Kind	Structure		
Elements	presence	V2xFac_DangerousGoodsExtendedPresenceType	Mark optional childs present or not
	dangerousGoodsType	V2xFac_DangerousGoodsBasicType	Type of dangerous goods
	unNumber	uint16	4-digit number that identifies the substance of the dangerous goods
	elevatedTemperature	boolean	Whether the carried dangerous goods are transported at high temperature
	tunnelsRestricted	boolean	whether the heavy vehicle carrying dangerous goods is restricted to enter tunnels
	limitedQuantity	boolean	whether the carried

			dangerous goods are packed with limited quantity
	emergencyActionCode	V2xFac_EmergencyActionCodeType	Physical signage placard at the vehicle
	phoneNumber	V2xFac_PhoneNumberType	Contact phone number of assistance service in case of incident or accident
	companyName	V2xFac_CompanyNameType	Name of company that manages the transportation of the dangerous goods
Description	DF_DangerousGoodsExtended as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00219] [

Name	V2xFac_EmergencyActionCodeType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of uint8	--
		Size	24
Description	emergencyActionCode as defined in DangerousGoodsExtended in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 24.		
Variation	--		

] ()

[SWS_V2xFac_00220] [

Name	V2xFac_PhoneNumberType
Kind	Structure

Elements	count	uint8	Number of valid elements within array.
	values	Array of uint8	--
		Size	24
Description	phoneNumber as defined in DangerousGoodsExtended in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 24.		
Variation	--		

] ()

[SWS_V2xFac_00221] [

Name	V2xFac_CompanyNameType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of uint8	--
		Size	24
Description	companyName as defined in DangerousGoodsExtended in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 24.		
Variation	--		

] ()

[SWS_V2xFac_00222] [

Name	V2xFac_DangerousGoodsExtendedPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	emergencyActionCode	0x04	Bit 2: Optional child present
	bit	phoneNumber	0x02	Bit 1: Optional child present
	bit	companyName	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_DangerousGoodsExtendedType			

] ()

[SWS_V2xFac_00230] [

Name	V2xFac_VehicleIdentificationType		
Kind	Structure		
Elements	presence	V2xFac_VehicleIdentificationPresenceType	Mark optional childs present or not
	wmiNumber	V2xFac_WmiNumberType	World Manufacturer

			Identifier (WMI)
	vds	V2xFac_VdsType	Vehicle Descriptor Section (VDS)
Description	DF_VehicleIdentification as defined in ETSI TS 102 894-2 V1.2.1. Values for data elements within this structure shall be used according that document.		
Variation	--		

] ()

[SWS_V2xFac_00223] [

Name	V2xFac_VehicleIdentificationPresenceType			
Kind	Bitfield			
Derived from	uint8			
Elements	Kind	Name	Mask	Description
	bit	wmiNumber	0x02	Bit 1: Optional child present
	bit	vds	0x01	Bit 0 (LSB): Optional child present
Description	Presence flags for V2xFac_VehicleIdentificationType			

] ()

[SWS_V2xFac_00243] [

Name	V2xFac_WmiNumberType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of uint8	--
		Size	3
Description	DE_WMInumber as defined in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 3.		
Variation	--		

] ()

[SWS_V2xFac_00244] [

Name	V2xFac_VdsType		
Kind	Structure		
Elements	count	uint8	Number of valid elements within array.
	values	Array of uint8	--
		Size	6
Description	DE_VDS as defined in ETSI TS 102 894-2 V1.2.1. Size of the Array shall be 6.		

Variation	--

] ()

8.7.4 Ports

8.7.4.1 V2xFac_V2xFac_DenBs

[SWS_V2xFac_00102] ⌈

Name	V2xFac_DenBs		
Kind	ProvidedPort	Interface	V2xFacDenBs
Description	Service port for DEN specific service requests		
Variation	--		

] ()

8.7.4.2 V2xFac_V2xFac_V2xApplRxIndication_CAM

[SWS_V2xFac_00104] ⌈

Name	V2xFac_V2xApplRxIndication_CAM		
Kind	ProvidedPort	Interface	V2xApplRxIndicationCam
Description	Port for delivering received CAMs to application layer		
Variation	--		

] ()

8.7.4.3 V2xFac_V2xFac_V2xApplRxIndication_DENM

[SWS_V2xFac_00233] ⌈

Name	V2xFac_V2xApplRxIndication_DENM		
Kind	ProvidedPort	Interface	V2xApplRxIndicationDenm
Description	Port for delivering received DENMs to application layer		
Variation	--		

] ()

8.7.4.4 V2xFac_V2xFac_Vdp

[SWS_V2xFac_00105] ⌈

Name	V2xFac_Vdp

Kind	RequiredPort	Interface	V2xFacVdp
Description	Port for retrieving data from VDP application		
Variation	--		

] ()

9 Sequence diagrams

9.1 CAM Generation and Transmission

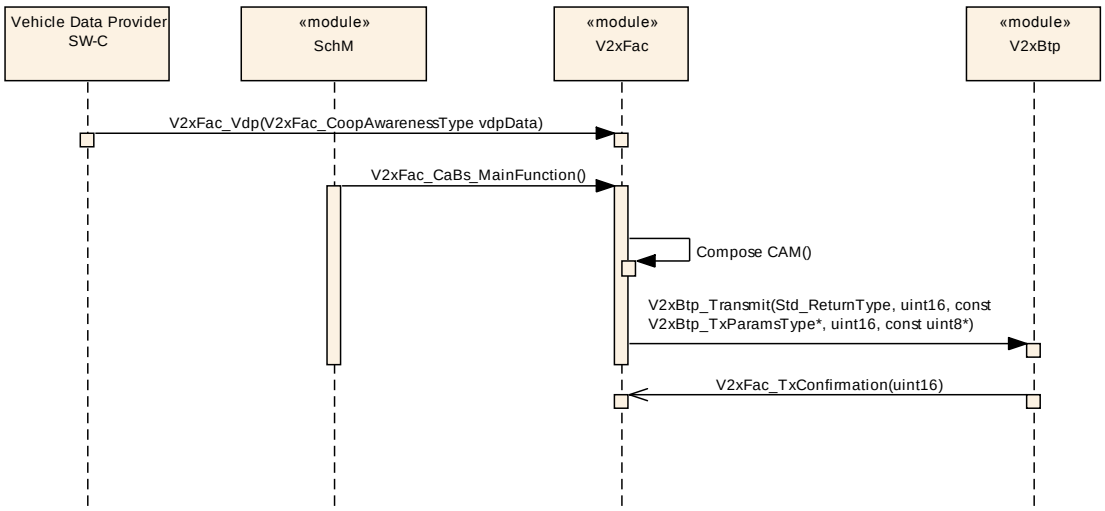


Figure 9.1 CAM Generation and Transmission

9.2 CAM Reception

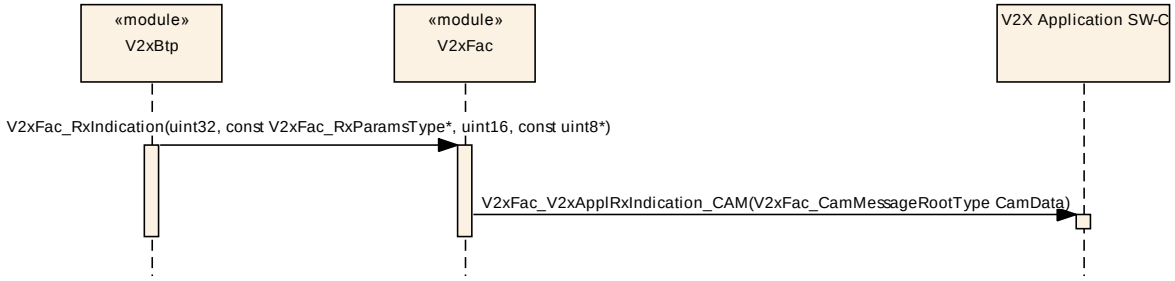


Figure 9.2 CAM Reception

9.3 DENM Generation and Transmission

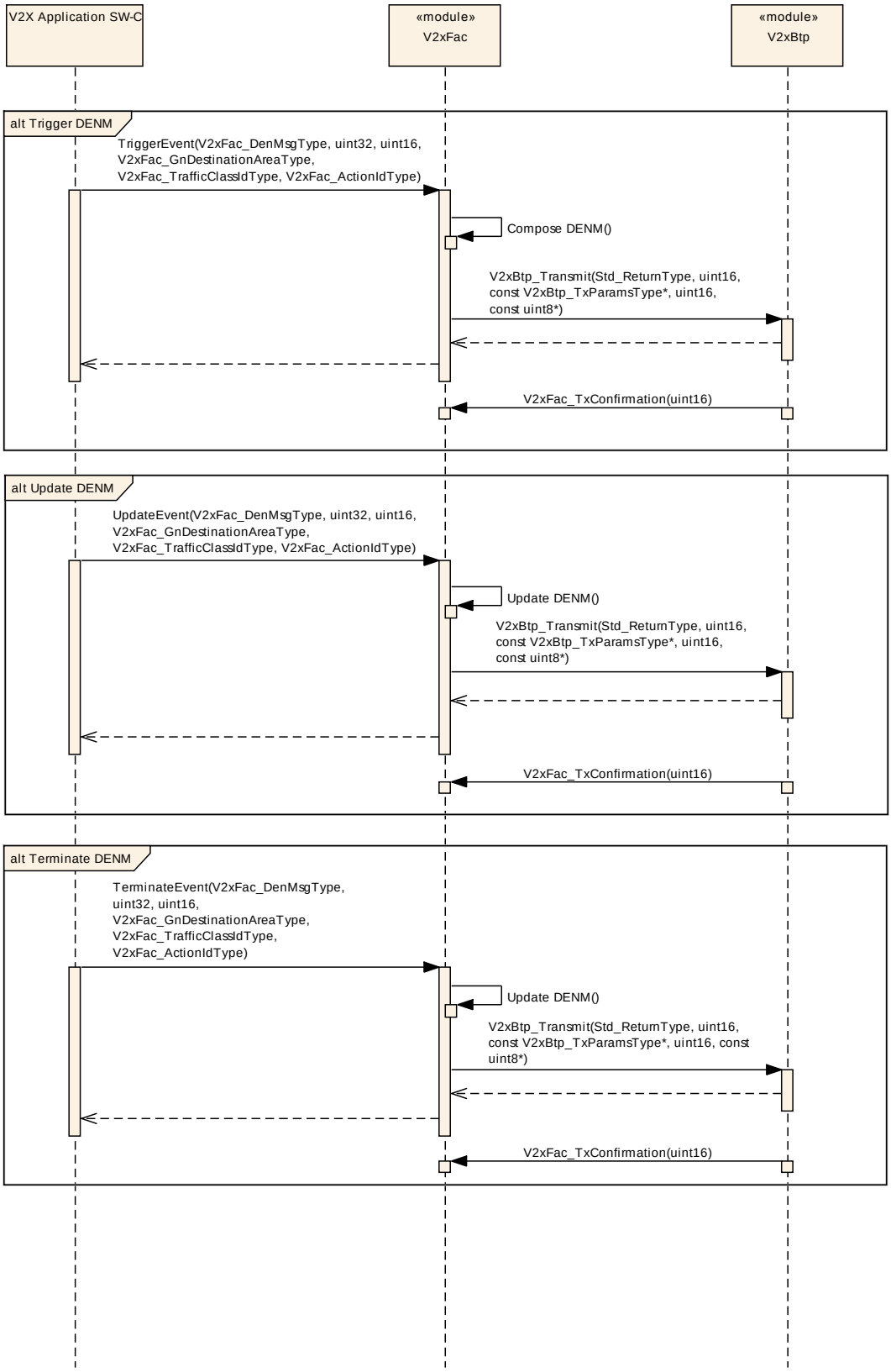


Figure 9.3 DENM Generation and Transmission

9.4 DENM Reception

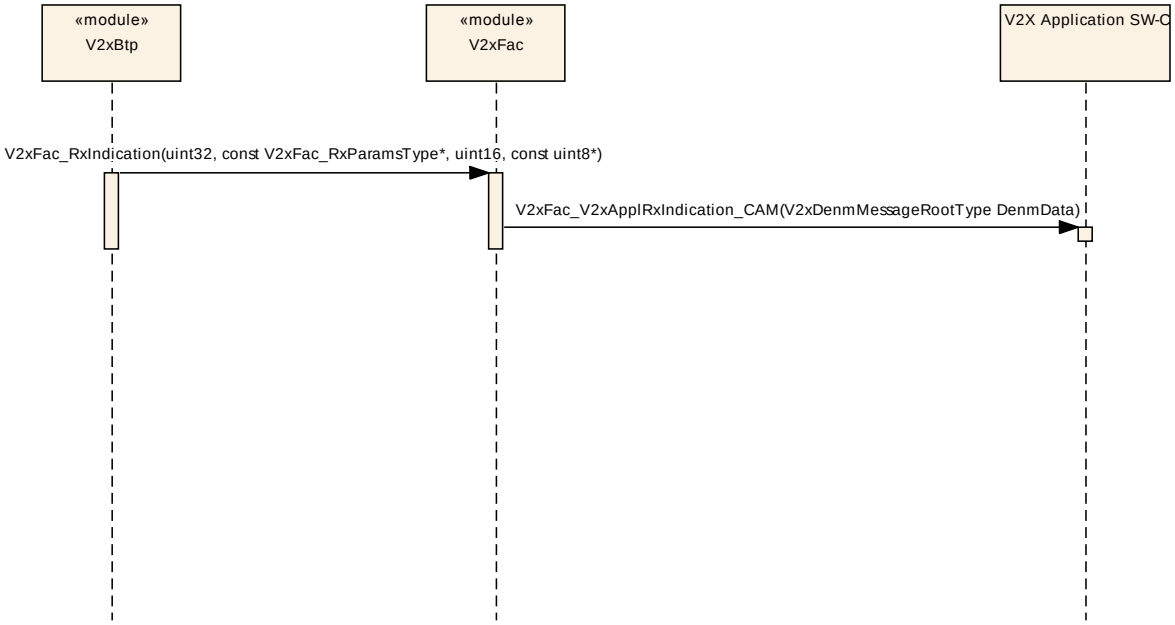


Figure 9.4 DENM Reception

10 Configuration specification

Chapter 10.1 specifies the structure (containers) and the parameters of the module V2xFac.

Chapter 10.2 specifies additionally published information of the module V2xFac.

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 Variants

[SWS_V2xFac_00238] [The V2xFsc module only supports VARIANT-PRE-COMPILE] (SRS_BSW_00345)

10.1.2 V2xFac

SWS Item	**ECUC_V2xFac_00001 :**
Module Name	*V2xFac*
Module Description	Configuration of the V2xFac module.
Post-Build Variant Support	false
Supported Config Variants	VARIANT-PRE-COMPILE

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
V2xFacGeneral	1	This container contains the general configuration parameters of the Vehicle-2-X Basic Transport.

10.1.3 V2xFacGeneral

SWS Item	**ECUC_V2xFac_00002 :**
Container Name	V2xFacGeneral
Description	This container contains the general configuration parameters of the Vehicle-2-X Basic Transport.
Configuration Parameters	

SWS Item	**ECUC_V2xFac_00006 :**	
Name	V2xFacCaBsMainFunctionPeriod	
Parent Container	V2xFacGeneral	
Description	This parameter defines the schedule period of V2xFac_CaBs_MainFunction.Unit: [s]	
Multiplicity	1	
Type	EcucFloatParamDef	
Range	]0 .. INF[	
Default value	0.1	
Post-Build Variant Value	false	

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

SWS Item	**ECUC_V2xFac_00005 :**		
Name	V2xFacDenBsMainFunctionPeriod		
Parent Container	V2xFacGeneral		
Description	This parameter defines the schedule period of V2xFac_DenBs_MainFunction.Unit: [s]		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	]0 .. INF[		
Default value	0.1		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_V2xFac_00004 :**		
Name	V2xFacDevErrorDetect		
Parent Container	V2xFacGeneral		
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		

SWS Item	**ECUC_V2xFac_00007 :**	
Name	V2xFacStationType	
Parent Container	V2xFacGeneral	
Description	This configuration value defines the station type information of the originating ITS-S, RoadSideUnit (15) not supported by AUTOSAR.	
Multiplicity	1	
Type	EcucEnumerationParamDef	
Range	V2XFAC_ST_BUS	--
	V2XFAC_ST_CYCLIST	--
	V2XFAC_ST_HEAVYTRUCK	--
	V2XFAC_ST_LIGHTTRUCK	--
	V2XFAC_ST_MOPED	--
	V2XFAC_ST_MOTORCYCLE	--
	V2XFAC_ST_PASSENGERCAR	--
	V2XFAC_ST_PEDESTRIAN	--
	V2XFAC_ST_SPECIALVEHICLES	--
	V2XFAC_ST_TRAILER	--
	V2XFAC_ST_TRAM	--

	V2XFAC_ST_UNKNOWN	--	
Default value	V2XFAC_ST_UNKNOWN		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_V2xFac_00003 :**		
Name	V2xFacVersionInfoApi		
Parent Container	V2xFacGeneral		
Description	Enable/disables the API for reading the version information of the V2xFac 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		

No Included Containers

11 Not applicable requirements