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**Project Specific Technical Specification**

**PSTS006 Data Entity Catalogue**

**December 2020**

## Document control sheet

### Contact for enquiries and proposed changes

If you have any questions regarding this document or if you have a suggestion for improvements, please contact:

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### Version history

Version no.	Owner	Date	Nature of amendment
1.0	Abraham Lopez	29/06/2018	Tender Issue
1.1	David Alderson	27/7/2018	Add <i>lateralAcceleration</i>
2.0	Peter Chalmers	02/12/2020	Review changes to C-ITS messages; Major update to ICVP message schemas

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## 1 Introduction

This document includes data element descriptions for each of the five message types (CAM, DENM, IVIM, SPATEM and MAPEM) and each of the custom message types required for communications to the C-ITS-F. Each of these is aligned to the ETSI data description and are formatted similarly for consistency. Use case specific implementations of data elements are highlighted (that is, *countryCode*: 11000 11100).

## 2 Definition of terms

**Table 2-1 - Acronyms**

Term	Definition
ARLW	Advanced Red-Light Warning
ASN.1	Abstract Syntax Notation One
BoQ	Back of queue
CAM	Cooperative awareness message (EU)
CAVI	Cooperative and Automated Vehicle Initiative
CEN	European committee for standardization
C-ITS	Cooperative intelligent transport systems
C-ITS-F	Central ITS facility
DEN	Decentralised environmental notification
DENM	Decentralised environmental notification message (EU)
DER	Distinguished Encoding Rules
DSRC	Dedicated short range communications
EEBL	Emergency Electronic Brake Light
EFC	Encrypted Fair Copy
ETSI	European Telecommunications Standards Institute
ETSI EN	European Telecommunications Standards Institute European Norm
ETSI TS	European Telecommunications Standards Institute Technical Standard
EU	European Union
ISO	International Organization for Standardization
ISO/TS	International Organization for Standardization Technical Standard
ITA	International Telegraph Alphabet
ITS	Intelligent transport systems
ITS-S	ITS station
IVI	In-vehicle Information
IVIM	In-vehicle Information Messages
IVS	In vehicle signage
LSB	Least Significant Bit
MAP	Cooperative ITS message, broadcasting geography/topology of intersection
MAPEM	MapData extended Message
PSTS	Project Specific Technical Specification
RHS	Road hazard signalling
RHW	Road hazard warning
RWW	Road Work Warning
SAE	Society of Automotive Engineers
SPaT	Signal phase and timing (cooperative message)
SPATEM	Signal Phase and Timing Extended Message
SSV	Slow/Stopped Vehicle
TMR	Queensland Department of Transport and Main Roads
TWVR	Turning Warning for Vulnerable Road User
UC	Use Case
UPER	Unaligned Packed Encoding Rules
US	United States of America
UTC	Coordinated Universal Time

## Transport and Main Roads

### 3 Reference documents

**Table 3-1 – Referenced documents – External**

Document ID	Document Name / Description
ETSI TS 302 637-2 V1.3.2	Part 2: Specification of Cooperative Awareness Basic Service
ETSI EN 302 637-3 V1.2.1	Part 3: Specifications of Decentralized Environmental Notification Basic Service
ETSI TS 102 894-2 V1.2.1	Part 2: Applications and facilities layer common data dictionary
ETSI 101 539 Part 1:	Road Hazard Signalling
ETSI TS 103 301 V1.1.1	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Facilities layer protocols and communication requirements for infrastructure services
PD CEN ISO/TS 19321 (2015-04)	Intelligent Transport Systems - Cooperative ITS - Dictionary of in-vehicle information (IVI) data structures
SAE J2735 (2016-03)	"Dedicated Short Range Communications (DSRC) Message Set Dictionary".
ISO 3166-1	Country Codes

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#### 4 CAM Data Elements

CAM must include the mandatory data elements marked 'M' in the 'Use' column.

**Table 4-1 - CAM Data Elements**

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
protocolVersion	M	INTEGER{ currentVersion(1) } (0..255)	<i>currentVersion</i> is currently '1'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
messageID	M	INTEGER{denm(1), cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7)} (0..255)	<i>messageID</i> shall be '2'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
stationID	M	INTEGER(0..4294967295)	The ITS-S ID may be a pseudonym. It may change over space and/or over time.	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
generationDeltaTime	M	INTEGER { oneMilliSec(1) } (0..65535)	Time corresponding to the time of the reference position in the CAM, considered as time of the CAM generation. The value of the DE shall be wrapped to 65 536. This value shall be set as the remainder of the corresponding value of <i>TimestampPlts</i> divided by 65 536 as below: $generationDeltaTime = TimestampPlts \text{ mod } 65\ 536$ <i>TimestampPlts</i> represents an integer value in milliseconds since 2004-01-01T00:00:00Z as defined in ETSI TS 102 894-2.	cam	ETSI EN 302 637-2 V1.3.2 (2014-11) B.3 generationDeltaTime

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
stationType	M	INTEGER { unknown(0), pedestrian(1), cyclist(2), moped(3), motorcycle(4), passengerCar(5), bus(6), lightTruck(7), heavyTruck(8), trailer(9), specialVehicles(10), tram(11), roadSideUnit(15) } (0..255)	<p><i>StationType</i> shall be defaulted to '5'</p> <p>The type of an ITS-S. The station type depends on the integration environment of ITS-S into vehicle, mobile devices or at infrastructure.</p>	cam-camParameters-basicContainer	ETSI TS 102 894-2 V1.2.1 A.78 DE_StationType
latitude	M	INTEGER { oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(900000001) } (-900000000..900000001)	<p>Absolute geographical latitude in a WGS84 coordinate system, providing a range of 90 degrees in north or in south hemisphere.</p> <p>Positive values are used for latitude in north of the Equator, negative values are used for latitude in south of the Equator. When the information is unavailable, the value shall be set to 900 000 001.</p> <p>Example: latitude = - 276490110</p>	cam-camParameters-basicContainer-referencePosition	ETSI TS 102 894-2 V1.2.1 A.41 DE_Latitude
longitude	M	INTEGER { oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(1800000001) } (-1800000000..1800000001)	<p>Absolute geographical longitude in a WGS84 co-ordinate system, providing a range of 180 degrees to the east or to the west of the prime meridian.</p> <p>Negative values are used for longitudes to the west, positive values are used for longitudes to the east. When the information is unavailable, the value shall be set to 1 800 000 001.</p> <p>Example: longitude = 1532299140</p>	cam-camParameters-basicContainer-referencePosition	ETSI TS 102 894-2 V1.2.1 A.44 DE_Longitude

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
semiMajorConfidence	M	INTEGER{ oneCentimeter(1), outOfRange(4094), unavailable(4095) }(0..4095)	half of length of the major axis, i.e. distance between the centre point and major axis point of the position accuracy ellipse.	cam- camParameters- basicContainer- referencePosition - positionConfidenceEllipse	ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse
semiMinorConfidence	M	INTEGER{ oneCentimeter(1), outOfRange(4094), unavailable(4095) }(0..4095)	half of length of the minor axis, i.e. distance between the centre point and minor axis point of the position accuracy ellipse	cam- camParameters- basicContainer- referencePosition - positionConfidenceEllipse	ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse
semiMajorOrientation	M	INTEGER { wgs84North(0), wgs84East(900), wgs84South(1800), wgs84West(2700), unavailable(3601) }(0..3601)	orientation direction of the ellipse major axis of the position accuracy ellipse with regards to the WGS84 north	cam- camParameters- basicContainer- referencePosition - positionConfidenceEllipse	ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse
altitudeValue	M	INTEGER { referenceEllipsoidSurface(0), oneCentimeter(1), unavailable(800001) }(-100000..800001)	Altitude in a WGS84 co-ordinate system. When the information is not available, the DE shall be set to 800 001. For altitude equal or greater than 8 000 m, the DE shall be set to 800 000. For altitude equal or less than -1 000 m, the DE shall be set to -100 000.	cam- camParameters- basicContainer- referencePosition -altitude	ETSI TS 102 894-2 V1.2.1 A.9 DE_AltitudeValue



Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
altitudeConfidence		ENUMERATED { alt-000-01 (0), alt-000-02 (1), alt-000-05 (2), alt-000-10 (3), alt-000-20 (4), alt-000-50 (5), alt-001-00 (6), alt-002-00 (7), alt-005-00 (8), alt-010-00 (9), alt-020-00 (10), alt-050-00 (11), alt-100-00 (12), alt-200-00 (13), outOfRange (14), unavailable (15) }	Absolute accuracy of a reported altitude value of a geographical point for a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the usage of this DE. The value shall be set to: <ul style="list-style-type: none"> <li>• 0 if the altitude accuracy is equal to or less than 0,01 metre</li> <li>• 1 if the altitude accuracy is equal to or less than 0,02 metre</li> <li>• 2 if the altitude accuracy is equal to or less than 0,05 metre</li> <li>• 3 if the altitude accuracy is equal to or less than 0,1 metre</li> <li>• 4 if the altitude accuracy is equal to or less than 0,2 metre</li> <li>• 5 if the altitude accuracy is equal to or less than 0,5 metre</li> <li>• 6 if the altitude accuracy is equal to or less than 1 metre</li> <li>• 7 if the altitude accuracy is equal to or less than 2 metres</li> <li>• 8 if the altitude accuracy is equal to or less than 5 metres</li> <li>• 9 if the altitude accuracy is equal to or less than 10 metres</li> <li>• 10 if the altitude accuracy is equal to or less than 20 metres</li> <li>• 11 if the altitude accuracy is equal to or less than 50 metres</li> <li>• 12 if the altitude accuracy is equal to or less than 100 metres</li> <li>• 13 if the altitude accuracy is equal to or less than 200 metres</li> <li>• 14 if the altitude accuracy is out of range, i.e. greater than 200 metres</li> <li>• 15 if the altitude accuracy information is unavailable</li> </ul>	cam-camParameters-basicContainer-referencePosition-altitude	ETSI TS 102 894-2 V1.2.1 A.8 DE_AltitudeConfidence
headingValue	M	INTEGER { wgs84North(0), wgs84East(900), wgs84South(1800), wgs84West(2700), unavailable(3601) } (0..3601)	Orientation of a heading with regards to the WGS84 north.	cam-camParameters-highFrequencyContainer-highFrequency-heading	ETSI TS 102 894-2 V1.2.1 A.112 DF_Heading

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
headingConfidence	M	INTEGER { equalOrWithinZeroPointOneDegree (1), equalOrWithinOneDegree (10), outOfRange(126), unavailable(127) }(1..127)	<p>The absolute accuracy of a reported heading value for a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE.</p> <p>The value shall be set to:</p> <ul style="list-style-type: none"> <li>• 1 if the heading accuracy is equal to or less than 0,1 degree,</li> <li>• n (n &gt; 1 and n &lt; 125) if the heading accuracy is equal to or less than n × 0,1 degree,</li> <li>• 125 if the heading accuracy is equal to or less than 12,5 degrees,</li> <li>• 126 if the heading accuracy is out of range, i.e. greater than 12,5 degrees,</li> <li>• 127 if the heading accuracy information is not available.</li> </ul> <p>The DE is used in Heading DF as defined in clause A.112.</p> <p>NOTE: The fact that a value is received with confidence set to 'unavailable(127)' can be caused by several reasons, such as:</p> <ul style="list-style-type: none"> <li>- the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor,</li> <li>- the sensor cannot calculate the accuracy due to lack of variables, or</li> <li>- there has been a vehicle bus (e.g. CAN bus) error.</li> </ul> <p>In all 3 cases above, the reported heading value may be valid and used by the application.</p> <p>If a heading value is received and its confidence is set to 'outOfRange(126)', it means that the reported heading value is not valid and therefore cannot be trusted. Such value is not useful for the application.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-heading	ETSI TS 102 894-2 V1.2.1 A.112 DF_Heading
speedValue	M	INTEGER { standstill(0), oneCentimeterPerSec(1), unavailable(16383) }(0..16383)	<p>A speed value. For values equal to or greater than 163,82 m/s, the value shall be set to 16 382. When the information is not available, the value shall be set to 16 383.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-speed	ETSI TS 102 894-2 A.126 DF_Speed

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
speedConfidence	M	INTEGER { equalOrWithinOneCentimeterPerSec(1), equalOrWithinOneMeterPerSec(100), outOfRange(126), unavailable(127) }(1..127)	<p>The absolute accuracy of a speed value information for a predefined confidence level.</p> <p>The required confidence level is defined by the station applying this DE.</p> <p>The value shall be set to:</p> <ul style="list-style-type: none"> <li>• 1 if the speed accuracy is equal to or less than 1 cm/s.</li> <li>• n (n &gt; 1 and n &lt; 125) if the speed accuracy is equal to or less than n cm/s.</li> <li>• 125 if the speed accuracy is equal to or less than 125 cm/s.</li> <li>• 126 if the speed accuracy is out of range, i.e. greater than 125 cm/s.</li> <li>• 127 if the speed accuracy information is not available.</li> </ul> <p>The DE is used in Speed DF as defined in clause A.126.</p> <p>NOTE: The fact that a speed value is received with confidence set to 'unavailable(127)' can be caused by several reasons, such as:</p> <ul style="list-style-type: none"> <li>- the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor,</li> <li>- the sensor cannot calculate the accuracy due to lack of variables, or</li> <li>- there has been a vehicle bus (e.g. CAN bus) error.</li> </ul> <p>In all 3 cases above, the reported speed value may be valid and used by the application.</p> <p>If a speed value is received and its confidence is set to 'outOfRange(126)', it means that the reported speed value is not valid and therefore cannot be trusted. Such is not useful for the application.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-speed	ETSI TS 102 894-2 A.126 DF_Speed
driveDirection	M	ENUMERATED { forward (0), backward (1), unavailable (2) }	<p>It denotes whether a vehicle is driving forward or backward. When the information is unavailable, the value shall be set to 2.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency	ETSI TS 102 894-2 A.22 DE_DriveDirection

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
vehicleLengthValue	M	INTEGER { tenCentimeters(1), outOfRange(1022), unavailable(1023) }(1..1023)	Length of a vehicle. The value shall be set to 1 022 if the vehicle length is equal to or greater than 102,2 metres.  The value shall be set to 1 023 if the information is unavailable.	cam- camParameters- highFrequencyCo ntainer- basicVehicleCont ainerHighFreque ncy- vehicleLength	ETSI TS 102 894-2 A.92 DE_VehicleLengthValue
vehicleLengthConfidenceIndication	M	ENUMERATED { noTrailerPresent(0), trailerPresentWithKnownLength(1), trailerPresentWithUnknownLength(2), trailerPresencelsUnknown(3), unavailable(4) }	To indicate whether the presence of a trailer is detectable or whether its length is included in a reported vehicle length value.  When the information is not known, the value shall be set to unavailable (4).	cam- camParameters- highFrequencyCo ntainer- basicVehicleCont ainerHighFreque ncy- vehicleLength	ETSI TS 102 894-2 A.91 DE_VehicleLengthConfidenceIndication
vehicleWidth	M	INTEGER { tenCentimeters(1), outOfRange(61), unavailable(62) }(1..62)	Width of a vehicle, including side mirrors. For a vehicle width equal to or greater than 6,1 metres, the value shall be set to 61. The value shall be set to 62 if the information is unavailable.  Unit: 0,1 metre	cam- camParameters- highFrequencyCo ntainer- basicVehicleCont ainerHighFreque ncy	ETSI TS 102 894-2 A.95 DE_VehicleWidth
longitudinalAccelerationValue	M	INTEGER { pointOneMeterPerSecSquaredForward(1), pointOneMeterPerSecSquaredBackward(-1), unavailable(161) }(-160 .. 161)	Vehicle acceleration at longitudinal direction in the centre of the mass of the empty vehicle. It corresponds to the vehicle coordinate system as specified in ISO 8855 [2].  Negative values indicate that the vehicle is braking. For values equal to or greater than 16 m/s <sup>2</sup> , the value shall be set to -160. Positive values indicate that the vehicle is accelerating. For acceleration equal to or greater than 16 m/s <sup>2</sup> the value shall be set to 160. When the data is unavailable, the value shall be set to 161.  Unit: 0,1 m/s <sup>2</sup>	cam- camParameters- highFrequencyCo ntainer- basicVehicleCont ainerHighFreque ncy- longitudinalAccel eration	ETSI TS 102 894-2 V1.2.1 A.116 DF_LongitudinalAcceleration

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
longitudinalAccelerationConfidence	M	INTEGER { pointOneMeterPerSecSquared(1), outOfRange(101), unavailable(102) } (0 .. 102)	<p>Accuracy of the reported longitudinal acceleration value with a predefined confidence level. It shall be presented as defined in clause A.1 AccelerationConfidence.</p> <p>The absolute accuracy of a reported vehicle acceleration value with a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE. The value shall be set to: 1 if the acceleration accuracy is equal to or less than 0,1 m/s<sup>2</sup>. n (n &gt; 1 and n &lt; 100) if the acceleration accuracy is equal to or less than n × 0,1 m/s<sup>2</sup>. 100 if the acceleration accuracy is equal to or less than 10 m/s<sup>2</sup>. 101 if the acceleration accuracy is out of range i.e. greater than 10 m/s<sup>2</sup>. 102 if the data is unavailable.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-longitudinalAcceleration	ETSI TS 102 894-2 V1.2.1 A.116 DF_LongitudinalAcceleration
lateralAccelerationValue	M	INTEGER { pointOneMeterPerSecSquaredToRight(-1), pointOneMeterPerSecSquaredToLeft(1), unavailable(161) } (-160 .. 161)	<p>Vehicle acceleration at lateral direction in the centre of the mass of the empty vehicle. It corresponds to the vehicle coordinate system as specified in ISO 8855 [2].</p> <p>Negative value indicates that the vehicle is accelerating towards the right side with regards to the vehicle orientation. For values equal to or greater than 16 m/s<sup>2</sup> towards the right, the value shall be set to -160. Positive values indicate the acceleration to the left-hand side with regards to the vehicle orientation. For values equal to or greater than 16 m/s<sup>2</sup> towards the left, the value shall be set to 160. When the information is not available, the value shall be set to 161.</p> <p>Unit: 0,1 m/s<sup>2</sup></p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-lateralAcceleration	ETSI TS 102 894-2 V1.2.1 A.115 DF_LateralAcceleration

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
lateralAccelerationConfidence	M	INTEGER { pointOneMeterPerSecSquared(1), outOfRange(101), unavailable(102) } (0 .. 102)	<p>Accuracy of the reported lateral acceleration value with a predefined confidence level. It shall be presented as defined in clause A.1 AccelerationConfidence.</p> <p>The absolute accuracy of a reported vehicle acceleration value with a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE. The value shall be set to: 1 if the acceleration accuracy is equal to or less than 0,1 m/s<sup>2</sup>. n (n &gt; 1 and n &lt; 100) if the acceleration accuracy is equal to or less than n × 0,1 m/s<sup>2</sup>. 100 if the acceleration accuracy is equal to or less than 10 m/s<sup>2</sup>. 101 if the acceleration accuracy is out of range i.e. greater than 10 m/s<sup>2</sup>. 102 if the data is unavailable.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-lateralAcceleration	ETSI TS 102 894-2 V1.2.1 A.115 DF_LateralAcceleration
curvatureValue	M	INTEGER{ straight(0), reciprocalOf1MeterRadiusToRight(-30000), reciprocalOf1MeterRadiusToLeft(30000), unavailable(30001) } (-30000..30001)	It describes the inverse of a detected vehicle turning curve radius scaled with 30 000A curvature detected by a vehicle represents the curvature of the actual vehicle trajectory. Positive values indicate a turning curve to the left-hand side of the driver. It corresponds to the vehicle coordinate system as defined in ISO 8855 [2]. The value shall be set to 0 when the vehicle is moving straight. When the information is not available, the DE shall be set to 30 001.	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-curvature	ETSI TS 102 894-2 A.15 DE_CurvatureValue

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
curvatureConfidence	M	CurvatureConfidence ::= ENUMERATED { onePerMeter-0-00002 (0), onePerMeter-0-0001 (1), onePerMeter-0-0005 (2), onePerMeter-0-002 (3), onePerMeter-0-01 (4), onePerMeter-0-1 (5), outOfRange (6), unavailable (7) }	<p>It describes the absolute accuracy range of a reported curvature value for a predefined confidence level. The required confidence level is defined by the corresponding standards applying the DE.</p> <p>The value shall be set to:</p> <ul style="list-style-type: none"> <li>• 0 if the accuracy is less than or equal to 0,00002 m<sup>-1</sup></li> <li>• 1 if the accuracy is less than or equal to 0,0001 m<sup>-1</sup></li> <li>• 2 if the accuracy is less than or equal to 0,0005 m<sup>-1</sup></li> <li>• 3 if the accuracy is less than or equal to 0,002 m<sup>-1</sup></li> <li>• 4 if the accuracy is less than or equal to 0,01 m<sup>-1</sup></li> <li>• 5 if the accuracy is less than or equal to 0,1 m<sup>-1</sup></li> <li>• 6 if the accuracy is out of range, i.e. greater</li> <li>• 7 if the information is not available</li> </ul> <p>The DE is used in Curvature DF as defined in clause A.107.</p> <p>NOTE: The fact that a curvature value is received with confidence set to 'unavailable(7)' can be caused by several reasons, such as:</p> <ul style="list-style-type: none"> <li>– the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor,</li> <li>– the sensor cannot calculate the accuracy due to lack of variables, or</li> <li>– there has been a vehicle bus (e.g. CAN bus) error.</li> </ul> <p>In all 3 cases above, the reported curvature value may be valid and used by the application.</p> <p>If a curvature value is received and its confidence is set to 'outOfRange(6)', it means that the reported curvature value is not valid and therefore cannot be trusted. Such value is not useful for the application.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-curvature	ETSI TS 102 894-2 A.14 DE_CurvatureConfidence
curvatureCalculationMode	M	ENUMERATED{ yawRateUsed(0), yawRateNotUsed(1), unavailable(2),... }	<p>It describes whether the yaw rate is used to calculate the curvature for a reported curvature value.</p> <p>When the information of curvature calculation mode is unknown, the value shall be set to 2.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency	ETSI TS 102 894-2 A.13 DE_CurvatureCalculationMode

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
yawRateValue	M	INTEGER { straight(0), degSec-000-01ToRight(-1), degSec-000-01ToLeft(1), unavailable(32767) } (-32766..32767)	<p>It denotes the vehicle rotation around z-axis of coordinate system centred on the centre of mass of the empty-loaded vehicle. It corresponds to the vehicle coordinate system as specified in ISO 8855 [2]. The leading sign denotes the direction of rotation. Positive values indicate that the rotation is anti-clockwise (i.e. to the left). The value shall be set to 32 766 if the yaw rate is equal to or greater than 327,66 degrees/second to the left. Negative values indicate that the rotation is clockwise (i.e. to the right). The value shall be set to -32 766 if the yaw rate is equal to or greater than 327,66 degrees/second to the right. The value shall be set to 32 767 if the information is not available.</p> <p>The yaw rate value shall be a raw data value, i.e. not filtered, smoothed or otherwise modified. The reading instant should be the same as for the vehicle acceleration.</p>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-yawRate	ETSI TS 102 894-2 A.101 DE_YawRateValue
yawRateConfidence	M	ENUMERATED { degSec-000-01 (0), degSec-000-05 (1), degSec-000-10 (2), degSec-001-00 (3), degSec-005-00 (4), degSec-010-00 (5), degSec-100-00 (6), outOfRange (7), unavailable (8) }	<p>DE that denotes the absolute accuracy range for reported yaw rate value for a predefined confidence level (e.g. 95 %). The required confidence level is defined by the station applying this DE. The value shall be set to:</p> <ul style="list-style-type: none"> <li>• 0 if the accuracy is equal to or less than 0,01 degree/second</li> <li>• 1 if the accuracy is equal to or less than 0,05 degrees/second</li> <li>• 2 if the accuracy is equal to or less than 0,1 degree/second</li> <li>• 3 if the accuracy is equal to or less than 1 degree/second</li> <li>• 4 if the accuracy is equal to or less than 5 degrees/second</li> <li>• 5 if the accuracy is equal to or less than 10 degrees/second</li> <li>• 6 if the accuracy is equal to or less than 100 degrees/second</li> <li>• 7 if the accuracy is out of range, i.e. greater than 100 degrees/second</li> <li>• 8 if the accuracy information is unavailable</li> </ul>	cam-camParameters-highFrequencyContainer-basicVehicleContainerHighFrequency-yawRate	ETSI TS 102 894-2 A.100 DE_YawRateConfidence



Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
vehicleRole	O	<p>ENUMERATED {            default(0),            publicTransport(1),            specialTransport(2),            dangerousGoods(3),            roadWork(4),            rescue(5),            emergency(6),            safetyCar(7),            agriculture(8),            commercial(9),            military(10),            roadOperator(11),            taxi(12),            reserved1(13),            reserved2(14),            reserved3(15)            }</p>	<p>Role played by a vehicle at a point in time. The DE shall be set to:</p> <ul style="list-style-type: none"> <li>• default(0): default vehicle role as indicated by the vehicle type,</li> <li>• publicTransport(1): vehicle is used to operate public transport service,</li> <li>• specialTransport(2): vehicle is used for special transport purpose, e.g. oversized trucks,</li> <li>• dangerousGoods(3): vehicle is used for dangerous goods transportation,</li> <li>• roadWork(4): vehicle is used to realize roadwork or road maintenance mission,</li> <li>• rescue(5): vehicle is used for rescue purpose in case of an accident, e.g. as a towing service,</li> <li>• emergency(6): vehicle is used for emergency mission, e.g. ambulance, fire brigade,</li> <li>• safetyCar(7): vehicle is used for public safety, e.g. patrol,</li> <li>• agriculture(8): vehicle is used for agriculture, e.g. farm tractor as defined in CEN/TS 16157-3 [4], annex A, table A.137,</li> <li>• commercial(9): vehicle is used for transportation of commercial goods as defined in CEN/TS 16157-3 [5], annex A, table A.137,</li> <li>• military(10): vehicle is used for military purpose as defined in CEN/TS 16157-3 [6], annex A, table A.137,</li> <li>• roadOperator(11): vehicle is used in road operator missions as defined in CEN/TS 16157-3 [7], annex A, table A.137,</li> <li>• taxi(12): vehicle is used to provide an authorized taxi service as defined in CEN/TS 16157-3 [8], annex A, table A.137,</li> <li>• reserved(13): reserved for future usage,</li> <li>• reserved(14): reserved for future usage,</li> <li>• reserved(15): reserved for future usage.</li> </ul>	<p>cam-            camParameters-            lowFrequencyCo            ntainer-            basicVehicleCont            ainerLowFrequen            cy</p>	<p>ETSI TS 102 894-2            A.94 DE_VehicleRole</p>

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
exteriorLights	O	BIT STRING { lowBeamHeadlightsOn (0), highBeamHeadlightsOn (1), leftTurnSignalOn (2), rightTurnSignalOn (3), daytimeRunningLightsOn (4), reverseLightOn (5), fogLightOn (6), parkingLightsOn (7) } (SIZE(8))	This DE describes the status of the exterior light switches of a vehicle.  The value of each bit indicates the state of the switch, which commands the corresponding light. The bit corresponding to a specific light is set to 1, when the corresponding switch is turned on, either manually by the driver or automatically by a vehicle system. The bit value does not indicate if the corresponding lamps are alight or not.  Default value shall be set to 0.	cam-camParameters-lowFrequencyContainer-basicVehicleContainerLowFrequency	ETSI TS 102 894-2 A.28 DE_ExteriorLights
deltaLatitude	O	INTEGER { oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10) , unavailable(131072) } (-131071..131072)	A delta latitude offset with regards to the latitude value of the reference position.  It defines offset latitude with regards to a referred latitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.  Positive values are used for providing offset towards the north from the reference position. Negative values are used for providing offset towards the south from the reference position. When the information is unavailable, the value shall be set to 131 072.  Unit: 0.1 micro degree	cam-camParameters-lowFrequencyContainer-basicVehicleContainerLowFrequency-pathHistory-PathPoint-pathPosition	ETSI TS 102 894-2 A.20 DE_DeltaLatitude
deltaLongitude	O	INTEGER { oneMicrodegreeEast (10), oneMicrodegreeWest (10), unavailable(131072) } (-131071..131072)	It defines an offset longitude with regards to a referred longitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.  Positive values are used for providing offset towards the east from the reference position. Negative values are used for providing offset towards the west from the reference position. When the information is unavailable, the value shall be set to 131 072.  Unit: 0.1 micro degree	cam-camParameters-lowFrequencyContainer-basicVehicleContainerLowFrequency-pathHistory-PathPoint-pathPosition	ETSI TS 102 894-2 A.21 DE_DeltaLongitude

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
deltaAltitude	O	<pre> INTEGER { oneCentimeterUp (1), oneCentimeterDown (-1), unavailable(12800) } (-12700..12800) </pre>	<p>It defines an offset altitude with regards to a referred altitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing altitude offset above the reference position. For values equal or greater than 127.99 metres, the value shall be 12 799. Negative values are used for providing altitude offset below the reference position. When the information is unavailable, the value shall be set to 12 800.</p> <p>Unit: 0.01 metre</p>	<p>cam-camParameters-lowFrequencyContainer-basicVehicleContainerLowFrequency-pathHistory-PathPoint-pathPosition</p>	<p>ETSI TS 102 894-2 A.19 DE_DeltaAltitude</p>

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## 5 DENM Data Elements

DENM must include the data elements marked 'M' in the 'Use' column. The table identifies where the DENM data elements vary between use cases. The use cases listed for DENM are Electronic Emergency Brake Light (EEBL), Road Hazard Warning (RHW), Road Works Warning (RWW) and Back of Queue (BoQ). If the 'Use Case' column is blank then it means all use-cases. DENM must include the mandatory data elements marked 'M' in the 'Use' column.

**Table 5-1 - CAVI DENM Data Elements Superset**

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
protocolVersion	M	INTEGER{ currentVersion(1) } (0..255)		The DE protocolVersion is used to select the appropriate protocol decoder at the receiving ITS-S. <i>currentVersion</i> shall be set to '1'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
messageID	M	INTEGER{ denm(1), cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7) } (0..255)		This DE messageID should be harmonized with other V2X message identifier definitions. <i>messageID</i> shall be set to '1'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
stationID	M	INTEGER(0..4294967295)		Identifier for an ITS-S. The ITS-S ID may be a pseudonym. It may change over space and/or over time. The DE is used in <i>ActionID</i> DF as defined in clause A.102 and <i>ItsPduHeader</i> DF as defined in clause A.114.	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader A.77 DE_StationID
originatingStationID	M	INTEGER(0..4294967295)		ID of the ITS-S that takes the action. It shall be presented as defined in clause A.77 StationID. The ITS-S ID may be a pseudonym. It may change over space and/or over time.	denm- management- actionID	ETSI TS 102 894-2 V1.2.1 A.102 DF_ActionID A.77 DE_StationID
sequenceNumber	M	INTEGER(0..65535)		A sequence number.	denm- management- actionID	ETSI TS 102 894-2 V1.2.1 A.102 DF_ActionID A.68 DE_SequenceNumber

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
detectionTime	M	INTEGER { utcStartOf2004(0), oneMillisecAfterUTCStarOf2004(1) }(0..4398046511103)		<p>Time at which the event is detected by the originating ITS-S.</p> <p>The value of the <i>detectionTime</i> refers to the most recent value of received DENMs of the same <i>actionID</i>.</p> <p>Timestamp at which an event or event update/termination is detected.</p> <p>Time at which the event is detected by the originating ITS-S. For the DENM repetition, this DE shall remain unchanged.</p> <p>Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].</p> <p>Unit: milliseconds</p>	denm-management	<p>ETSI EN 302 637-3 V1.2.2 3.2 Symbols 8.4.1.6 Receiving ITS-S message table B.11 detectionTime</p> <p>ETSI TS 102 894-2 V1.2.1 A.82 DE_TimestampIts</p>
referenceTime	M	INTEGER { utcStartOf2004(0), oneMillisecAfterUTCStarOf2004(1) }(0..4398046511103)		<p>The referenceTime represents the time at which a DENM is generated by the DEN basic service, after receiving the application request.</p> <p>This DE refers to the time at which a new DENM, an update DENM or a cancellation DENM is generated.</p> <p>Timestamp at which a new, update or cancellation DENM is generated by the DEN basic service.</p> <p>Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].</p> <p>Unit: milliseconds</p>	denm-management	<p>ETSI EN 302 637-3 V1.2.2 3.2 Symbols B.37 referenceTime A.82 DE_TimestampIts 6.1.2.2 DENM update ETSI TS 102 894-2 V1.2.1 A.82 DE_TimestampIts</p>
termination	O	ENUMERATED { isCancellation(0), isNegation (1) }	RHW BoQ RWW	<p>This DE indicates if the type of generated DENM is a cancellation DENM or a negation DENM.</p> <p>The termination is maintained by the originating ITS-S.</p> <p>NOTE: This DE is present when event cancellation is applicable, otherwise DENM is considered as new or an update.</p>	denm-management	<p>ETSI EN 302 637-3 V1.2.2 B.50 termination</p>

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
latitude	M	INTEGER { oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(900000001) } (-900000000..900000001)		<p>Absolute geographical latitude in a WGS84 coordinate system, providing a range of 90 degrees in north or in south hemisphere.</p> <p>Positive values are used for latitude in north of the Equator, negative values are used for latitude in south of the Equator. When the information is unavailable, the value shall be set to 900 000 001.</p> <p>Unit: 0.1 microdegree Example: latitude = - 276490110</p>	denm-management-eventPosition	ETSI TS 102 894-2 V1.2.1 A.41 DE_Latitude
longitude	M	INTEGER { oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(1800000001) } (-1800000000..1800000001)		<p>Absolute geographical longitude in a WGS84 coordinate system, providing a range of 180 degrees to the east or to the west of the prime meridian.</p> <p>Negative values are used for longitudes to the west, positive values are used for longitudes to the east. When the information is unavailable, the value shall be set to 1 800 000 001.</p> <p>Unit: 0.1 microdegree Example: longitude = 1532299140</p>	denm-management-eventPosition	ETSI TS 102 894-2 V1.2.1 A.44 DE_Longitude

semiMajorConfidence	M	<p>INTEGER{  oneCentimeter(1),  outOfRange(4094),  unavailable(4095)  } (0..4095)</p>	<p>Half of length of the major axis, i.e. distance between the centre point and major axis point of the position accuracy ellipse.</p> <p>Absolute position accuracy in one of the axis directions as defined in a shape of ellipse with a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE.</p> <p>The value shall be set to:  1 if the accuracy is equal to or less than 1 cm,  n (n &gt; 1 and n &lt; 4 093) if the accuracy is equal to or less than n cm,  4 093 if the accuracy is equal to or less than 4 093 cm,  4 094 if the accuracy is out of range, i.e. greater than 4 093 cm,  4 095 if the accuracy information is unavailable.</p> <p>The DE is used in PosConfidenceEllipse DF as defined in clause A.119.</p> <p>NOTE: The fact that a position coordinate value is received with confidence set to 'unavailable(4095)' can be caused by several reasons, such as:  the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor,  the sensor cannot calculate the accuracy due to lack of variables, or  there has been a vehicle bus (e.g. CAN bus) error. In all 3 cases above, the reported position coordinate value may be valid and used by the application.  If a position coordinate value is received and its confidence is set to 'outOfRange(4094)', it means that the reported position coordinate value is not valid and therefore cannot be trusted. Such value is not useful for the application.</p> <p>Unit: 1 centimetre</p>	denm-management-eventPosition-positionConfidenceEllipse	ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse A.67 DE_SemiAxisLength
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Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
semiMinorConfidence	M	INTEGER{ oneCentimeter(1), outOfRange(4094), unavailable(4095) }(0..4095)		<p>Half of length of the minor axis, i.e. distance between the centre point and minor axis point of the position accuracy ellipse</p> <p>Absolute position accuracy in one of the axis directions as defined in a shape of ellipse with a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE.</p> <p>The value shall be set to:  1 if the accuracy is equal to or less than 1 cm,  n (n &gt; 1 and n &lt; 4 093) if the accuracy is equal to or less than n cm,  4 093 if the accuracy is equal to or less than 4 093 cm,  4 094 if the accuracy is out of range, i.e. greater than 4 093 cm,  4 095 if the accuracy information is unavailable.</p> <p>The DE is used in PosConfidenceEllipse DF as defined in clause A.119.</p> <p>NOTE: The fact that a position coordinate value is received with confidence set to 'unavailable(4095)' can be caused by several reasons, such as:</p> <ul style="list-style-type: none"> <li>the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor,</li> <li>the sensor cannot calculate the accuracy due to lack of variables, or</li> <li>there has been a vehicle bus (e.g. CAN bus) error. In all 3 cases above, the reported position coordinate value may be valid and used by the application.</li> </ul> <p>If a position coordinate value is received and its confidence is set to 'outOfRange(4094)', it means that the reported position coordinate value is not valid and therefore cannot be trusted. Such value is not useful for the application.</p>	denm-management-eventPosition-positionConfidenceEllipse	ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse A.67 DE_SemiAxisLength



Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
semiMajorOrientation	M	INTEGER { wgs84North(0), wgs84East(900), wgs84South(1800), wgs84West(2700), unavailable(3601) } (0..3601)		<p>Orientation direction of the ellipse major axis of the position accuracy ellipse with regards to the WGS84 north.</p> <p>When the information is not available, the DE shall be set to 3 601.</p> <p>The DE is used in Heading DF as defined in clause A.112, and PosConfidenceEllipse</p> <p>DF as defined in clause A.119.</p> <p>Unit: 0.1 degree</p>	denm-management-eventPosition-positionConfidenceEllipse	ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse A.35 DE_HeadingValue
altitudeValue	M	INTEGER { referenceEllipsoidSurface(0), oneCentimeter(1), unavailable(800001) } (-100000..800001)		<p>Altitude in a WGS84 co-ordinate system. When the information is not available, the DE shall be set to 800 001. For altitude equal or greater than 8 000 m, the DE shall be set to 800 000. For altitude equal or less than -1 000 m, the DE shall be set to -100 000.</p> <p>Unit: 0.01 metre</p>	denm-management-eventPosition-altitude	ETSI TS 102 894-2 V1.2.1 A.9 DE_AltitudeValue

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
altitudeConfidence		ENUMERATED { alt-000-01 (0), alt-000-02 (1), alt-000-05 (2), alt-000-10 (3), alt-000-20 (4), alt-000-50 (5), alt-001-00 (6), alt-002-00 (7), alt-005-00 (8), alt-010-00 (9), alt-020-00 (10), alt-050-00 (11), alt-100-00 (12), alt-200-00 (13), outOfRange (14), unavailable (15) }		<p>Absolute accuracy of a reported altitude value of a geographical point for a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the usage of this DE.</p> <p>The value shall be set to:</p> <ul style="list-style-type: none"> <li>• 0 if the altitude accuracy is equal to or less than 0,01 metre</li> <li>• 1 if the altitude accuracy is equal to or less than 0,02 metre</li> <li>• 2 if the altitude accuracy is equal to or less than 0,05 metre</li> <li>• 3 if the altitude accuracy is equal to or less than 0,1 metre</li> <li>• 4 if the altitude accuracy is equal to or less than 0,2 metre</li> <li>• 5 if the altitude accuracy is equal to or less than 0,5 metre</li> <li>• 6 if the altitude accuracy is equal to or less than 1 metre</li> <li>• 7 if the altitude accuracy is equal to or less than 2 metres</li> <li>• 8 if the altitude accuracy is equal to or less than 5 metres</li> <li>• 9 if the altitude accuracy is equal to or less than 10 metres</li> <li>• 10 if the altitude accuracy is equal to or less than 20 metres</li> <li>• 11 if the altitude accuracy is equal to or less than 50 metres</li> <li>• 12 if the altitude accuracy is equal to or less than 100 metres</li> <li>• 13 if the altitude accuracy is equal to or less than 200 metres</li> <li>• 14 if the altitude accuracy is out of range, i.e. greater than 200 metres</li> <li>• 15 if the altitude accuracy information is unavailable</li> </ul>	denm-management-eventPosition-altitude	ETSI TS 102 894-2 V1.2.1 A.9 DE_AltitudeValue

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
relevanceDistance	M	ENUMERATED{ lessThan50m(0), lessThan100m(1), lessThan200m(2), lessThan500m(3), lessThan1000m(4), lessThan5km(5), lessThan10km(6), over10km(7) }		<p>The distance within which the event is considered relevant to the receiving ITS-S [6.1.3.1-relevanceDistance].</p> <p>The distance in which event information is relevant for the receiving ITS-S, starting from the event position as defined in clause 6.1.3.1.</p> <p>Default relevanceDistance setting shall be: lessThan500m(2)</p>	denm-management	<p>ETSI EN 302 637-3 V1.2.2 6.1.3.1 DENM relevance area B.38 relevanceDistance ETSI TS 102 894-2 V1.2.1 A.61 DE_RelevanceDistance ETSI TS 101 539-1 V1.1.1 Table 6.3.2: Relevance area parameters</p>
relevanceTrafficDirection	M	ENUMERATED{ allTrafficDirections(0), upstreamTraffic(1), downstreamTraffic(2), oppositeTraffic(3) }		<p>The traffic direction along which the receiving ITS-Ss may encounter the event. Therefore, it is also the direction along which the DENM should be disseminated [6.1.3.1- relevanceTrafficDirection].</p> <p>The traffic direction along which the event information is relevant for the receiving ITS-S, as defined in clause 6.1.3.1.</p> <p>Default relevanceTrafficDirection setting shall be: upstreamTraffic(1)</p>	denm-management	<p>ETSI EN 302 637-3 V1.2.2 6.1.3.1 DENM relevance area B.39 relevanceTrafficDirection  ETSI TS 102 894-2 V1.2.1 A.62 DE_RelevanceTrafficDirection</p>
validityDuration	M	INTEGER { timeOfDetection(0), oneSecondAfterDetection(1) } (0..86400)		<p>Duration of a traffic event validity.</p> <p>validityDuration is a time offset starting from the detectionTime.</p> <p>Unit: Second</p>	denm-management	<p>ETSI TS 102 894-2 V1.2.1 A.88 DE_ValidityDuration ETSI EN 302 637-3 V1.2.2 8.4.1.5 T_R_Validity</p>

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
stationType	M	INTEGER{ unknown(0), pedestrian(1), cyclist(2), moped(3), motorcycle(4), passengerCar(5), bus(6), lightTruck(7), heavyTruck(8), trailer(9), specialVehicles(10), tram(11), roadSideUnit(15) } (0..255)		<p>This DE provides the station type information of the originating ITS-S.</p> <p>The type of an ITS-S. The station type depends on the integration environment of ITS-S into vehicle, mobile devices or at infrastructure. Detailed definition of type is out of scope of the present document.</p> <p>Default setting shall be: V2V Use case: passengerCar(5) I2V Use case: unknown(0). This is to support C-ITS-F as originating station. No other code close to C-ITS-F unless TMR creates one.</p>	denm-management	<p>ETSI EN 302 637-3 B.49 stationType</p> <p>ETSI TS 102 894-2 V1.2.1 A.78 DE_StationType</p>
informationQuality	M	INTEGER{ unavailable(0), lowest(1), highest(7) } (0..7)		<p>Quality level of the information provided by the ITS-S application of the originating ITS-S. It indicates the probability of the detected event being truly existent at the event position [B.23].</p> <p><i>informationQuality</i>: Shall be as defined in clause B.23. The value ranges from lowest (1) to highest (7). The <i>informationQuality</i> value shall be provided by the application layer of the originating ITS-S. The value 0 shall be set when the information is unavailable.</p> <p>If the</p>	denm- situation	<p>ETSI EN 302 637-3 V1.2.2 B.23 informationQuality 7.1.4 DENM situation container</p>
causeCode	M	INTEGER{ reserved (0), trafficCondition (1), accident (2), roadworks (3), adverseWeatherCondition-Adhesion (6), hazardousLocation-SurfaceCondition (9), hazardousLocation-	EEBL	EEBL use case shall use the following causeCode: dangerousSituation (99) - The type of event is dangerous situation in which autonomous safety system in vehicle is activated.	denm- situation-eventType	ETSI TS 102 894-2 V1.2.1 A.10 DE_CauseCodeType
			RHW	RHS use cases shall use the following causeCodes:  hazardousLocation-ObstacleOnTheRoad(10)	denm- situation-eventType	ETSI TS 102 894-2 V1.2.1 A.10 DE_CauseCodeType

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference				
		ObstacleOnTheRoad (10), hazardousLocation-AnimalOnTheRoad (11), humanPresenceOnTheRoad (12), wrongWayDriving (14), rescueAndRecoveryWorkInProgress (15), adverseWeatherCondition-ExtremeWeatherCondition (17), adverseWeatherCondition-Visibility (18), adverseWeatherCondition-Precipitation (19), slowVehicle (26), dangerousEndOfQueue (27), vehicleBreakdown (91), postCrash (92), humanProblem (93), stationaryVehicle (94), emergencyVehicleApproaching (95), hazardousLocation-DangerousCurve (96), collisionRisk (97), signalViolation (98), dangerousSituation (99) } (0..255)		hazardousLocation-SurfaceCondition (9) stationaryVehicle (94) adverseWeatherCondition-ExtremeWeatherCondition (17) accident (2)						
			RWW	RWW use case shall use the following causeCode:  roadworks (3)	denm- situation- eventType	ETSI TS 102 894-2 V1.2.1 A.10 DE_CauseCodeType				
			BoQ	BoQ use case shall use the following causeCode: dangerousEndOfQueue (27): the type of event is dangerous end of vehicle queue		ETSI TS 102 894-2 V1.2.1 A.10 DE_CauseCodeType				
subCauseCode	M	INTEGER (0..255)	EEBL	EEBL use case shall use: emergencyElectronicBrakeEngaged(1) - Emergency electronic brake is engaged.	denm- situation- eventType	ETSI TS 102 894-2 V1.2.1 A.81 DE_SubCauseCodeType A.18 DE_DangerousSituationSubCauseCode				
			RHW	The following minimum subCauseCode for RHW shall be supported:	denm- situation- eventType	ETSI TS 102 894-2 V1.2.1 A.81 DE_SubCauseCodeType A.18 DE_DangerousSituationSubCauseCode				
				<table border="1"> <thead> <tr> <th>subCauseCode</th> <th>value</th> </tr> </thead> <tbody> <tr> <td>hazardousLocation-ObstacleOnTheRoadSubCauseCode</td> <td>unavailable(0)</td> </tr> </tbody> </table>	subCauseCode	value	hazardousLocation-ObstacleOnTheRoadSubCauseCode	unavailable(0)		
subCauseCode	value									
hazardousLocation-ObstacleOnTheRoadSubCauseCode	unavailable(0)									

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference								
				<table border="1"> <tr> <td>hazardousLocation-SurfaceCondition SubCauseCode</td> <td>unavailable(0)</td> </tr> <tr> <td>stationaryVehicle SubCauseCode</td> <td>unavailable(0)</td> </tr> <tr> <td>adverseWeatherCondition-ExtremeWeatherCondition SubCauseCode</td> <td>unavailable(0)</td> </tr> <tr> <td>accidentSubCauseCode</td> <td>unavailable(0) multivehicle-Accident(1)</td> </tr> </table>	hazardousLocation-SurfaceCondition SubCauseCode	unavailable(0)	stationaryVehicle SubCauseCode	unavailable(0)	adverseWeatherCondition-ExtremeWeatherCondition SubCauseCode	unavailable(0)	accidentSubCauseCode	unavailable(0) multivehicle-Accident(1)		
hazardousLocation-SurfaceCondition SubCauseCode	unavailable(0)													
stationaryVehicle SubCauseCode	unavailable(0)													
adverseWeatherCondition-ExtremeWeatherCondition SubCauseCode	unavailable(0)													
accidentSubCauseCode	unavailable(0) multivehicle-Accident(1)													
			RWW	<p>RWW use cases shall use the following <i>subCauseCodes</i>:</p> <p>unavailable(0): in case further detailed information on roadworks is unavailable.</p> <p>The sub causes are described as following:</p> <p><i>majorRoadworks</i>(1): in case a major roadworks is ongoing,</p> <p><i>roadMarkingWork</i>(2): in case a road marking work is ongoing,</p> <p><i>slowMovingRoadMaintenance</i>(3): in case slow moving road maintenance work is ongoing,</p> <p><i>shortTermStationaryRoadworks</i>(4): in case a short term stationary roadwork is ongoing,</p> <p><i>streetCleaning</i>(5): in case a vehicle street cleaning work is ongoing,</p> <p>Default <i>subCauseCode</i> shall be <i>slowMovingRoadMaintenance</i>(3)</p>	denm- situation-eventType	ETSI TS 102 894-2 V1.2.1 A.81 DE_SubCauseCodeType A.18 DE_DangerousSituationSubCauseCode								
			BoQ	BoQ use cases shall use the following <i>causeCode</i> :	denm- situation-eventType	ETSI TS 102 894-2 V1.2.1 A.81 DE_SubCauseCodeType								

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
				unavailable(0): in case information on the type of dangerous queue is unavailable.		A.18 DE_DangerousSituationSubCauseCode
deltaLatitude	O	INTEGER{ oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(131072) }{-131071..131072}	RWW	It defines offset latitude with regards to a referred latitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.  Positive values are used for providing offset towards the north from the reference position. Negative values are used for providing offset towards the south from the reference position. When the information is unavailable, the value shall be set to 131 072. unit: 0.1 microdegree	denm- situation- eventHistory- EventPoint- eventPosition	ETSI TS 102 894-2 V1.2.1 A.110 DF_EventHistory A.21 DE_DeltaLongitude
deltaLongitude	O	INTEGER{ oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(131072) }{-131071..131072}	RWW	It defines an offset longitude with regards to a referred longitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.  Positive values are used for providing offset towards the east from the reference position. Negative values are used for providing offset towards the west from the reference position. When the information is unavailable, the value shall be set to 131 072.	denm- situation- eventHistory- EventPoint- eventPosition	ETSI TS 102 894-2 V1.2.1 A.110 DF_EventHistory A.21 DE_DeltaLongitude
deltaAltitude	O	INTEGER { oneCentimeterUp (1), oneCentimeterDown (-1), unavailable(12800) }{-12700..12800}	RWW	It defines an offset altitude with regards to a referred altitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.  Positive values are used for providing altitude offset above the reference position. For values equal or greater than 127,99 metres, the value shall be 12 799. Negative values are used for providing altitude offset below the reference position. When the information is unavailable, the value shall be set to 12 800.	denm- situation- eventHistory- EventPoint- eventPosition	ETSI TS 102 894-2 V1.2.1 A.110 DF_EventHistory A.19 DE_DeltaAltitude

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
informationQuality	O	INTEGER { unavailable(0), lowest(1), highest(7) } (0..7)	RWW	Quality level of the information provided by the ITS-S application of the originating ITS-S. It indicates the probability of the detected event being truly existent at the event position [B.23].  <i>informationQuality</i> : Shall be as defined in clause B.23. The value ranges from lowest (1) to highest (7). The <i>informationQuality</i> value shall be provided by the application layer of the originating ITS-S. The value 0 shall be set when the information is unavailable.	denm- situation- eventHistory- EventPoint	ETSI TS 102 894-2 V1.2.1 A.110 DF_EventHistory A.39 DE_InformationQuality ETSI EN 302 637-3 V1.2.2 B.23 informationQuality 7.1.4 DENM situation container
speedValue	O	INTEGER{ standstill(0), oneCentimeterPerSec(1), unavailable(16383) } (0..16383)	EEBL BoQ RHW	A speed value. For values equal to or greater than 163,82 m/s, the value shall be set to 16 382. When the information is not available, the value shall be set to 16 383. Unit: 0.01 m/s	denm-location- eventSpeed	ETSI TS 101 539-1 V1.1.1 6.3.4 Emergency electronic brake lights specific functional requirements ETSI TS 102 894-2 V1.2.1 A.74 DE_SpeedValue
speedConfidence	O	INTEGER{ equalOrWithinOneCentimeterPerSec(1), equalOrWithinOneMeterPerSec(100), outOfRange(126), unavailable(127) } (1..127)	EEBL BoQ RHW	The absolute accuracy of a speed value information for a predefined confidence level. The required confidence level is defined by the station applying this DE. The value shall be set to: 1 if the speed accuracy is equal to or less than 1 cm/s. n (n > 1 and n < 125) if the speed accuracy is equal to or less than n cm/s. 125 if the speed accuracy is equal to or less than 125 cm/s. 126 if the speed accuracy is out of range, i.e. greater than 125 cm/s. 127 if the speed accuracy information is not available. Unit: cm/s	denm-location- eventSpeed	ETSI TS 101 539-1 V1.1.1 6.3.4 Emergency electronic brake lights specific functional requirements  ETSI TS 102 894-2 V1.2.1 A.72 DE_SpeedConfidence
headingValue	O	INTEGER { wgs84North(0), wgs84East(900), wgs84South(1800),	EEBL	Orientation of a heading with regards to the WGS84 north.	denm-location- eventPositionHeading	ETSI TS 101 539-1 V1.1.1 6.3.4 Emergency electronic brake lights specific functional requirements



Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
		wgs84West(2700), unavailable(3601) }(0..3601)		When the information is not available, the DE shall be set to 3 601.  The DE is used in Heading DF as defined in clause A.112, and PosConfidenceEllipse DF as defined in clause A.119.  Unit: 0.1 degree		ETSI TS 102 894-2 V1.2.1 A.35 DE_HeadingValue
headingConfidence	O	INTEGER{ equalOrWithinZeroPointOneDegree (1), equalOrWithinOneDegree (10), outOfRange(126), unavailable(127) }(1..127)	EEBL	The absolute accuracy of a reported heading value for a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE.  The value shall be set to: 1 if the heading accuracy is equal to or less than 0,1 degree, n (n > 1 and n < 125) if the heading accuracy is equal to or less than n × 0,1 degree, 125 if the heading accuracy is equal to or less than 12,5 degrees, 126 if the heading accuracy is out of range, i.e. greater than 12,5 degrees, 127 if the heading accuracy information is not available.  The DE is used in Heading DF as defined in clause A.112.  NOTE: The fact that a value is received with confidence set to 'unavailable(127)' can be caused by several reasons, such as: the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor, the sensor cannot calculate the accuracy due to lack of variables, or there has been a vehicle bus (e.g. CAN bus) error.  In all 3 cases above, the reported heading value may be valid and used by the application.  If a heading value is received and its confidence is set to 'outOfRange(126)', it means that the reported heading value is not valid and therefore cannot be trusted. Such value is not useful for the application.	denm-location-eventPositionHeading	ETSI TS 101 539-1 V1.1.1 6.3.4 Emergency electronic brake lights specific functional requirements  ETSI TS 102 894-2 V1.2.1 A.34 DE_HeadingConfidence

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
deltaLatitude	M	INTEGER{ oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(131072) }(-131071..131072)		<p>deltaLatitude is a data element under nested data frames under <i>traces</i>. Up to 40 <i>PathPoint</i> (inside is deltaLatitude data element) is allowed in every <i>PathHistory</i>. See reference for more details.</p> <p>It defines offset latitude with regards to a referred latitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing offset towards the north from the reference position. Negative values are used for providing offset towards the south from the reference position. When the information is unavailable, the value shall be set to 131 072.</p> <p>unit: 0.1 microdegree</p> <p>NOTE:</p> <p>Each trace describes a set of consecutive PathPoint positions leading to the event position.</p> <p>Within one trace, the PathPoint closest to the event position shall be put as the first waypoint, it presents an offset delta position with regards to the eventPosition. Other <i>PathPoints</i> shall be structured in ascending order according to the distance to the eventPosition along the trace path. Each PathPoint presents an offset delta position (<i>and optionally an offset travel time</i>) with regards to the previous PathPoint.</p>	denm-location-traces-PathHistory-PathPoint-pathPosition	ETSI TS 102 894-2 V1.2.1 A.128 DF_Traces A.20 DE_DeltaLatitude

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
deltaLongitude		INTEGER{ oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(131072) }{-131071..131072}		<p>deltaLongitude is a data element under nested data frames under <i>traces</i>. Up to 40 PathPoint (inside is deltaLongitude data element) is allowed in every PathHistory. See reference for more details.</p> <p>It defines an offset longitude with regards to a referred longitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing offset towards the east from the reference position. Negative values are used for providing offset towards the west from the reference position. When the information is unavailable, the value shall be set to 131 072. unit: 0.1 microdegree</p> <p>NOTE: Each trace describes a set of consecutive PathPoint positions leading to the event position.</p> <p>Within one trace, the PathPoint closest to the event position shall be put as the first waypoint, it presents an offset delta position with regards to the eventPosition. Other PathPoints shall be structured in ascending order according to the distance to the eventPosition along the trace path. Each PathPoint presents an offset delta position (<i>and optionally an offset travel time</i>) with regards to the previous PathPoint.</p>	denm-location-traces-PathHistory-PathPoint-pathPosition	ETSI TS 102 894-2 V1.2.1 A.128 DF_Traces A.21 DE_DeltaLongitude
deltaAltitude		INTEGER { oneCentimeterUp (1), oneCentimeterDown (-1), unavailable(12800) } -12700..12800)		<p>deltaAltitude is a data element under nested data frames under <i>traces</i>. Up to 40 PathPoint (inside is deltaAltitude data element) is allowed in every PathHistory. See reference for more details.</p> <p>It defines an offset altitude with regards to a referred altitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing altitude offset above the reference position. For values equal or</p>	denm-location-traces-PathHistory-PathPoint-pathPosition	ETSI TS 102 894-2 V1.2.1 A.128 DF_Traces A.19 DE_DeltaAltitude

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
				<p>greater than 127,99 metres, the value shall be 12 799. Negative values are used for providing altitude offset below the reference position. When the information is unavailable, the value shall be set to 12 800.</p> <p>Unit: 0.01 metre</p> <p>NOTE:</p> <p>Each trace describes a set of consecutive PathPoint positions leading to the event position.</p> <p>Within one trace, the PathPoint closest to the event position shall be put as the first waypoint, it presents an offset delta position with regards to the eventPosition. Other PathPoints shall be structured in ascending order according to the distance to the eventPosition along the trace path. Each PathPoint presents an offset delta position (<i>and optionally an offset travel time</i>) with regards to the previous PathPoint.</p>		
speedLimit	O	INTEGER { oneKmPerHour(1) } (1..255)	RWW	<p>Definition Speed limitation applied to a geographical position, a road section or a geographical region.</p> <p>Unit km/h</p>	denm-alacarte-roadWorks	ETSI TS 102 894-2 V1.2.1 A.73 DE_SpeedLimit

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
deltaLatitude	O	INTEGER{ oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(131072) }{-131071..131072}	RWW	<p>It defines offset latitude with regards to a referred latitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing offset towards the north from the reference position. Negative values are used for providing offset towards the south from the reference position. When the information is unavailable, the value shall be set to 131 072.</p> <p>unit: 0.1 microdegree</p> <p>NOTES: The <i>startingPointSpeedLimit</i> DF indicates the effective starting position of a speed limit being applied to the roadwork zone. The speed limit applies a specific distance prior to the roadwork zone starting position. It is described as a delta position with regards to the eventPosition for a DENM.</p> <p>This DF is included in roadWorks DF in the alacarte container.</p>	denm-alacarte-roadWorks-startingPointSpeedLimit	<p>ETSI TS 102 894-2 V1.2.1 A.20 DE_DeltaLatitude</p> <p>ETSI EN 302 637-3 V1.2.2 B.45 startingPointSpeedLimit</p>
deltaLongitude	O	INTEGER{ oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(131072) }{-131071..131072}	RWW	<p>It defines an offset longitude with regards to a referred longitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing offset towards the east from the reference position. Negative values are used for providing offset towards the west from the reference position. When the information is unavailable, the value shall be set to 131 072.</p> <p>unit: 0.1 microdegree</p> <p>NOTES: The <i>startingPointSpeedLimit</i> DF indicates the effective starting position of a speed limit being applied to the roadwork zone. The speed limit applies a specific distance prior to the roadwork zone starting position. It is described as a delta position with regards to the eventPosition for a DENM.</p> <p>This DF is included in roadWorks DF in the alacarte container.</p>	denm-alacarte-roadWorks-startingPointSpeedLimit	<p>ETSI TS 102 894-2 V1.2.1 A.21 DE_DeltaLongitude</p> <p>ETSI EN 302 637-3 V1.2.2 B.45 startingPointSpeedLimit</p>

Data element	Use (M/O)	Format	Use Case	Notes	Message Tree Reference	Reference
deltaAltitude	O	INTEGER { oneCentimeterUp (1), oneCentimeterDown (-1), unavailable(12800) } -12700..12800)	RWW	<p>It defines an offset altitude with regards to a referred altitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing altitude offset above the reference position. For values equal or greater than 127,99 metres, the value shall be 12 799. Negative values are used for providing altitude offset below the reference position. When the information is unavailable, the value shall be set to 12 800.</p> <p>NOTES: The startingPointSpeedLimit DF indicates the effective starting position of a speed limit being applied to the roadwork zone. The speed limit applies a specific distance prior to the roadwork zone starting position. It is described as a delta position with regards to the eventPosition for a DENM. This DF is included in roadWorks DF in the alacarte container.</p>	denm-alacarte-roadWorks-startingPointSpeedLimit	<p>ETSI TS 102 894-2 V1.2.1 A.19 DE_DeltaAltitude</p> <p>ETSI EN 302 637-3 V1.2.2 B.45 startingPointSpeedLimit</p>
originatingStationID	O	INTEGER(0..4294967295)	RWW	<p>ID of the ITS-S that takes the action. It shall be presented as defined in clause A.77 StationID. The ITS-S ID may be a pseudonym. It may change over space and/or over time.</p> <p>NOTES: The <i>referenceDenms</i> DF indicates is a sequence of <i>actionIDs</i> for different DENMs that describe the same event. If it is available it is part of all DENMs describing this event. This DF is included in roadWorks DF in the alacarte container.</p>	denm-alacarte-roadWorks-referenceDenms-ActionID	<p>ETSI TS 102 894-2 V1.2.1 A.102 DF_ActionID A.77 DE_StationID</p> <p>ETSI EN 302 637-3 V1.2.2 B.36 referenceDenms</p>
sequenceNumber	O	INTEGER (0..65535)	RWW	<p>A sequence number.</p> <p>NOTES: The <i>referenceDenms</i> DF indicates is a sequence of <i>actionIDs</i> for different DENMs that describe the same event. If it is available it is part of all DENMs describing this event. This DF is included in roadWorks DF in the alacarte container.</p>	denm-alacarte-roadWorks-referenceDenms-ActionID	<p>ETSI TS 102 894-2 V1.2.1 A.102 DF_ActionID A.77 DE_StationID</p> <p>ETSI EN 302 637-3 V1.2.2 B.36 referenceDenms</p>

## 6 IVIM Data Elements

IVIM used in the ICVP are used for the IVS use-case only. IVIMs must include the data elements marked 'M' in the 'Use' column.

**Table 6-1 - IVIM Data Elements**

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
protocolVersion	M	INTEGER{ currentVersion(1) }(0..255)	The DE protocolVersion is used to select the appropriate protocol decoder at the receiving ITS-S. <i>currentVersion</i> shall be set to '1'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
messageID	M	INTEGER{ denm(1), cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7) }(0..255)	This DE messageID should be harmonized with other V2X message identifier definitions.  <i>messageID</i> shall be set to "6"	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
stationID	M	INTEGER(0..4294967295)	Identifier for an ITS-S. The ITS-S ID may be a pseudonym. It may change over space and/or over time. The DE is used in ActionID DF as defined in clause A.102 and ItsPduHeader DF as defined in clause A.114.	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader A.77 DE_StationID
countryCode	M	BIT STRING(SIZE(10))	Value assignment is done in accordance with ISO 3166-1 and by using the ITA.2 alphabet. Default value shall be: 11000 11100	ivi-mandatory-serviceProviderId	ISO 3166-1
providerIdentifier	M	INTEGER(0 .. 16383)	See Annex A of ISO 14816 for registration  Predefined values to be determined	ivi-mandatory-serviceProviderId	CEN ISO/TS 19321:2015 Table 1 — IVI Management Container

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
iviIdentificationNumber	M	INTEGER(1..32767,...)	Identifier of the IVI Structure, as assigned by the Service Provider using the DE	ivi-mandatory	CEN ISO/TS 19321:2015 Table 1 — IVI Management Container
timestamp	M	INTEGER { utcStartOf2004(0), oneMillisecAfterUTCStarOf2004(1) }(0..4398046511103)	Timestamp of the generation or last change of information content.	ivi-mandatory	CEN ISO/TS 19321:2015 Table 1 — IVI Management Container ETSI TS 102 894-2 V1.2.1 A.82 DE_TimestampIts
validFrom	M	INTEGER { utcStartOf2004(0), oneMillisecAfterUTCStarOf2004(1) }(0..4398046511103)	Start time of the validity period of the message.	ivi-mandatory	CEN ISO/TS 19321:2015 Table 1 — IVI Management Container ETSI TS 102 894-2 V1.2.1 A.82 DE_TimestampIts
validTo	M	INTEGER { utcStartOf2004(0), oneMillisecAfterUTCStarOf2004(1) }(0..4398046511103)	End time of the validity period of the message.	ivi-mandatory	CEN ISO/TS 19321:2015 Table 1 — IVI Management Container ETSI TS 102 894-2 V1.2.1 A.82 DE_TimestampIts
iviStatus	M	INTEGER { new (0), update (1), cancellation (2), negation (3) }(0..7)	<p>NOTES:</p> <p>0: new Indicates that the IVI Structure is sent out in its first edition.</p> <p>1: <i>update</i> Indicates that the IVI Structure is sent out as an update of an already sent out IVI Structure.</p> <p>2: <i>cancellation</i> Indicates that the IVI is cancelled by the Service Provider that provided it.</p> <p>3: <i>negation</i> Indicates that the IVI is negated by an authorized Service Provider that is different from the one that provided it.</p>	ivi-mandatory	CEN ISO/TS 19321:2015 Table 11 — IVIStatus Annex A (normative) ASN.1 module



Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
latitude	M	INTEGER { oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(900000001) } (-900000000..900000001)	<p>Absolute geographical latitude in a WGS84 coordinate system, providing a range of 90 degrees in north or in south hemisphere.</p> <p>Positive values are used for latitude in north of the Equator, negative values are used for latitude in south of the Equator. When the information is unavailable, the value shall be set to 900 000 001.</p> <p>Unit: 0.1 microdegree Example: latitude = - 276490110</p>	ivi-optional-glc-referencePosition	CEN ISO/TS 19321:2015 7.3.25 ReferencePosition ETSI TS 102 894-2 V1.2.1 A.41 DE_Latitude
longitude	M	INTEGER { oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(1800000001) } (-1800000000..1800000001)	<p>Absolute geographical longitude in a WGS84 co-ordinate system, providing a range of 180 degrees to the east or to the west of the prime meridian.</p> <p>Negative values are used for longitudes to the west, positive values are used for longitudes to the east. When the information is unavailable, the value shall be set to 1 800 000 001.</p> <p>Unit: 0.1 microdegree Example: longitude = 1532299140</p>	ivi-optional-glc-referencePosition	CEN ISO/TS 19321:2015 7.3.25 ReferencePosition ETSI TS 102 894-2 V1.2.1 A.44 DE_Longitude

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
semiMajorConfidence	M	INTEGER{ oneCentimeter(1), outOfRange(4094), unavailable(4095) } (0..4095)	<p>Half of length of the major axis, i.e. distance between the centre point and major axis point of the position accuracy ellipse.</p> <p>Absolute position accuracy in one of the axis directions as defined in a shape of ellipse with a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE.</p> <p>The value shall be set to:</p> <ul style="list-style-type: none"> <li>• 1 if the accuracy is equal to or less than 1 cm,</li> <li>• n (n &gt; 1 and n &lt; 4 093) if the accuracy is equal to or less than n cm,</li> <li>• 4 093 if the accuracy is equal to or less than 4 093 cm,</li> <li>• 4 094 if the accuracy is out of range, i.e. greater than 4 093 cm,</li> <li>• 4 095 if the accuracy information is unavailable.</li> </ul> <p>The DE is used in PosConfidenceEllipse DF as defined in clause A.119.</p> <p>NOTE: The fact that a position coordinate value is received with confidence set to 'unavailable(4095)' can be caused by several reasons, such as:</p> <ul style="list-style-type: none"> <li>– the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor,</li> <li>– the sensor cannot calculate the accuracy due to lack of variables, or</li> <li>– there has been a vehicle bus (e.g. CAN bus) error.</li> </ul> <p>In all 3 cases above, the reported position coordinate value may be valid and used by the application.</p> <p>If a position coordinate value is received and its confidence is set to 'outOfRange(4094)', it means that the reported position coordinate value is not valid and therefore cannot be trusted. Such value is not useful for the application.</p> <p>Unit: 1 centimetre</p>	ivi-optional-glc-referencePosition-positionConfidenceEllipse	CEN ISO/TS 19321:2015 7.3.25 ReferencePosition ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse A.67 DE_SemiAxisLength

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
semiMinorConfidence	M	INTEGER{ oneCentimeter(1), outOfRange(4094), unavailable(4095) } (0..4095)	<p>Half of length of the minor axis, i.e. distance between the centre point and minor axis point of the position accuracy ellipse</p> <p>Absolute position accuracy in one of the axis directions as defined in a shape of ellipse with a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE.</p> <p>The value shall be set to:</p> <ul style="list-style-type: none"> <li>• 1 if the accuracy is equal to or less than 1 cm,</li> <li>• n (n &gt; 1 and n &lt; 4 093) if the accuracy is equal to or less than n cm,</li> <li>• 4 093 if the accuracy is equal to or less than 4 093 cm,</li> <li>• 4 094 if the accuracy is out of range, i.e. greater than 4 093 cm,</li> <li>• 4 095 if the accuracy information is unavailable.</li> </ul> <p>The DE is used in PosConfidenceEllipse DF as defined in clause A.119.</p> <p>NOTE: The fact that a position coordinate value is received with confidence set to 'unavailable(4095)' can be caused by several reasons, such as:</p> <ul style="list-style-type: none"> <li>– the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor,</li> <li>– the sensor cannot calculate the accuracy due to lack of variables, or</li> <li>– there has been a vehicle bus (e.g. CAN bus) error.</li> </ul> <p>In all 3 cases above, the reported position coordinate value may be valid and used by the application.</p> <p>If a position coordinate value is received and its confidence is set to 'outOfRange(4094)', it means that the reported position coordinate value is not valid and therefore cannot be trusted. Such value is not useful for the application.</p>	ivi-optional-glc-referencePosition-positionConfidenceEllipse	CEN ISO/TS 19321:2015 7.3.25 ReferencePosition ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse A.67 DE_SemiAxisLength

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
semiMajorOrientation	M	INTEGER { wgs84North(0), wgs84East(900), wgs84South(1800), wgs84West(2700), unavailable(3601) } (0..3601)	<p>Orientation direction of the ellipse major axis of the position accuracy ellipse with regards to the WGS84 north.</p> <p>When the information is not available, the DE shall be set to 3 601. The DE is used in Heading DF as defined in clause A.112, and PosConfidenceEllipse</p> <p>DF as defined in clause A.119.</p> <p>Unit: 0.1 degree</p>	ivi-optional-glc-referencePosition-positionConfidenceEllipse	CEN ISO/TS 19321:2015 7.3.25 ReferencePosition ETSI TS 102 894-2 V1.2.1 A.119 DF_PosConfidenceEllipse A.35 DE_HeadingValue
altitudeValue	M	INTEGER { referenceEllipsoidSurface(0), oneCentimeter(1), unavailable(800001) } (-100000..800001)	<p>Altitude in a WGS84 co-ordinate system. When the information is not available, the DE shall be set to 800 001. For altitude equal or greater than 8 000 m, the DE shall be set to 800 000. For altitude equal or less than -1 000 m, the DE shall be set to -100 000.</p> <p>Unit: 0.01 metre</p>	ivi-optional-glc-referencePosition-altitude	ETSI TS 102 894-2 V1.2.1 A.9 DE_AltitudeValue
altitudeConfidence	M	ENUMERATED { alt-000-01 (0), alt-000-02 (1), alt-000-05 (2), alt-000-10 (3), alt-000-20 (4), alt-000-50 (5), alt-001-00 (6), alt-002-00 (7), alt-005-00 (8), alt-010-00 (9), alt-020-00 (10), alt-050-00 (11), alt-100-00 (12), alt-200-00 (13), outOfRange (14), unavailable (15) }	<p>Absolute accuracy of a reported altitude value of a geographical point for a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the usage of this DE.</p> <p>The value shall be set to:</p> <ul style="list-style-type: none"> <li>• 0 if the altitude accuracy is equal to or less than 0,01 metre</li> <li>• 1 if the altitude accuracy is equal to or less than 0,02 metre</li> <li>• 2 if the altitude accuracy is equal to or less than 0,05 metre</li> <li>• 3 if the altitude accuracy is equal to or less than 0,1 metre</li> <li>• 4 if the altitude accuracy is equal to or less than 0,2 metre</li> <li>• 5 if the altitude accuracy is equal to or less than 0,5 metre</li> <li>• 6 if the altitude accuracy is equal to or less than 1 metre</li> <li>• 7 if the altitude accuracy is equal to or less than 2 metres</li> <li>• 8 if the altitude accuracy is equal to or less than 5 metres</li> <li>• 9 if the altitude accuracy is equal to or less than 10 metres</li> <li>• 10 if the altitude accuracy is equal to or less than 20 metres</li> <li>• 11 if the altitude accuracy is equal to or less than 50 metres</li> <li>• 12 if the altitude accuracy is equal to or less than 100 metres</li> <li>• 13 if the altitude accuracy is equal to or less than 200 metres</li> <li>• 14 if the altitude accuracy is out of range, i.e. greater than 200 metres</li> <li>• 15 if the altitude accuracy information is unavailable</li> </ul>	ivi-optional-glc-referencePosition-altitude	CEN ISO/TS 19321:2015 7.3.25 ReferencePosition ETSI TS 102 894-2 V1.2.1 A.9 DE_AltitudeValue

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
zoneId	M	INTEGER (1..32,...)	Identifier of the definition of the zone.	ivi-optional-glc-parts-GlcPart	CEN ISO/TS 19321:2015 Table 2 — Geographic Location Container Annex A (normative) ASN.1 module
deltaLatitude	M	INTEGER{ oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(131072) }(-131071..131072)	<p>deltaLatitude is a data element under sequenced <i>DeltaPosition</i> data frame. Up to 32 <i>DeltaPosition</i> (inside is deltaLatitude data element) is allowed in every <i>PolygonalLine</i>. See reference for more details.</p> <p>It defines offset latitude with regards to a referred latitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing offset towards the north from the reference position. Negative values are used for providing offset towards the south from the reference position. When the information is unavailable, the value shall be set to 131 072. unit: 0.1 microdegree</p> <p>NOTE: Within a <i>segment line</i>, the <i>DeltaPosition</i> closest to the <i>ReferencePosition</i> shall be put as the first waypoint, it presents an offset delta position with regards to the <i>ReferencePosition</i>. Other <i>DeltaPosition</i> shall be structured in ascending order according to the distance to the <i>ReferencePosition</i> along the trace path. Each <i>DeltaPosition</i> presents an offset delta position (<i>and optionally an offset travel time</i>) with regards to the previous <i>DeltaPosition</i>.</p>	ivi-optional-glc-parts-GlcPart- zone-segment-line-deltaPositions-DeltaPosition	CEN ISO/TS 19321:2015 7.3.5 <i>DeltaPosition</i> Annex A (normative) ASN.1 module ETSI TS 102 894-2 V1.2.1 A.20 DE_DeltaLatitude

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
deltaLongitude		INTEGER{ oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(131072) }{-131071..131072}	<p>deltaLongitude is a data element under sequenced DeltaPosition data frame. Up to 32 DeltaPosition (inside is deltaLongitude data element) is allowed in every PolygonalLine. See reference for more details.</p> <p>It defines an offset longitude with regards to a referred longitude value. It may be used to describe a geographical point with regards to a specific reference geographical position.</p> <p>Positive values are used for providing offset towards the east from the reference position. Negative values are used for providing offset towards the west from the reference position. When the information is unavailable, the value shall be set to 131 072.</p> <p>unit: 0.1 microdegree</p> <p>NOTE: Within a <i>segment line</i>, the DeltaPosition closest to the <i>ReferencePosition</i> shall be put as the first waypoint, it presents an offset delta position with regards to the <i>ReferencePosition</i>. Other DeltaPosition shall be structured in ascending order according to the distance to the <i>ReferencePosition</i> along the trace path. Each DeltaPosition presents an offset delta position (<i>and optionally an offset travel time</i>) with regards to the previous DeltaPosition.</p>	ivi-optional-glc-parts-GlcPart- zone-segment-line-deltaPositions-DeltaPosition	CEN ISO/TS 19321:2015 7.3.5 DeltaPosition Annex A (normative) ASN.1 module ETSI TS 102 894-2 V1.2.1 A.21 DE_DeltaLongitude
Zid	M	INTEGER (1..32,...)	List of Identifier(s) of the definition(s) of the Relevance Zone(s), to which the IVS Container applies, using the data element Zid.	ivi-optional-glc-GlcPart-relevanceZonelds	CEN ISO/TS 19321:2015 Table 3 — General IVI Application Container 7.3.30 Zid Annex A (normative) ASN.1 module
direction	M	INTEGER{ sameDirection (0), oppositeDirection (1), bothDirections (2), valueNotUsed (3) }(0..3)	<p>Direction of relevance within the relevance zone using the data element Direction.</p> <p>Default value shall be '0' - sameDirection</p>	ivi-optional-glc-GlcPart	CEN ISO/TS 19321:2015 Table 3 — General IVI Application Container Annex A (normative) ASN.1 module

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
iviType	M	iviType ::= INTEGER { immediateDangerWarningMessages (0), regulatoryMessages (1), trafficRelatedInformationMessages (2), pollutionMessages (3), notTrafficRelatedInformationMessages (4) } (0..7)	<p>Priority of the Container information within the overall context of IVI.</p> <p>NOTES:</p> <ol style="list-style-type: none"> <li>0. Immediate danger warning messages. Information regarding immediate danger warning.</li> <li>1. Regulatory messages. Information regarding regulatory messages.</li> <li>2. Traffic-related information messages. Traffic-related information which is not linked to immediate danger.</li> <li>3. Pollution messages. Information messages and warning messages excluding driving prohibitions and obligations.</li> <li>4. Not traffic-related information messages. Other information not linked to the traffic.</li> </ol> <p>Default type shall be '1' – regulatory messages.</p>	ivi-optional-gic-GicPart	CEN ISO/TS 19321:2015 Table 3 — General IVI Application Container 7.3.16 IviType Annex A (normative) ASN.1 module
trafficSignPictogram	M	ENUMERATED { dangerWarning, regulatory, informative, ... }	Default value shall be 'regulatory'	ivi-optional-gic-GicPart-roadSignCodes-RSCode- code-iso14823-pictogramCode-serviceCategoryCode	CEN ISO/TS 19321:2015 7.2.9 ISO14823Code 7.2.14 RSCode Annex A (normative) ASN.1 module
nature	M	INTEGER (1..9)	Default value shall be '5'	ivi-optional-gic-GicPart-roadSignCodes-RSCode- code-iso14823-pictogramCode-pictogramCategoryCode	CEN ISO/TS 19321:2015 Annex A (normative) ASN.1 module
serialNumber	M	INTEGER (0..99)	Default value shall be '57'	ivi-optional-gic-GicPart-roadSignCodes-RSCode- code-iso14823-pictogramCode-pictogramCategoryCode	CEN ISO/TS 19321:2015 Annex A (normative) ASN.1 module

Data element	Use (M/O)	Format	Notes	Message Tree Reference	Reference
spm	M	INTEGER(0..250)	NOTE: Speed value.	ivi-optional-gic-GicPart-roadSignCodes-RSCode- code-iso14823-attributes-spe	CEN ISO/TS 19321:2015 Annex A (normative) ASN.1 module
unit	M	INTEGER { kmperh (0), milesperh (1), kilometre (2), metre (3), decimetre (4), centimetre (5), mile (6), yard (7), foot (8), minutesOfTime (9), tonnes (10),—1000 kg, not Ton! hundredkg (11), pound (12),—lbs rateOfIncline (13), durationinminutes (14) — value 15 reserved for future use (0..15)	Default value shall be '0'	ivi-optional-gic-GicPart-roadSignCodes-RSCode- code-iso14823-attributes-spe	CEN ISO/TS 19321:2015 Annex A (normative) ASN.1 module



## 7 SPATEM Data Elements

SPATEMs must include the data elements marked 'M' in the 'Use' column.

**Table 7-1: SPATEM Data Elements**

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
protocolVersion	M	INTEGER{ currentVersion(1) } (0..255)	The DE protocolVersion is used to select the appropriate protocol decoder at the receiving ITS-S.  <i>currentVersion</i> shall be set to '1'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
messageID	M	INTEGER{ denm(1), cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7) } (0..255)	This DE messageID should be harmonized with other V2X message identifier definitions.  <i>messageID</i> shall be set to '4'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
stationID	M	INTEGER(0..4294967295)	Identifier for an ITS-S.  The ITS-S ID may be a pseudonym. It may change over space and/or over time.  The DE is used in ActionID DF as defined in clause A.102 and ItsPduHeader DF as defined in clause A.114.	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader A.77 DE_StationID
timeStamp	M	INTEGER (0..527040)	Represented as DE_MinuteOfTheYear data element expresses the number of elapsed minutes of the current year in the time system being used (typically UTC time). It is typically used to provide a longer range time stamp indicating when a message was created. Taken together with the <i>DSecond</i> data element, it provides a range of one full year with a resolution of 1mSecond. NOTE: the value 527040 shall be used for invalid	spat	SAE J2735 (MAR2016) 5.13 Message: MSG_SignalPhaseAndTiming Message (SPAT) 7.100 Data Element: DE_MinuteOfTheYear

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
id	M	INTEGER (0..65535)	<p><i>IntersectionID</i> is a data element to represent 'id' and is used within a region to uniquely define an intersection within that country or region in a 16-bit field. Assignment rules are established by the regional authority associated with the <i>RoadRegulatorID</i> under which this <i>IntersectionID</i> is assigned. Within the region the policies used to ensure an assigned value's uniqueness before that value is reused (if ever) is the responsibility of that region. Any such reuse would be expected to occur over a long epoch (many years).</p> <p>NOTE: The values zero through 255 are allocated for testing purposes Note that the value assigned to an intersection will be unique within a given regional ID only</p>	spat-intersections-IntersectionState-id	<p>SAE J2735 (MAR2016) 7.56 Data Element: DE_IntersectionID 6.37 Data Frame: DF_IntersectionState 6.36 Data Frame: DF_IntersectionReferenceID</p>
revision	M	INTEGER (0..127)	<p>The DE_MsgCount is a data element to represent 'revision'. It is used to provide a sequence number within a stream of messages with the same <i>DSRCmsgID</i> and from the same sender. A sender may initialize this element to any value in the range 0-127 when sending the first message with a given <i>DSRCmsgID</i>, or if the sender has changed identity (e.g. by changing its <i>TemporaryID</i>) since sending the most recent message with that <i>DSRCmsgID</i>. Depending on the application the sequence number may change with every message or may remain fixed during a stream of messages when the content within each message has not changed from the prior message sent. For this element, the value after 127 is zero.</p> <p>The receipt of a non-sequential <i>MsgCount</i> value (from the same sending device and message type) implies that one or more messages from that sending device may have been lost, unless <i>MsgCount</i> has been re-initialized due to an identity change.</p>	spat-intersections-IntersectionState	<p>SAE J2735 (MAR2016) 6.37 Data Frame: DF_IntersectionState 7.104 Data Element: DE_MsgCount</p>

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
status	M	BIT STRING { <i>manualControllsEnabled</i> (0), <i>stopTimelsActivated</i> (1), <i>failureFlash</i> (2), <i>preemptIsActive</i> (3), <i>signalPriorityIsActive</i> (4), <i>fixedTimeOperation</i> (5), <i>trafficDependentOperation</i> (6), <i>standbyOperation</i> (7), <i>failureMode</i> (8), <i>off</i> (9), <i>recentMAPmessageUpdate</i> (10), <i>recentChangeInMAPassignedLanesIDsUsed</i> (11), <i>noValidMAPisAvailableAtThisTime</i> (12), <i>noValidSPATisAvailableAtThisTime</i> (13) } (SIZE(16))	<p>The Intersection Status Object contains Advanced Traffic Controller (ATC) status information that may be sent to local OBUs as part of the SPATEM process.</p> <p>NOTE:            All zeros indicate normal operating mode with no recent changes. The duration of the term 'recent' is defined by the system performance requirement in use.  <i>manualControllsEnabled</i> (0) - Timing reported is per programmed values, etc. but person at cabinet can manually request that certain intervals are terminated early (e.g. green).  <i>stopTimelsActivated</i> (1) - And all counting/timing has stopped.  <i>failureFlash</i> (2) - Above to be used for any detected hardware failures, e.g. conflict monitor as well as for police flash  <i>preemptIsActive</i> (3)  <i>signalPriorityIsActive</i> (4)  <i>fixedTimeOperation</i> (5) - Schedule of signals is based on time only (i.e. the state can be calculated)  <i>trafficDependentOperation</i> (6) - Operation is based on different levels of traffic parameters (requests, duration of gaps or more complex parameters)  <i>standbyOperation</i> (7) - Controller: partially switched off or partially Yellow flashing  <i>failureMode</i> (8) - Controller has a problem or failure in operation  <i>off</i> (9) - Controller is switched off related to MAPEM and SPATEM bindings  <i>recentMAPmessageUpdate</i> (10) - MAPEM revision with content changes  <i>recentChangeInMAPassignedLanesIDsUsed</i> (11) - Change in MAP's assigned lanes used (lane changes. Changes in the active lane list description  <i>noValidMAPisAvailableAtThisTime</i> (12) - MAPEM (and various lanes indexes) not available  <i>noValidSPATisAvailableAtThisTime</i> (13) - SPATEM system is not working currently. Bits 14,15 reserved at this time and shall be zero</p>	spat- intersections- IntersectionState	SAE J2735 (MAR2016) 6.37 Data Frame: DF_IntersectionState 7.57 Data Element: DE_IntersectionStatusObject

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
moy	M	INTEGER (0..527040)	<p>Represented as DE_MinuteOfTheYear data element expresses the number of elapsed minutes of the current year in the time system being used (typically UTC time). It is typically used to provide a longer range time stamp indicating when a message was created. Taken together with the DSecond data element, it provides a range of one full year with a resolution of 1mSecond.</p> <p>NOTE: the value 527040 shall be used for invalid</p>	spat-intersections-IntersectionState	<p>SAE J2735 (MAR2016)</p> <p>6.37 Data Frame: DF_IntersectionState</p> <p>7.100 Data Element: DE_MinuteOfTheYear</p>
timeStamp	M	INTEGER (0..65535)	<p>The DSRC second expressed in this data element consists of integer values from zero to 60999, representing the milliseconds within a minute. A leap second is represented by the value range 60000 to 60999. The value of 65535 shall represent an unavailable value in the range of the minute. The values from 61000 to 65534 are reserved.</p> <p>NOTE: units of milliseconds</p>	spat-intersections-IntersectionState	<p>SAE J2735 (MAR2016)</p> <p>6.37 Data Frame: DF_IntersectionState</p> <p>7.39 Data Element: DE_DSecond</p>
signalGroup	M	INTEGER (0..255)	<p>The <i>SignalGroupID</i> is a data element to represent 'signalGroup'. The <i>SignalGroupID</i> is an index used to MAPEM between the internal state machine of one or more signal controllers (or other types of traffic flow devices) and a common numbering system that can represent all possible combinations of active states (movements and phases in US traffic terminology). All possible movement variations are assigned a unique value within the intersection. Conceptually, the ID represents a means to provide a list of lanes in a set which would otherwise need to be enumerated in the message. The values zero and 255 are reserved, so there may up to 254 different signal group IDs within one single intersection. The value 255 represents a protected-Movement-Allowed or permissive-Movement-Allowed condition that always exists. This value is applied to lanes, with or without traffic control devices that operate as free-flow lanes. Typically referred to as Channelized Right/Left Turn Lanes (in right/left-hand drive countries).</p>	spat-intersections-IntersectionState-states-MovementState	<p>SAE J2735 (MAR2016)</p> <p>6.53 Data Frame: DF_MovementState</p> <p>7.171 Data Element: DE_SignalGroupID</p>

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
connectionID	M	INTEGER (0..255)	The <i>LaneConnectionID</i> data entry is used to state a connection index for a lane to lane connection. It is used to relate this connection between the lane (defined in the MAP) and any dynamic clearance data sent in the SPAT. It should be noted that the index may be shared with other lanes (for example, two left turn lanes may share the same dynamic clearance data). It should also be noted that a given lane to lane connection may be part of more than one <i>GroupID</i> due to signal phase considerations but will only have one ConnectionID. The ConnectionID concept is not used (is not present) when dynamic clearance data is not provided in the SPAT.	spat-intersections-IntersectionState-states-MovementState-maneuverAssistList-ConnectionmaneuverAssistList	SAE J2735 (MAR2016) 7.86 Data Element: DE_LaneConnectionID
pedBicycleDetect	M	BOOLEAN -- true if ANY Pedestrians or Bicyclists are -- detected crossing the target lane or lanes	The <i>PedestrianBicycleDetect</i> data element is used to provide an indication of whether Pedestrians and/or Bicyclists have been detected in the crossing lane.	spat-intersections-IntersectionState-states-MovementState-maneuverAssistList-ConnectionmaneuverAssistList	SAE J2735 (MAR2016) 7.131 Data Element: DE_PedestrianBicycleDetect
eventState	M	ENUMERATED { unavailable (0), dark (1), stop-Then-Proceed (2), stop-And-Remain (3), pre-Movement (4), permissive-Movement-Allowed (5), protected-Movement-Allowed (6), permissive-clearance (7), protected-clearance (8), caution-Conflicting-Traffic (9) }	The DE_MovementPhaseState data element provides the overall current state of the movement (in many cases a signal state), including its core phase state and an indication of whether this state is permissive or protected. DE_MovementPhaseState value belongs  NOTES: Note that based on the regions and the operating mode not every phase will be used in all transportation modes and that not every phase will be used in all transportation modes <i>unavailable</i> (0) - This state is used for unknown or error <i>dark</i> (1) - The signal head is dark (unlit) <b>Reds</b> <i>stop-Then-Proceed</i> (2) - Often called 'flashing red' in US. Driver Action: Stop vehicle at stop line and Do not proceed unless it is safe. Note that the right to proceed either right or left when it is safe may be contained in the lane description to handle what is called a 'right on red' <i>stop-And-Remain</i> (3) - e.g. called 'red light' in US. Driver Action: Stop vehicle at stop line and Do not proceed. Note that the right	spat-intersections-IntersectionState-states-MovementState-state-time-speed-MovementEvent-	SAE J2735 (MAR2016) 6.51 Data Frame: DF_MovementEvent 7.103 Data Element: DE_MovementPhaseState

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
			<p>to proceed either right or left when it is safe may be contained in the lane description to handle what is called a 'right on red'</p> <p><b>Greens</b></p> <p><i>pre-Movement</i> (4) - Not used in the US, red+yellow partly in EU. Driver Action: Stop vehicle, Prepare to proceed (pending green) and (Prepare for transition to green/go)</p> <p><i>permissive-Movement-Allowed</i> (5) - Often called 'permissive green' in US. Driver Action: Proceed with caution and must yield to all conflicting traffic. Conflicting traffic may be present in the intersection conflict area</p> <p><i>protected-Movement-Allowed</i> (6) - Often called 'protected green' in US. Driver Action: Proceed, tossing caution to the wind in indicated (allowed) direction.</p> <p><b>Yellows</b></p> <p>The vehicle is not allowed to cross the stop bar if it is possible to stop without danger.</p> <p><i>permissive-clearance</i> (7) - Often called 'permissive yellow' in US. Driver Action: Prepare to stop, Proceed if unable to stop and Clear Intersection. Conflicting traffic may be present in the intersection conflict area</p> <p><i>protected-clearance</i> (8) - Often called 'protected yellow' in US Driver Action: Prepare to stop, Proceed if unable to stop in indicated direction (to connected lane) and Clear Intersection.</p> <p><i>caution-Conflicting-Traffic</i> (9) - Often called 'flashing yellow' in US. Often used for extended periods of time. Driver Action: Proceed with caution and Conflicting traffic may be present in the intersection conflict area.</p> <p>The number assignments are not used with UPER encoding and are only to be used with DER or implicit encoding</p>		

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
startTime	M	INTEGER (0..36001)	<p>The DF_TimeChangeDetails data frame conveys details about the timing of a phase within a movement. The core data concept expressed is the time stamp (time mark) at which the related phase will change to the next state. This is often found in the <i>MinEndTime</i> element, but the other elements may be needed to convey the full concept when adaptive timing is employed.</p> <p>The StartTime element is used to relate when the phase itself started or is expected to start. This in turn allows the indication that a set of time change details refers to a future phase, rather than a currently active phase.</p> <p>By this method, timing information about "pre" phase events (which are the short transitional phase used to alert OBEs to an impending green/go or yellow/caution phase) and the longer yellow-caution phase data is supported in the same form as various green/go phases. In theory, the time change details could be sent for a large sequence of phases if the signal timing was not adaptive and the operator wished to do so. In practice, it is expected only the "next" future phase will commonly be sent. It should be noted that this also supports the sending of time periods regarding various red phases; however, this is not expected to be done commonly.</p> <p>NOTE:  Tenths of a second in the current or next hour -- In units of 1/10th second from UTC time  A range of 0-36000 covers one hour  The values 35991..35999 are used when a leap second occurs  The value 36000 is used to indicate time &gt;3600 seconds  36001 is to be used when value undefined or unknown  Note that this is NOT expressed in GPS time or in local time</p>	spat- intersections- IntersectionState- states- MovementState- state-time-speed- timing	SAE J2735 (MAR2016) 6.51 Data Frame: DF_MovementEvent 6.134 Data Frame: DF_TimeChangeDetails 7.194 Data Element: DE_TimeMark

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
minEndTime	M	INTEGER (0..36001)	<p>The element MinEndTime is used to convey the earliest time possible at which the phase could change, except when unpredictable events relating to a pre-emption or priority call disrupt a currently active timing plan. In a phase where the time is fixed (as in a fixed yellow or clearance time), this element shall be used alone. This value can be viewed as the earliest possible time at which the phase could change, except when unpredictable events relating to a pre-emption or priority call come into play and disrupt a currently active timing plan.</p> <p>NOTE: Tenths of a second in the current or next hour -- In units of 1/10th second from UTC time A range of 0~36000 covers one hour The values 35991..35999 are used when a leap second occurs The value 36000 is used to indicate time &gt;3600 seconds 36001 is to be used when value undefined or unknown Note that this is NOT expressed in GPS time or in local time</p>	<p>spat- intersections- IntersectionState- states- MovementState- state-time-speed- timing</p>	<p>SAE J2735 (MAR2016) 6.51 Data Frame: DF_MovementEvent 6.134 Data Frame: DF_TimeChangeDetails</p>
maxEndTime	O	INTEGER (0..36001)	<p>The element MaxEndTime is used to convey the latest time possible which the phase could change, except when unpredictable events relating to a pre-emption or priority call come into play and disrupt a currently active timing plan. In a phase where the time is fixed (as in a fixed yellow or clearance time), this element shall be used alone.</p> <p>NOTE: Tenths of a second in the current or next hour -- In units of 1/10th second from UTC time A range of 0~36000 covers one hour The values 35991..35999 are used when a leap second occurs The value 36000 is used to indicate time &gt;3600 seconds 36001 is to be used when value undefined or unknown Note that this is NOT expressed in GPS time or in local time</p>	<p>spat- intersections- IntersectionState- states- MovementState- state-time-speed- timing</p>	<p>SAE J2735 (MAR2016) 6.51 Data Frame: DF_MovementEvent 6.134 Data Frame: DF_TimeChangeDetails</p>



Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
connectionID	M	INTEGER (0..255)	The LaneConnectionID data entry is used to state a connection index for a lane to lane connection. It is used to relate this connection between the lane (defined in the MAP) and any dynamic clearance data sent in the SPAT. It should be noted that the index may be shared with other lanes (for example, two left turn lanes may share the same dynamic clearance data). It should also be noted that a given lane to lane connection may be part of more than one GroupID due to signal phase considerations but will only have one ConnectionID. The ConnectionID concept is not used (is not present) when dynamic clearance data is not provided in the SPAT.	spat-intersections-IntersectionState-manueverAssistList-ConnectionmanueverAssistList	SAE J2735 (MAR2016) 7.86 Data Element: DE_LaneConnectionID
pedBicycleDetect	M	BOOLEAN -- true if ANY Pedestrians or Bicyclists are -- detected crossing the target lane or lanes	The PedestrianBicycleDetect data element is used to provide an indication of whether Pedestrians and/or Bicyclists have been detected in the crossing lane.	spat-intersections-IntersectionState-manueverAssistList-ConnectionmanueverAssistList	SAE J2735 (MAR2016) 7.131 Data Element: DE_PedestrianBicycleDetect

PROJECT DOCUMENT  
REFERENCE ONLY

## 8 MAPEM Data Elements

MAPEMs must include the data elements marked 'M' in the 'Use' column.

**Table 8-1: MAPEM Data Elements**

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
protocolVersion	M	INTEGER{ currentVersion(1) } (0..255)	The DE protocolVersion is used to select the appropriate protocol decoder at the receiving ITS-S.  <i>currentVersion</i> shall be set to '1'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
messageID	M	INTEGER{denm(1), cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7)} (0..255)	This DE messageID should be harmonized with other V2X message identifier definitions.  <i>messageID</i> shall be set to '5'	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader
stationID	M	INTEGER(0..4294967295)	Identifier for an ITS-S. The ITS-S ID may be a pseudonym. It may change over space and/or over time. The DE is used in ActionID DF as defined in clause A.102 and ItsPduHeader DF as defined in clause A.114.	header	ETSI TS 102 894-2 V1.2.1 A.114 DF_ItsPduHeader A.77 DE_StationID
msgIssueRevision	M	INTEGER (0..127)	The MsgCount is a data element to represent 'msgIssueRevision'. MsgCount is used to provide a sequence number within a stream of messages with the same DSRCmsgID and from the same sender. A sender may initialize this element to any value in the range 0-127 when sending the first message with a given DSRCmsgID, or if the sender has changed identity (e.g. by changing its TemporaryID) since sending the most recent message with that DSRCmsgID. Depending on the application the sequence number may change with every message or may remain fixed during a stream of messages when the content within each message has not changed from the prior message sent. For this element, the value after 127 is zero.  The receipt of a non-sequential MsgCount value (from the same sending device and message type) implies that one or more messages from that sending device may have been lost, unless MsgCount has been re-initialized due to an identity change.	map	SAE J2735 (MAR2016) 5.6 Message: MSG_MapData (MAP) 7.104 Data Element: DE_MsgCount

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
name	M	IA5String (SIZE(1..63))	<p>The <i>DescriptiveName</i> is a data element to represent 'name'.</p> <p>The <i>DescriptiveName</i> data element is used in maps and intersections to provide a human readable and recognizable name for the feature that follows. It is typically used when debugging a data flow and not in production use. One key exception to this general rule is to provide a human-readable string for disabled travellers in the case of crosswalks and sidewalk lane objects.</p>	map-intersections-IntersectionGeometry	SAE J2735 (MAR2016) 7.29 Data Element: DE_DescriptiveName
region	M	INTEGER (0..65535)	<p>The RoadRegulatorID is a data element to represent 'region'.</p> <p>The RoadRegulatorID is a 16-bit globally unique identifier assigned to an entity responsible for assigning Intersection IDs in the region over which it has such authority. The value zero shall be used for testing and should only be used in the absence of a suitable assignment. A single entity which assigns intersection IDs may be assigned several <i>RoadRegulatorIDs</i>. These assignments are presumed to be permanent.</p> <p>Default value for region shall be '1'.</p> <p>NOTE: The value zero shall be used for testing only</p>	map-intersections-IntersectionGeometry-id	SAE J2735 (MAR2016) 6.36 Data Frame: DF_IntersectionReferencel D 7.159 Data Element: DE_RoadRegulatorID
id	M	INTEGER (0..65535)	<p>The IntersectionID is a data element to represent 'id'.</p> <p>The IntersectionID is used within a region to uniquely define an intersection within that country or region in a 16-bit field. Assignment rules are established by the regional authority associated with the RoadRegulatorID under which this IntersectionID is assigned. Within the region the policies used to ensure an assigned value's uniqueness before that value is reused (if ever) is the responsibility of that region. Any such reuse would be expected to occur over a long epoch (many years).</p>	map-intersections-IntersectionGeometry-id	SAE J2735 (MAR2016) 6.36 Data Frame: DF_IntersectionReferencel D 7.56 Data Element: DE_IntersectionID

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
revision	M	INTEGER (0..127)	<p>The MsgCount is a data element to represent 'revision'.</p> <p>MsgCount is used to provide a sequence number within a stream of messages with the same DSRCmsgID and from the same sender. A sender may initialize this element to any value in the range 0-127 when sending the first message with a given DSRCmsgID, or if the sender has changed identity (e.g. by changing its TemporaryID) since sending the most recent message with that DSRCmsgID. Depending on the application the sequence number may change with every message or may remain fixed during a stream of messages when the content within each message has not changed from the prior message sent. For this element, the value after 127 is zero.</p> <p>The receipt of a non-sequential MsgCount value (from the same sending device and message type) implies that one or more messages from that sending device may have been lost, unless MsgCount has been re-initialized due to an identity change.</p>	map-intersections-IntersectionGeometry	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>7.104 Data Element: DE_MsgCount</p>
lat	M	INTEGER (-900000000..900000001)	<p>The Latitude is a data element to represent 'lat'.</p> <p>The geographic latitude of an object, expressed in 1/10th integer microdegrees, as a 31 bit value, and with reference to the horizontal datum then in use. The value 900000001 shall be used when unavailable.</p> <p>NOTES: LSB = 1/10 micro degree Providing a range of plus-minus 90 degrees</p>	map-intersections-IntersectionGeometry-refPoint	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.87 Data Frame: DF_Position3D</p> <p>7.91 Data Element: DE_Latitude</p>

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
long	M	INTEGER (-1799999999..1800000001)	<p>The Longitude is a data element to represent 'lat'.</p> <p>The geographic longitude of an object, expressed in 1/10th integer microdegrees, as a 32-bit value, and with reference to the horizontal datum then in use. The value 1800000001 shall be used when unavailable.</p> <p>NOTES: LSB = 1/10 micro degree Providing a range of plus-minus 180 degrees</p>	map-intersections-IntersectionGeometry-refPoint	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.87 Data Frame: DF_Position3D</p> <p>7.95 Data Element: DE_Longitude</p>
laneWidth	M	INTEGER (0..32767)	<p>The LaneWidth is a data element to represent 'laneWidth'.</p> <p>The LaneWidth data element conveys the width of a lane in LSB units of 1 cm. Maximum value for a lane is 327.67 meters in width</p> <p>NOTE: units of 1 cm</p>	map-intersections-IntersectionGeometry	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>7.90 Data Element: DE_LaneWidth</p>
laneID	M	INTEGER (0..255)	<p>The <i>LaneID</i> is a data element to represent <i>laneID</i>.</p> <p>The <i>LaneID</i> data element conveys an assigned index that is unique within an intersection. It is used to refer to that lane by other objects in the intersection MAPEM data structure. Lanes may be ingress (inbound traffic) or egress (outbound traffic) in nature, as well as barriers and other types of specialty lanes. Each lane (each lane object) is assigned a unique ID. The <i>LaneID</i>, in conjunction with the <i>intersectionID</i>, forms a regionally unique way to address a specific lane in that region.</p> <p>NOTE: The value 0 shall be used when the <i>laneID</i> is not available or not known. The value 255 is reserved for future use.</p>	map-intersections-IntersectionGeometry-laneSet- GenericLane	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>7.88 Data Element: DE_LaneID</p>

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
name	M	IA5String (SIZE(1..63))	<p>The DescriptiveName is a data element to represent 'name'.</p> <p>The DescriptiveName data element is used in maps and intersections to provide a human readable and recognizable name for the feature that follows. It is typically used when debugging a data flow and not in production use. One key exception to this general rule is to provide a human-readable string for disabled travellers in the case of crosswalks and sidewalk lane objects.</p>	map-intersections-IntersectionGeometry-laneSet- GenericLane	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>7.29 Data Element: DE_DescriptiveName</p>
ingressApproach	O	INTEGER (0..15)	<p>The <i>ApproachID</i> is a data element to represent <i>ingressApproach</i>.</p> <p>The <i>ApproachID</i> data element is used to relate the index of an approach, either ingress or egress within the subject lane. In general, an approach index in the context of a timing movement is not of value in the MAPEM and SPATEM process because the lane ID and signal group ID concepts handle this with more precision. This value can also be useful as an aid as it can be used to indicate the gross position of a moving object (vehicle) when its lane level accuracy is unknown. This value can also be used when a deployment represents sets of lanes as groups without further details (as is done in Japan).</p> <p>NOTE: inbound approach zero to be used when valid value is unknown</p>	map-intersections-IntersectionGeometry-laneSet- GenericLane	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>7.11 Data Element: DE_ApproachID</p>

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
egressApproach	O	INTEGER (0..15)	<p>The ApproachID is a data element to represent 'egressApproach'.</p> <p>The ApproachID data element is used to relate the index of an approach, either ingress or egress within the subject lane. In general, an approach index in the context of a timing movement is not of value in the MAPEM and SPATEM process because the lane ID and signal group ID concepts handle this with more precision. This value can also be useful as an aid as it can be used to indicate the gross position of a moving object (vehicle) when its lane level accuracy is unknown. This value can also be used when a deployment represents sets of lanes as groups without further details (as is done in Japan).</p> <p>NOTE: outbound approach zero to be used when valid value is unknown</p>	map-intersections-IntersectionGeometry-laneSet- GenericLane	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>7.11 Data Element: DE_ApproachID</p>
directionalUse	M	BIT STRING { ingressPath (0), egressPath (1) } (SIZE (2))	<p>The <i>LaneDirection</i> is a data element to represent 'directionalUse'.</p> <p>The <i>LaneDirection</i> data element is used to denote the allowed direction of travel over a lane object. By convention, the lane object is always described from the stop line outwards away from the intersection. Therefore, the ingress direction is from the end of the path to the stop line and the egress direction is from the stop line outwards. It should be noted that some lane objects are not used for travel and that some lane objects allow bi-directional travel.</p> <p>NOTES: With bits as defined: Allowed directions of travel in the lane object All lanes are described from the stop line outwards <i>ingressPath</i> (0) - travel from rear of path to front is allowed <i>egressPath</i> (1) - travel from front of path to rear is allowed No Travel, i.e. the lane object type does not support travel (medians, curbs, etc.) is indicated by not asserting any bit value Bi-Directional Travel (such as a ped crosswalk) is indicated by asserting both of the bits</p>	map-intersections-IntersectionGeometry-laneSet-GenericLane-laneAttributes	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>6.44 Data Frame: DF_LaneAttributes</p> <p>7.87 Data Element: DE_LaneDirection</p>

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
sharedWith	M	BIT STRING { overlappingLaneDescriptionProvided (0), multipleLanesTreatedAsOneLane (1), otherNonMotorizedTrafficTypes (2), individualMotorizedVehicleTraffic (3), busVehicleTraffic (4), taxiVehicleTraffic (5), pedestriansTraffic (6), cyclistVehicleTraffic (7), trackedVehicleTraffic (8), pedestrianTraffic (9) } (SIZE (10))	<p>The <i>LaneSharing</i> is a data element to represent 'sharedWith'.</p> <p>The <i>LaneSharing</i> data element is used to denote the presence of other user types (travel modes) who have an equal right to access and use the lane. There may also be another lane object describing their use of a lane. This data concept is used to indicate lanes and/or users that travel along the same path, and not those that simply cross over the lane's segments path (such as a pedestrian crosswalk crossing a lane for motor vehicle use). The typical use is to alert the user of the MAPEM data that additional traffic of another mode may be present in the same spatial lane.</p> <p>NOTES:</p> <p>Bits shall be set using the following options:</p> <p><i>overlappingLaneDescriptionProvided</i> (0) - Assert when another lane object is present to describe the path of the overlapping shared lane this construct is not used for lane objects which simply cross.</p> <p><i>multipleLanesTreatedAsOneLane</i> (1) - Assert if the lane object path and width details represents multiple lanes within it that are not further described</p> <p>Various modes and type of traffic that may share this lane:</p> <p><i>otherNonMotorizedTrafficTypes</i> (2) - horse drawn etc.</p> <p><i>individualMotorizedVehicleTraffic</i> (3),  <i>busVehicleTraffic</i> (4),  <i>taxiVehicleTraffic</i> (5),  <i>pedestriansTraffic</i> (6),  <i>cyclistVehicleTraffic</i> (7),  <i>trackedVehicleTraffic</i> (8),  <i>pedestrianTraffic</i> (9)</p> <p>Default shall all be zeros.            All zeros would indicate 'not shared' and 'not overlapping'</p>	map-intersections-IntersectionGeometry-laneSet-GenericLane-laneAttributes	SAE J2735 (MAR2016) 6.34 Data Frame: DF_IntersectionGeometry 6.34 Data Frame: DF_IntersectionGeometry 6.47 Data Frame: DF_LaneList 6.29 Data Frame: DF_GenericLane 6.44 Data Frame: DF_LaneAttributes 7.89 Data Element: DE_LaneSharing



Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
vehicle	M	BIT STRING { isVehicleRevocableLane(0), isVehicleFlyOverLane(1), hovLaneUseOnly (2), restrictedToBusUse (3), restrictedToTaxiUse (4), restrictedFromPublicUse (5), hasIRbeaconCoverage (6), permissionOnRequest (7) } (SIZE (8,...)) }	The <i>LaneAttributes-Vehicle</i> data element relates specific properties found in a vehicle lane type. This data element provides a means to denote that the use of a lane is restricted to certain vehicle types. Various common lane attribute properties (such as travel directions and allowed movements or maneuvers) can be found in other entries. NOTE: For CAVI pilot, <i>laneType</i> shall be a choice between <i>vehicle</i> and <i>crosswalk</i> .	map-intersections-IntersectionGeometry-laneSet-GenericLane-laneAttributes-laneType	SAE J2735 (MAR2016) 6.34 Data Frame: DF_IntersectionGeometry 6.34 Data Frame: DF_IntersectionGeometry 6.47 Data Frame: DF_LaneList 6.29 Data Frame: DF_GenericLane 6.44 Data Frame: DF_LaneAttributes 6.48 Data Frame: DF_LaneTypeAttributes 7.85 Data Element: DE_LaneAttributes-Vehicle
crosswalk	M	BIT STRING { crosswalkRevocableLane (0), bicycleUseAllowed (1), isXwalkFlyOverLane (2), fixedCycleTime (3), biDirectionalCycleTimes (4), hasPushToWalkButton (5), audioSupport (6), rfSignalRequestPresent(7), unsignalizedSegmentsPresent (8) } (SIZE (16)) }	The <i>LaneAttributes-Crosswalk</i> data element relates specific properties found in a crosswalk lane type. It should be noted that various common lane attribute properties (such as travel directions and allowed movements or maneuvers) can be found in other entries. NOTE: For CAVI pilot, <i>laneType</i> shall be a choice between <i>vehicle</i> and <i>crosswalk</i> .	map-intersections-IntersectionGeometry-laneSet-GenericLane-laneAttributes-laneType	SAE J2735 (MAR2016) 6.34 Data Frame: DF_IntersectionGeometry 6.34 Data Frame: DF_IntersectionGeometry 6.47 Data Frame: DF_LaneList 6.29 Data Frame: DF_GenericLane 6.44 Data Frame: DF_LaneAttributes 6.48 Data Frame: DF_LaneTypeAttributes 7.80 Data Element: DE_LaneAttributes-Crosswalk

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
maneuvers	M	BIT STRING { maneuverStraightAllowed (0), maneuverLeftAllowed (1), maneuverRightAllowed (2), maneuverUTurnAllowed (3), maneuverLeftTurnOnRedAllowed (4), maneuverRightTurnOnRedAllowed (5), maneuverLaneChangeAllowed (6), maneuverNoStoppingAllowed (7), yieldAlwaysRequired (8), goWithHalt (9), caution (10), reserved1 (11)	<p>The DE_AllowedMovements data element relates the allowed (possible) maneuvers from a lane, typically a motorized vehicle lane. It should be noted that in practice these values may be further restricted by vehicle class, local regulatory environment and other changing conditions.</p> <p>NOTES: maneuvers are as follows:  <i>maneuverStraightAllowed</i> (0) - a Straight movement is allowed in this lane  <i>maneuverLeftAllowed</i> (1) - a Left Turn movement is allowed in this lane  <i>maneuverRightAllowed</i> (2) - a Right Turn movement is allowed in this lane  <i>maneuverUTurnAllowed</i> (3) - a U turn movement is allowed in this lane  <i>maneuverLeftTurnOnRedAllowed</i> (4) - a Stop, and then proceed when safe movement is allowed in this lane  <i>maneuverRightTurnOnRedAllowed</i> (5) - a Stop, and then proceed when safe movement is allowed in this lane  <i>maneuverLaneChangeAllowed</i> (6) - a movement which changes to an outer lane on the egress side is allowed in this lane (example: left into either outbound lane)  <i>maneuverNoStoppingAllowed</i> (7) - the vehicle should not stop at the stop line (example: a flashing green arrow)  <i>yieldAlwaysRequired</i> (8) - the allowed movements above are not protected (example: a permanent yellow condition)  <i>goWithHalt</i> (9) - after making a full stop, may proceed  <i>caution</i> (10) - proceed past stop line with caution  <i>reserved1</i> (11) - used to align to 12 Bit Field</p> <p>A value of zero shall be used for unknown, indicating no Maneuver.  <b>Refer to Standard for more details.</b></p>	map-intersections-IntersectionGeometry-laneSet-GenericLane	SAE J2735 (MAR2016) 6.34 Data Frame: DF_IntersectionGeometry 6.34 Data Frame: DF_IntersectionGeometry 6.47 Data Frame: DF_LaneList 6.29 Data Frame: DF_GenericLane 7.4 Data Element: DE_AllowedManeuvers

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
x	M	See Description	<p><b>Refer to Standard for more details.</b></p> <p>The DF_NodeOffsetPointXY data frame presents a structure to hold different sized data frames for a single node point in a lane. Nodes are described in terms of X and Y offsets in units of 1 centimetre (when zoom is 1:1). Changes in elevation and in the lane width can be expressed in a similar way with the optional Attributes data entry which appears alongside the <i>NodeOffsetPoint</i> in use.</p> <p>The choice of which node type is driven by the magnitude (size) of the offset data to be encoded. When the distance from the last node point is smaller, the smaller entries can (and should) be chosen</p> <p>Each single selected node is computed as an X and Y offset from the prior node point unless one of the entries reflecting a complete lat-long representation is selected. In this case, subsequent entries become offsets from that point. This ability was added for assistance with the development, storage, and back office exchange of messages where message size is not a concern and should not be sent over the air due to its additional message payload size.</p>	map-intersections-IntersectionGeometry-laneSet-GenericLane-nodeList- nodes-NodeXY-delta- <i>node-XYn</i>	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>6.75 Data Frame: DF_NodeOffsetPointXY</p>
y	M	See Description	<p><b>Refer to Standard for more details.</b></p> <p>The DF_NodeOffsetPointXY data frame presents a structure to hold different sized data frames for a single node point in a lane. Nodes are described in terms of X and Y offsets in units of 1 centimetre (when zoom is 1:1). Changes in elevation and in the lane width can be expressed in a similar way with the optional Attributes data entry which appears alongside the <i>NodeOffsetPoint</i> in use.</p> <p>The choice of which node type is driven by the magnitude (size) of the offset data to be encoded. When the distance from the last node point is smaller, the smaller entries can (and should) be chosen</p> <p>Each single selected node is computed as an X and Y offset from the prior node point unless one of the entries reflecting a complete lat-long representation is selected. In this case, subsequent entries become offsets from that point. This ability was added for assistance with the development, storage, and back office exchange of messages where message size is not a concern and should not be sent over the air due to its additional message payload size.</p>	map-intersections-IntersectionGeometry-laneSet-GenericLane-nodeList- nodes-NodeXY-delta- <i>node-XYn</i>	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>6.75 Data Frame: DF_NodeOffsetPointXY</p>

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
lane	M	INTEGER (0..255)	<p>The LaneID is a data element to represent 'lane'.</p> <p>The LaneID data element conveys an assigned index that is unique within an intersection. It is used to refer to that lane by other objects in the intersection MAPEM data structure. Lanes may be ingress (inbound traffic) or egress (outbound traffic) in nature, as well as barriers and other types of specialty lanes. Each lane (each lane object) is assigned a unique ID. The Lane ID, in conjunction with the intersection ID, forms a regionally unique way to address a specific lane in that region.</p> <p>NOTES:  the value 0 shall be used when the lane ID is not available or not known  the value 255 is reserved for future use</p>	map-intersections-IntersectionGeometry-laneSet-GenericLane-connectsTo – Connection - connectingLane	SAE J2735 (MAR2016) 6.34 Data Frame: DF_IntersectionGeometry 6.34 Data Frame: DF_IntersectionGeometry 6.47 Data Frame: DF_LaneList 6.29 Data Frame: DF_GenericLane 6.16 Data Frame: DF_ConnectsToList 6.14 Data Frame: DF_Connection 6.13 Data Frame: DF_ConnectingLane 7.88 Data Element: DE_LaneId

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Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
maneuver	M	BIT STRING { maneuverStraightAllowed (0), maneuverLeftAllowed (1), maneuverRightAllowed (2), maneuverUTurnAllowed (3), maneuverLeftTurnOnRedAllowed (4), maneuverRightTurnOnRedAllowed (5), maneuverLaneChangeAllowed (6), maneuverNoStoppingAllowed (7), yieldAlwaysRequired (8), goWithHalt (9), caution (10), reserved1 (11)	<p>The AllowedMovements is a data element to represent 'maneuver'. The AllowedMovements data element relates the allowed (possible) maneuvers from a lane, typically a motorized vehicle lane. It should be noted that in practice these values may be further restricted by vehicle class, local regulatory environment and other changing conditions.</p> <p>NOTES: maneuver are as follows: <i>maneuverStraightAllowed</i> (0) - a Straight movement is allowed in this lane <i>maneuverLeftAllowed</i> (1) - a Left Turn movement is allowed in this lane <i>maneuverRightAllowed</i> (2) - a Right Turn movement is allowed in this lane <i>maneuverUTurnAllowed</i> (3) - a U turn movement is allowed in this lane <i>maneuverLeftTurnOnRedAllowed</i> (4) - a Stop, and then proceed when safe movement is allowed in this lane <i>maneuverRightTurnOnRedAllowed</i> (5) - a Stop, and then proceed when safe movement is allowed in this lane <i>maneuverLaneChangeAllowed</i> (6) - a movement which changes to an outer lane on the egress side is allowed in this lane (example: left into either outbound lane) <i>maneuverNoStoppingAllowed</i> (7) - the vehicle should not stop at the stop line (example: a flashing green arrow) <i>yieldAlwaysRequired</i> (8) - the allowed movements above are not protected (example: a permanent yellow condition) <i>goWithHalt</i> (9) - after making a full stop, may proceed <i>caution</i> (10) - proceed past stop line with caution <i>reserved1</i> (11) - used to align to 12 Bit Field</p> <p>A value of zero shall be used for unknown, indicating no Maneuver. <b>Refer to Standard for more details.</b></p>	map-intersections-IntersectionGeometry-laneSet-GenericLane-connectsTo – Connection - connectingLane	SAE J2735 (MAR2016) 6.34 Data Frame: DF_IntersectionGeometry 6.34 Data Frame: DF_IntersectionGeometry 6.47 Data Frame: DF_LaneList 6.29 Data Frame: DF_GenericLane 6.16 Data Frame: DF_ConnectsToList 6.14 Data Frame: DF_Connection 7.4 Data Element: DE_AllowedManeuvers

Data Element Identifier	Use (M/O)	Format	Notes	Message Tree Reference	Reference
signalGroup	M	INTEGER (0..255)	<p>The SignalGroupID is a data element to represent 'signalGroup'.</p> <p>The SignalGroupID is an index used to MAPEM between the internal state machine of one or more signal controllers (or other types of traffic flow devices) and a common numbering system that can represent all possible combinations of active states (movements and phases in US traffic terminology). All possible movement variations are assigned a unique value within the intersection. Conceptually, the ID represents a means to provide a list of lanes in a set which would otherwise need to be enumerated in the message. The values zero and 255 are reserved, so there may up to 254 different signal group IDs within one single intersection.</p> <p>The value 255 represents a protected-Movement-Allowed or permissive-Movement-Allowed condition that always exists . This value is applied to lanes, with or without traffic control devices, that operate as free-flow lanes. Typically referred to as Channelized Right/Left Turn Lanes (in right/left-hand drive countries).</p> <p>NOTES:</p> <p>The value 0 shall be used when the ID is not available or not known the value 255 is reserved to indicate a permanent green movement state therefore a simple 8 phase signal controller device might use 1..9 as its groupIDs.</p>	map-intersections-IntersectionGeometry-laneSet-GenericLane-connectsTo - Connection	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>6.16 Data Frame: DF_ConnectsToList</p> <p>6.14 Data Frame: DF_Connection</p> <p>7.171 Data Element: DE_SignalGroupID</p>
connectionID	M	INTEGER (0..255)	<p>The LaneConnectionID data entry is used to state a connection index for a lane to lane connection. It is used to relate this connection between the lane (defined in the MAP) and any dynamic clearance data sent in the SPAT. It should be noted that the index may be shared with other lanes (for example, two left turn lanes may share the same dynamic clearance data). It should also be noted that a given lane to lane connection may be part of more than one GroupID due to signal phase considerations but will only have one ConnectionID. The ConnectionID concept is not used (is not present) when dynamic clearance data is not provided in the SPAT.</p>	map-intersections-IntersectionGeometry-laneSet-GenericLane-connectsTo - Connection	<p>SAE J2735 (MAR2016)</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.34 Data Frame: DF_IntersectionGeometry</p> <p>6.47 Data Frame: DF_LaneList</p> <p>6.29 Data Frame: DF_GenericLane</p> <p>6.16 Data Frame: DF_ConnectsToList</p> <p>6.14 Data Frame: DF_Connection</p> <p>7.86 Data Element: DE_LaneConnectionID</p>

## 9 Station Platform Message (SPM) Data Elements

The station platform message contains data that allows all station types to be monitored for performance. This data is used to maintain optimal performance of the system and to quickly identify issues and trends with the aim of ensuring participants are warned of on-road events and to ensure that the Safety Evaluator has consistent data for the Safety Analysis.

**Table 9-1: SPM Data Elements**

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
protocolVersion	M	INTEGER{ currentVersion(1) } (0..255)	1	All	The DE protocolVersion is used to select the appropriate protocol decoder at the receiving ITS-S. currentVersion shall be set to '1'	header
stationID	M	INTEGER(0..4294967295)		All	Identifier for an ITS-S. The ITS-S ID may be a pseudonym. It may change over space and/or over time.	header
stationName	M	UTF8String(SIZE(1..23))		All	The stationName DE is synonymous to MQTT's Client Identifier and is used to uniquely identify the client to the server.	header
caviMessageId	M	INTEGER { cme(0), csem(1), gtm(2), scm(3), spm(4), v(5), vss(6), r(7)} (0..255)		All	Indicates the type of message that was received or transmitted. 0 – CME, C-ITS message event 1 – CSEM, Safety Evaluation data message 2 – GTM, geo-tiling message 3 – SCM, station configuration message 4 – SPM, station platform message 5 – C-ITS messages, excluding static speed 6 – static speed IVIM 7 – MAPEM for the R-ITS-S	header
management	M	-		All	Data frame containing management data	spm
referenceTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		All	The <i>referenceTime</i> represents the time at which a SPM is generated by the C-ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	spm - management

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
sessionNumber	M	INTEGER(0..4294967295)		All	The sessionNumber DE is a unique number used to identify the session of a C-ITS station. By default, sessionNumber increments every time a power cycle has occurred.	spm - management
sequenceNumber	M	INTEGER(0..4294967295)		All	The sequenceNumber DE is a unique number used to identify a SPM sent to the C-ITS-F. By default, a C-ITS Station transmits one SPM a minute. The sequenceNumber increments every transmission.	spm - management
participantCode	O	INTEGER { nonParticipant(7998), noSelection(7999) } (0..8000)		V-ITS-S	The <i>participantCode</i> is a pseudo name to uniquely identify a human participant.	spm - management
fieldStationData	O			R-ITS-S V-ITS-S	Data frame containing metrics generated by a field station	spm
softwareVersion	M	IA5String(SIZE(1..255))		All	Includes firmware, application software as a delimited string	spm - fieldStationData
stationParametersVersion	M	INTEGER(0..65535)		R-ITS-S V-ITS-S	Version number of the station parameter set in use for this session	spm - fieldStationData
systemParametersVersion	M	INTEGER(0..65535)		R-ITS-S V-ITS-S	Version number of the set of system parameters in use for this session	spm - fieldStationData
tileDataSetVersion	M	INTEGER(0..65535)		V-ITS-S	The <i>tileDataSetVersion</i> is a unique identifier of the tile set being used during the last minute	spm - fieldStationData
staticSpeedIvimDataSetVersion	M	INTEGER(0..65535)		V-ITS-S	The <i>staticSpeedIvimDataSetVersion</i> is a unique identifier of the static speed IVIM data set being used during the last minute.	spm - fieldStationData
positionAugmentationError	O	BOOLEAN		R-ITS-S V-ITS-S	Included if the station has experienced a position augmentation error since the last SPM	spm - fieldStationData
securityEnabled	M	BOOLEAN		R-ITS-S V-ITS-S	Used to enable/disable C-ITS message signing.	spm - fieldStationData
citsSoftwareEnabled	M	BOOLEAN		R-ITS-S V-ITS-S	An indicator of whether the use-case applications (for example, RHW) are running on the station	spm - fieldStationData



Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
hmiEnabled	M	BOOLEAN		R-ITS-S V-ITS-S	An indicator of whether the HMI is displaying messages or not. The HMI is disabled for participants in the control group.	spm - fieldStationData
latitude	O	INTEGER {oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(900000001)} (-900000000..900000001)		V-ITS-S	The latitude of the vehicle when the SPM was generated	spm - fieldStationData
longitude	O	INTEGER {oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(1800000001)} (-1800000000..1800000001)		V-ITS-S	The longitude of the vehicle when the SPM was generated	spm - fieldStationData
wanIpv4Address	O	IA5String(SIZE(7..15))		V-ITS-S	The current IPv4 address of the WAN interface if it is up	spm - fieldStationData
wanIpv6Address	O	IA5String(SIZE(2..39))		V-ITS-S	The current IPv6 address of the WAN interface if it is up	spm - fieldStationData
metrics	M	SEQUENCE SIZE (1..32) OF PlatformMetrics		All	A metrics data frame is used to bundle the collection of station metrics.	spm – fieldStationData - metrics
numberProcessingUnits	M	INTEGER (1..16)		R-ITS-S V-ITS-S	Reports the number of processing units	spm – fieldStationData - metrics
cpuOneMinuteLoadAverage	M	INTEGER { oneTenth(1) } (0..1000)		R-ITS-S V-ITS-S	Reports the last CPU 1-minute-average	spm – fieldStationData - metrics
cpuTemperature	M	INTEGER { oneDegreeCelcius(1) } (40..150)		R-ITS-S V-ITS-S	Reports the current CPU temperature	spm – fieldStationData - metrics
storageInUse	M	INTEGER { onePercent(1) } (0..100)		R-ITS-S V-ITS-S	Reports the percent of storage in use	spm – fieldStationData - metrics
gnssHdopErrorCount	M	INTEGER (0..600, ...)		R-ITS-S V-ITS-S	Reports the GNSS HDOP error count for the SPM period	spm – fieldStationData - metrics

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
gnssPdopErrorCount	M	INTEGER (0..600, ...)		R-ITS-S V-ITS-S	Reports the GNSS PDOP error count for the SPM period	spm – fieldStationData - metrics
gnssVdopErrorCount	M	INTEGER (0..600, ...)		R-ITS-S V-ITS-S	Reports the GNSS VDOP error count for the SPM period	spm – fieldStationData - metrics
gnssSatelliteErrorCount	M	INTEGER (0..600, ...)		R-ITS-S V-ITS-S	Reports the number time in the SPM period that the GNSS satellite count is below the threshold specified in the SCM	spm – fieldStationData - metrics
networkInterfaceError	M	SEQUENCE SIZE(1..4) OF INTEGER (0..4294967295)		R-ITS-S V-ITS-S	Reports the number of errors on each of up to 4 network interfaces	spm – fieldStationData - metrics
networkIfUnavailableCount	M	INTEGER (0..1024, ...)		R-ITS-S V-ITS-S	Reports the count of times that the station detected that the network interface was unavailable for the SPM period	spm – fieldStationData - metrics
freePhysicalMemory	M	INTEGER { onePercent(1) } (0..100)		R-ITS-S V-ITS-S	Reports the percentage of free physical memory at the time that the SPM was generated	spm – fieldStationData - metrics
systemUptime	M	INTEGER { oneMinute(1) } (0..4294967295)		R-ITS-S V-ITS-S	Reports the cumulative value that the station has been up in minutes	spm – fieldStationData - metrics
messageSignatureErrorCount	M	INTEGER (0..65535)		R-ITS-S V-ITS-S	Reports the number of times that the station detected a C-ITS message signature failure in this SPM period	spm – fieldStationData - metrics
gnssNoSyncTime	M	INTEGER { oneSecond(1) } (0..4294967295)		R-ITS-S V-ITS-S	Reports the cumulative value that GNSS has not been synchronised.	spm – fieldStationData - metrics
fpRitssTimeSyncErrorCount	O	INTEGER { none(0), moreThan1023(1024) } (0..1024)		R-ITS-S	The count of times for the current SPM period where the R-ITS-S detected a time synchronisation error in the data being sent by the STREAMS® Field Processor	spm – fieldStationData - metrics
citsMessageDecodeErrorCount	M	INTEGER (0..65536)		R-ITS-S V-ITS-S	The count of the messages that could not be decoded by the station in the current SPM period	spm – fieldStationData - metrics
ltsNoConnectionTime	O	{ oneSecond(1) } (0..4294967295)		V-ITS-S	The cumulative time that the LTS interface has not been connected	spm – fieldStationData - metrics

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
radioSignalStrengthIndicator	O	INTEGER { oneDb(-1), isMinOrLess(-200) } (-200..0)		V-ITS-S	The current radio strength	spm – fieldStationData - metrics
failedLoginAttemptCount	O	INTEGER		R-ITS-S V-ITS-S	The count of the number of times a user login attempt has failed. The count accumulator is set to 0 after each SPM is sent	spm – fieldStationData - metrics
iowait	M	INTEGER { zero(0), onePercent(10) } (0..1000)		R-ITS-S V-ITS-S	The current iowait time for the station	spm – fieldStationData - metrics
exceptionCount	M	INTEGER { none(0), maximum(65534), moreThanMaximum(65535) } (0..65535)		R-ITS-S V-ITS-S	The count of exceptions logged in the current SPM period	spm – fieldStationData
exceptions	O	SEQUENCE (SIZE(1..384)) OF Exception		R-ITS-S V-ITS-S	A data frame containing exceptions logged in the current SPM period	spm – fieldStationData
timestamp	M	INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		R-ITS-S V-ITS-S	ETSI TS 102 894-2 <i>Timestamp</i> ITS data element	spm – fieldStationData - exceptions
messageCount	M	INTEGER(0..65535)		R-ITS-S V-ITS-S	The count of times that the message occurred in the SPM period	spm – fieldStationData - exceptions
name	M	IA5String (SIZE(1..48))		R-ITS-S V-ITS-S	The name of the message	spm – fieldStationData - exceptions
level	M	IA5String (SIZE(1..32))		R-ITS-S V-ITS-S	The level of the message (for example, Error, Critical)	spm – fieldStationData - exceptions
message	M	IA5String (SIZE(1..160))		R-ITS-S V-ITS-S	The message content	spm – fieldStationData - exceptions
module	M	IA5String (SIZE(1..48))		R-ITS-S V-ITS-S	The software module that generated the message	spm – fieldStationData - exceptions

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
lineNumber	M	INTEGER(0..65535)		R-ITS-S V-ITS-S	The line number in the software module that the error occurred	spm – fieldStationData - exceptions
hmiData	O	-		V-ITS-S	A data frame containing messages related to the V-ITS-S HMI device	spm – fieldStationData
hmiSoftwareVersion	M	IA5String(SIZE(1..255))		V-ITS-S	The version of the HMI software running on the device	spm – fieldStationData - hmiData
hmiConfigurationSetId	M	INTEGER(0..4294967295)		V-ITS-S	The version of the HMI display icons and sound bites that is running on the device	spm – fieldStationData - hmiData
brightness	M	IA5String(SIZE(1..32))		V-ITS-S	The current brightness level of the device	spm – fieldStationData - hmiData
volume	M	IA5String(SIZE(1..32))		V-ITS-S	The current volume setting of the device	spm – fieldStationData - hmiData
hmiMessages	M	SEQUENCE (SIZE(1..128)) OF HmiMessage		V-ITS-S	A data frame containing the list of HMI messages displayed in the current SPM period	spm – fieldStationData - hmiData
displayedTime	M	INTEGER {utcStartOf2004(0), oneMillisecAfterUTCstartOf 2004(1)} (0..4398046511103)		V-ITS-S	ETSI TS 102 894-2 TimestampTS data element of the time that the message was displayed on the HMI	spm – fieldStationData – hmiData - hmiMessages
region1Message	M	IA5String(SIZE(1..32))		V-ITS-S	The name of the message that was displayed in region 1 of the HMI (status bar, top)	spm – fieldStationData – hmiData - hmiMessages
region2Message	M	IA5String(SIZE(1..32))		V-ITS-S	The name of the message that was displayed in region 2 of the HMI (speed display, left)	spm – fieldStationData – hmiData - hmiMessages
region3Message	M	IA5String(SIZE(1..32))		V-ITS-S	The name of the message that was displayed in region 3 of the HMI (warning display, right)	spm – fieldStationData – hmiData - hmiMessages

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
exceptionCount	M	INTEGER { none(0), maximum(65534), moreThanMaximum(65535) } (0..65535)		V-ITS-S	The count of exceptions that occurred in the current SPM period	spm – fieldStationData - hmiData
exceptions	O	SEQUENCE (SIZE(1..32)) OF Exception		V-ITS-S	A data frame containing exceptions that occurred in the current SPM period. A data frame with the same as data elements as spm – fieldStationData - exceptions	spm – fieldStationData - hmiData
centralStationData	O	-		C-ITS-S	A data frame containing status data for the central station	spm
metrics	M	SEQUENCE OF GenericMetrics		C-ITS-S	A data frame containing AWS CloudWatch metric data	spm – centralStationData
nameSpace	M	IA5String (SIZE(1..256))		C-ITS-S	See AWS CloudWatch documentation	spm – centralStationData – metrics
metricName	M	IA5String (SIZE(1..256))		C-ITS-S	See AWS CloudWatch documentation	spm – centralStationData – metrics
dimensions	M	SEQUENCE OF MetricDimension		C-ITS-S	See AWS CloudWatch documentation	spm – centralStationData – metrics
name	M	IA5String (SIZE(1..256))		C-ITS-S	See AWS CloudWatch documentation	spm – centralStationData – metrics – dimensions
value	M	IA5String (SIZE(1..256))		C-ITS-S	See AWS CloudWatch documentation	spm – centralStationData – metrics – dimensions
startTime	M	INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	ETSI TS 102 894-2 TimestampITS data element of the time that the metric period started	spm – centralStationData – metrics

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
endTime	M	INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	ETSI TS 102 894-2 TimestampITS data element of the time that the metric period ended	spm – centralStationData – metrics
period	M	INTEGER { oneMinute(60) } (30..600)		C-ITS-S	The length of the metric period in seconds.	spm – centralStationData – metrics
statistics	M	SEQUENCE OF IA5String (SIZE(1..1024))		C-ITS-S	See AWS CloudWatch documentation	spm – centralStationData – metrics
value	M	IA5String (SIZE(1..1024))		C-ITS-S	See AWS CloudWatch documentation IA5String (SIZE(1..1024))	spm – centralStationData – metrics
exceptionCount	M	INTEGER { none(0), maximum(65534), moreThanMaximum(65535) } (0..65535)		C-ITS-S	A count of the exceptions that occurred in the SPM period	spm – centralStationData
exceptions	O	SEQUENCE (SIZE(1..1024)) OF Exception		C-ITS-S	A data from containing exceptions that occurred in the current SPM period. A data frame with the same as data elements as spm – fieldStationData - exceptions	spm – centralStationData

## 10 C-ITS Safety Evaluation Message (CSEM) Data Elements

The CSEM is designed to collect the ETSI C-ITS messages received and transmitted by stations. The data is used to ensure that stations are receiving and transmitting the expected messages, that the data in the C-ITS message matches the event data provided by data sources such as QLDTraffic and also by the Safety Evaluator to analyse the affect C-ITS has on road safety.

**Table 10-1: C-ITS Safety Evaluation Message Data Elements**

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
protocolVersion	M	INTEGER{ currentVersion(1) } (0..255)	1	All	The DE <i>protocolVersion</i> is used to select the appropriate protocol decoder at the receiving ITS-S. <i>currentVersion</i> shall be set to '1'	header
stationID	M	INTEGER(0..4294967295)		All	Identifier for an ITS-S. The ITS-S ID may be a pseudonym. It may change over space and/or over time.	header
stationName	M	UTF8String(SIZE(1..23))		All	The <i>stationName</i> DE is synonymous to MQTT's Client Identifier and is used to uniquely identify the client to the server.	header
caviMessageId	M	INTEGER { cme(0), csem(1), gtm(2), scm(3), spm(4), v(5), vss(6), r(7)} (0..255)		All	Indicates the type of message that was received or transmitted. 0 – CME, C-ITS message event 1 – CSEM, Safety Evaluation data message 2 – GTM, geo-tiling message 3 – SCM, station configuration message 4 – SPM, station platform message 5 – C-ITS messages, excluding static speed 6 – static speed IVIM 7 – MAPEM for the R-ITS-S	header
management	M	CsemManagementContainer		All	A data frame that contains CSEM management data	
csemCreationTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		All	The <i>referenceTime</i> represents the time at which a CSEM is generated by the C-ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	csem -management

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
sessionNumber	M	INTEGER(0..4294967295)		All	The <i>sessionNumber</i> DE is a unique number used to identify the session of a C-ITS station. By default, <i>sessionNumber</i> increments every time a power cycle has occurred.	csem -management
sequenceNumber	M	INTEGER(0..4294967295)		All	The <i>sequenceNumber</i> DE is a unique number used to identify a collection of C-ITS messages sent to the C-ITS-F. By default, a C-ITS Station transmits one CSEM a minute. The <i>sequenceNumber</i> increments every transmission.	csem -management
participantCode	O	INTEGER { nonParticipant(7998), noSelection(7999) } (0..8000)		V-ITS-S	The <i>participantCode</i> is a pseudo name to uniquely identify a human participant.	csem -management
messageType	M	INTEGER { unknown(0), denm(1), cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7), secfail(8) } (0..255)		All	Describes the message type that is included in the CSEM. A CSEM can contain only one message type. Items 1 to 7 are ETSI message types. 0 – when a message cannot be decoded this value is used 8 – used when message security header cannot be verified	csem -management
messageCollection	M	SEQUENCE { rxDecoded Decoded OPTIONAL, txDecoded Decoded OPTIONAL, rxEncoded Encoded OPTIONAL, txEncoded Encoded OPTIONAL }		All	A data frame that holds the collection of C-ITS messages. rxDecoded and txDecoded are only used by the C-ITS-S.	csem
rxDecoded	O	Decoded		C-ITS-S	A data frame containing the C-ITS message and its attributes	csem - messageCollection
count	M	INTEGER(0..600, ...),		C-ITS-S	The count of message in <i>messageCollection</i>	csem – messageCollection - rxDecoded
decodedMessage	M	SEQUENCE OF DecodedMessage		C-ITS-S	A data frame that contains the decoded C-ITS message and when the message was sent and which station it was sent to	csem – messageCollection - rxDecoded
messageRxTxTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1) } (0..4398046511103)		C-ITS-S	The <i>referenceTime</i> represents the time at which a CSEM is generated by the C-ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	csem – messageCollection – rxDecoded - decodedMessage



Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
destinationStationName	O	StationName		C-ITS-S	The name of the station that the message was sent to by the C-ITS-S	csem – messageCollection – rxDecoded - decodedMessage
message	M	message IA5String		C-ITS-S	The decoded message content	csem – messageCollection – rxDecoded - decodedMessage
txDecoded	O	See <i>rxDecoded</i> data frame and its data elements		C-ITS-S	The same as <i>rxDecoded</i>	csem – messageCollection – txDecoded - decodedMessage
rxEncoded	O	See <i>rxDecoded</i> data frame and its data elements		R-ITS-S V-ITS-S	The same attributes as <i>rxDecoded</i> however the <i>message</i> has not been decoded and will likely contain a TS 103 097 security header	csem – messageCollection – rxEncoded - decodedMessage
txEncoded	O	See <i>rxDecoded</i> data frame and its data elements		R-ITS-S V-ITS-S	The same attributes as <i>rxDecoded</i> however the <i>message</i> has not been decoded and will likely contain a TS 103 097 security header	csem – messageCollection – txEncoded - decodedMessage

## 11 C-ITS Message Event (CME) Data Element

The CME is designed to record a C-ITS message lifecycle. Events are:

- **Sourced** – identification of the event source from a data provider such as QLDTraffic
- **Created** – the creation of the C-ITS message or messages from a data provider data packet
- **Relevant** – when a C-ITS message's geography becomes relevant to the vehicle's position
- **Notified** – when the combination of one or more relevant C-ITS messages cause a use-case application to generate an event message to be displayed on the HMI
- **Presented** – when the HMI Presentation Manager on the V-ITS-S arbitrates one or more notified events and selects a message to be displayed on the HMI based on message priority.

This message is only used by the C-ITS-S (sourced, created) and the V-ITS-S (relevant, notified, presented).

**Table 11-1: CME Data Elements**

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
protocolVersion	M	INTEGER{currentVersion(1)} (0..255)	1	C-ITS-S V-ITS-S	The DE <i>protocolVersion</i> is used to select the appropriate protocol decoder at the receiving ITS-S. <i>currentVersion</i> shall be set to '1'	header
stationID	M	INTEGER(0..4294967295)		C-ITS-S V-ITS-S	Identifier for an ITS-S. The ITS-S ID may be a pseudonym. It may change over space and/or over time.	header
stationName	M	UTF8String(SIZE(1..23))		C-ITS-S V-ITS-S	The <i>stationName</i> DE is synonymous to MQTT's Client Identifier and is used to uniquely identify the client to the server.	header

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
caviMessageId	M	INTEGER {cme(0), csem(1), gtm(2), scm(3), spm(4), v(5), vss(6), r(7)} (0..255)		C-ITS-S V-ITS-S	Indicates the type of message that was received or transmitted. 0 – CME, C-ITS message event 1 – CSEM, Safety Evaluation data message 2 – GTM, geo-tiling message 3 – SCM, station configuration message 4 – SPM, station platform message 5 – C-ITS messages, excluding static speed 6 – static speed IVIM 7 – MAPEM for the R-ITS-S	header
management	M			C-ITS-S V-ITS-S	A data frame containing CME management data	cme
cmeCreationTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S V-ITS-S	The <i>referenceTime</i> represents the time at which a CME is generated by the ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	cme -management
sessionNumber	M	INTEGER(0..4294967295)		C-ITS-S V-ITS-S	The <i>sessionNumber</i> DE is a unique number used to identify the session of a C-ITS station. By default, <i>sessionNumber</i> increments every time a power cycle has occurred.	cme -management
sequenceNumber	M	INTEGER(0..4294967295)		C-ITS-S V-ITS-S	The <i>sequenceNumber</i> DE is a unique number used to identify a collection of C-ITS messages sent to the C-ITS-F. By default, a C-ITS Station transmits one CME a minute. The <i>sequenceNumber</i> increments every transmission.	cme -management
participantCode	O	INTEGER { nonParticipant(7998), noSelection(7999) } (0..8000)		V-ITS-S	The <i>participantCode</i> is a pseudo name to uniquely identify a participant.	cme -management
events	M	CHOICE {sourced SourcedEvent, created CreatedEvent, relevant RelevantEvent, notified NotifiedEvent, presented PresentedEvent, ... }		C-ITS-S V-ITS-S	A data frame containing the events that occurred since the CMR was sent. Sourced and Created events are C-ITS-S only. Relevant, Notified and Presented are V-ITS-S only. The R-ITS-S does not use this message	cme

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
sourced	O	SourcedEvent		C-ITS-S	A data frame containing a reference to an event generated when the C-ITS-F receives an actionable packet on a source data interface (for example, QLDTraffic)	cme - events
eventTime	M	INTEGER{utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	The <i>referenceTime</i> represents the time at which a CME is generated by the ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	cme – events – sourced
dataSource	M	DataSourceCollectionReference		C-ITS-S	A data frame describing the source data package	cme – events – sourced
dataSourceId	M	INTEGER {unknown(0), streamsGatewayQueue(1), redcrab(2), mapemDatabase(3), streetProNavigatorRoadNetworkModel(4), qldTraffic(5), auscors(6), tileDatabase(7), citss(8),citsf(9), ritss(10), vitss(11), streamsFP(12), streamsGatewayVariableSpeedLimit(13), streetProNavigatorPlannedSpeeds(14)} (0..255)		C-ITS-S	Describes the source of the data	cme – events – sourced – dataSource
receivedTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	The <i>referenceTime</i> represents the time at which a CME is generated by the ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	cme – events – sourced – dataSource
dataSourceCollectionReference	M	IA5String (SIZE(1..256))		C-ITS-S	The name of the file in the data lake containing the packet received from the data source	cme – events – sourced – dataSource
created	O	CreatedEvent		C-ITS-S	A data frame describing an event item from a data source that caused a C-ITS message to be generated by the central station. The created event is the link between the data source event (for example, QLDTraffic road hazard) and the C-ITS message generated by the C-ITS-S to represent it.	cme – events
eventTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	The <i>referenceTime</i> represents the time at which a CME is generated by the ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	cme – events - created

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
dataSourceItem	M	DataSourceItemReference		C-ITS-S	A data frame uniquely describing an actionable item received from a data source. There may be multiple <i>dataSourceItem</i> related to the same <i>sourced</i> CME	cme – events - created
dataSourceId	M	INTEGER {unknown(0), streamsGatewayQueue(1), redcrab(2), mapemDatabase(3), streetProNavigatorRoadNetworkModel(4), qldTraffic(5), auscors(6), tileDatabase(7), citss(8),citsf(9), ritss(10), vitss(11), streamsFP(12), streamsGatewayVariableSpeedLimit(13), streetProNavigatorPlannedSpeeds(14)} (0..255)		C-ITS-S	Identifies where the data originated.	cme – events – created – dataSourceItem
dataSourceItemId	M	IA5String (SIZE(1..36))		C-ITS-S	Unique identifier for the data source item. This value an identifier that is provided by the data source	cme – events – created – dataSourceItem
updatedAtTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	<i>updatedAtTime</i> represents the time at which a CME is created or updated by the central ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10]. A data source item may be new, updated or cancelled during the event lifecycle. This time marks each change in the item's lifecycle.	cme – events – created – dataSourceItem
messageItem	M	MessageItemReference		C-ITS-S	A data frame that contains the composite key used to identify a created message	cme – events - created
messageItemId	M	IA5String (SIZE(1..256))		C-ITS-S	Unique identifier for the data source item. This value contains an identifier that is provided by the data source which is concatenated with the use case identifier if the data source provides data for multiple use cases (for example, RHW, RWW)	cme – events – created – messageItem
useCaseId	M	INTEGER {unknown(0), arlw(1), boq(2), eebl(3), ivs(4), rhw(5), rww(6), ssv(7), twvr(8)} (0..255)		C-ITS-S	The use case for which the data is being used.	cme – events – created – messageItem

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
updatedTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	<i>updatedTime</i> represents the time at which a CME is generated by the ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10]. A data source item may be new, updated or cancelled during the event lifecycle. This time marks each change in the item's lifecycle.	cme – events – created – messageItem
citsMessageReference	M	CHOICE {cam CamReference, denm DenmReference, ivim IvimReference, mapem MapemReference, spatem SpatemReference}		C-ITS-S	A data frame containing the reference to the C-ITS message generated for the <i>messageItem</i> . Only <i>DenmReference</i> , <i>IvimReference</i> and <i>MapemReference</i> are used by the C-ITS-S in the <i>created</i> event.	cme – events - created
denm	O	DenmReference		C-ITS-S	A data frame containing the composite key of the C-ITS message and optionally the content	cme – events – created – citsMessageReference
originatingStationId	M	INTEGER(0..4294967295)		C-ITS-S	<i>StationId</i> from TS 102 894-2	cme – events – created – citsMessageReference – denm
sequenceNumber	M	INTEGER (0..65535)		C-ITS-S	<i>SequenceNumber</i> from TS 102 894-2	cme – events – created – citsMessageReference – denm
referencetime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	The <i>referenceTime</i> represents the time at which a CME is generated by the ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10]. A data source item may be new, updated or cancelled during the event lifecycle. This time marks each change in the item's lifecycle.	cme – events – created – citsMessageReference – denm
citsMessage	O	OCTET STRING		C-ITS-S	Not used for CME	cme – events – created – citsMessageReference – denm
ivim	O	IvimReference		C-ITS-S	A data frame containing the composite key of the C-ITS message and optionally the content	cme – events – created – citsMessageReference

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
stationID	M	INTEGER(0..4294967295)		C-ITS-S	<i>StationId</i> from TS 102 894-2	cme – events – created – citsMessageReference – ivim
ividentificationNumber	M	INTEGER(1..32767, ...),		C-ITS-S	The IVIM message identification number	cme – events – created – citsMessageReference – ivim
timestamp	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	<i>timestamp</i> represents the time that the IVIM was created	cme – events – created – citsMessageReference – ivim
citsMessage	O	OCTET STRING		C-ITS-S	Not used for CME	cme – events – created – citsMessageReference – ivim
mapem	O	MapemReference		C-ITS-S	A data frame containing the composite key of the C-ITS message and optionally the content	cme – events – created – citsMessageReference
stationID	M	INTEGER(0..4294967295)		C-ITS-S	<i>StationId</i> from TS 102 894-2	cme – events – created – citsMessageReference – mapem
timestamp	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		C-ITS-S	<i>timestamp</i> represents the time that the MAPEM was created	cme – events – created – citsMessageReference – mapem
msgIssueRevision	M	INTEGER (0..127),		C-ITS-S	The revision of the MAPEM	cme – events – created – citsMessageReference – mapem
intersection	M	INTEGER(0..65535),		C-ITS-S	The intersection identified in the MAPEM. ICVP restricts the number of intersections in a MAPEM to one.	cme – events – created – citsMessageReference – mapem

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
citsMessage	O	OCTET STRING		C-ITS-S	Not used for CME	cme – events – created – citsMessageReference – mapem
tilelds	O	SEQUENCE OF IA5String (SIZE(1..32))		C-ITS-S	A list of tile identifiers to which the message is associated.	cme – events - created
relevant	O	RelevantEvent		V-ITS-S	DENM, IVIM and MAPEM contain geometries that describe an event. A CME relevant event is generated for a use-case when a V-ITS-S position causes the C-ITS message to be used for use-case evaluation. The CME relevant event is generated when the V-ITS-S enters and exits a geometry's approach also when it enters and exits the departure path. For DENM this is the traces and eventHistory, for IVIM it is the detection zone and relevance zone and for MAPEM the IntersectionGeometry and the conflict zone respectively. This data frame describes a relevant event.	cme – events
eventTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		V-ITS-S	<i>eventTime</i> represents the time at which a CME is generated by the ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	cme – events - relevant
citsMessageReferences	M	SEQUENCE SIZE (1..3) OF CitsMessageReference		V-ITS-S	Depending on the use case, multiple C-ITS message geometries may be active and used for the use case. This data frame contains references to these messages.	cme – events – relevant. See cme – events – created for content of a citsMessageReference
pathInstanceld		INTEGER(0..4294967295)		V-ITS-S	A unique identifier for each session that defines the period that a vehicle is in either a <i>traces/detection zone/IntersectionGeometry</i> (approach), <i>eventHistory/relevanceZone/conflict zone</i> . The identifier is unique for each time a vehicle is on a message's geometry in a session	cme – events - relevant



Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
locationType	M	ENUMERATED {enterApproachPath(0), exitApproachPath(1), enterEventPath(2), exitEventPath(3)}		V-ITS-S	<p><b>enterApproachPath(0)</b> - when a vehicle enters <i>traces/detectionZone/IntersectionGeometry</i> (approach) of an ETSI message.</p> <p><b>exitApproachPath(1)</b> - when a vehicle exits <i>traces/detectionZone/IntersectionGeometry</i> (approach) of an ETSI message.</p> <p><b>enterEventPath(2)</b> - when a vehicle enters <i>eventHistory/detectionZone/ConflictZone</i> of an ETSI message.</p> <p><b>exitEventPath(3)</b> - when a vehicle exits <i>eventHistory/detectionZone/ConflictZone</i> of an ETSI message.</p>	cme – events - relevant
useCaseld	M	INTEGER {unknown(0), arlw(1), boq(2), eeb(3), ivs(4), rhw(5), rww(6), ssv(7), twvr(8) } (0..255)		V-ITS-S	The use case for which the data is being used.	cme – events – relevant
Notified	O	NotifiedEvent		V-ITS-S	C-ITS messages that are relevant for a use-case may generate an HMI event if the vehicle exceeds limits determined by the use case applications described in PSTS011 to PSTS017. When this occurs, a notified event is generated by the V-ITS-S. This data frame describes which C-ITS messages were used by the V-ITS-S to generate the notification and what the HMI display request was.	cme – events
eventTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		V-ITS-S	<p>The <i>referenceTime</i> represents the time at which a CME is generated by the ITS station.</p> <p>Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].</p>	cme – events - notified
citsMessageReferences	M	SEQUENCE SIZE (1..3) OF CitsMessageReference		V-ITS-S	Depending on the use case, multiple C-ITS messages (for example, MAPEM and SPATEM) may be used to trigger the notification for the use case. This data frame contains references to these messages.	cme – events – notified. See cme – events – created for content of a citsMessageReference

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
pathInstanceid	M	INTEGER(0..4294967295)		V-ITS-S	A unique identifier for each session that defines the period that a vehicle is in either a <i>trace/detection zone/IntersectionGeometry</i> (approach), <i>eventHistory/relevanceZone/conflict zone</i> . The identifier is unique for each time a vehicle is on a message's geometry in a session	cme – events - notified
notifiedEventId	M	INTEGER(0..4294967295)		V-ITS-S	This number is generated by the V-ITS-S by a C-ITS application. It is unique for the session number. It is used by the V-ITS-S C-ITS application to track notification request acknowledgments. Refers to the latest notified event ID logged.	cme – events - notified
screenRegion	M	INTEGER {status(1), speed(2), useCase(3) } (1..3)		V-ITS-S	Refer to PSTS 003 for details	cme – events - notified
response		ENUMERATED { fail(0), success(1) }		V-ITS-S	The value of the response from the HMI presentation manager. The HMI presentation manager arbitrates the display all notifications based on message priority <i>currentSpeed</i>	cme – events - notified
currentSpeed	O	INTEGER { oneKmPerHour(1) } (0..200)		V-ITS-S	Specified where the data is available	cme – events - notified
eventSpeed	O	INTEGER { oneKmPerHour(1) } (0..200)		V-ITS-S	Specified where the data is available	cme – events - notified
distanceToEventPoint	O	INTEGER{ oneMetre(1) } (0..1000)		V-ITS-S	Specified where the data is available	cme – events - notified
roadSpeedLimit	O	INTEGER { oneKmPerHour(1) } (0..200)		V-ITS-S	Specified where the data is available	cme – events - notified
Presented	O	PresentedEvent		V-ITS-S	A data frame describing the event that was sent to the HMI by the presentation manager including a reference to the notified event.	cme – events
eventTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1) } (0..4398046511103)		V-ITS-S	<i>eventTime</i> represents the time at which a CME is generated by the ITS station. Number of milliseconds since 2004-01-01T00:00:00.000Z, as specified in ISO 8601 [i.10].	cme – events - presented

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
pathInstancelId	M	INTEGER(0..4294967295)		V-ITS-S	A unique identifier for each session that defines the period that a vehicle is in either a <i>trace/detection zone/IntersectionGeometry</i> (approach), <i>eventHistory/relevanceZone/conflict zone</i> . The identifier is unique for each time a vehicle is on a message's geometry in a session	cme – events - presented
notifiedEventId	M	INTEGER(0..4294967295)		V-ITS-S	This number is generated by the V-ITS-S by a C-ITS application. It is unique for the session number. It is used by the V-ITS-S C-ITS application to track notification request acknowledgments. Refers to the latest notified event ID logged.	cme – events - presented
presentedEventId	M	INTEGER(0..4294967295)		V-ITS-S	This number is generated by the HMI presentation manager. It is unique for a session number. It is used by the HMI presentation manager to track display acknowledgments	cme – events - presented
notifiedEventList	M	EQUENCE (SIZE(1..10)) OF NotifiedEvents		V-ITS-S	Refers to the latest notified event IDs that are current in the HMI presentation manager at the time of the presentation event. It should only include <i>notifiedEventIds</i> with different <i>pathInstancelIds</i> .	cme – events - presented
notifiedEventId	M	INTEGER(0..4294967295)		V-ITS-S	The identity of a notified event that was current at the time that the presented event was generated.	cme – events – presented - notifiedEventList
priority	M	INTEGER {oneTenth(1)} (0..127)		V-ITS-S	The priority of a notified event that was current at the time that the presented event was generated.	cme – events – presented - notifiedEventList
screenRegion	M	INTEGER {status(1), speed(2), useCase(3) } (1..3)		V-ITS-S	Refer to PSTS 003 for details	cme – events - presented
startTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		V-ITS-S	The time at which the presentation event started	cme – events - presented

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
endTime	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		V-ITS-S	The time at which the presentation event ended. This value means that the presented event is only logged after the event has completed.	cme – events - presented
response	M	ENUMERATED { fail(0), success(1) }		V-ITS-S	The value of the response from the HMI.	cme – events - presented
diagnosticMode	M	BOOLEAN		V-ITS-S	Set to true if vendor specific diagnostic displays are presented on the HMI rather than the pilot message set images and sounds	cme – events - presented
displayedHmiMessageId	M	IA5String(SIZE(1..32))		V-ITS-S	The HMI warning unique identifier. The image itself will not be transmitted. This will be the warning ID displayed on the HMI regardless of whether the participant is in the control or treatment group. Messages are not displayed on the HMI for the control group.	cme – events - presented
displayState	M	DisplayState		V-ITS-S	A data frame containing a list of HMI operational attributes	cme – events - presented
brightness	M	INTEGER		V-ITS-S	The brightness value of the HMI device	cme – events – presented - displayState
volume	M	INTEGER		V-ITS-S	The volume value of the HMI device	cme – events – presented - displayState

## 12 Station Configuration Message (SCM) Data Elements

The SCM is a message the contains system-wide parameters applicable to all stations and station-specific parameters.

**Table 12-1: Station Configuration Message Data Specifications**

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
protocolVersion	M	INTEGER{ currentVersion(1) } (0..255)	1	All	The DE <i>protocolVersion</i> is used to select the appropriate protocol decoder at the receiving ITS-S. <i>currentVersion</i> shall be set to '1'	header
stationID	M	INTEGER(0..4294967295)		All	Identifier for an ITS-S. The ITS-S ID may be a pseudonym. It may change over space and/or over time.	header
stationName	M	UTF8String(SIZE(1..23))		All	The <i>stationName</i> DE is synonymous to MQTT's Client Identifier and is used to uniquely identify the client to the server.	header
caviMessageId	M	INTEGER {cme(0), csem(1), gtm(2), scm(3), spm(4), v(5), vss(6), r(7)} (0..255)		All	Indicates the type of message that was received or transmitted. 0 – CME, C-ITS message event 1 – CSEM, Safety Evaluation data message 2 – GTM, geo-tiling message 3 – SCM, station configuration message 4 – SPM, station platform message 5 – C-ITS messages, excluding static speed 6 – static speed IVIM 7 – MAPEM for the R-ITS-S	header
scm	M	ScmStructure		R-ITS-S V-ITS-S	A data frame containing system and station parameters used to configure a station	scm
stationParameters	M	StationParameters		R-ITS-S V-ITS-S	The data frame that contains the station-specific parameters	scm
stationParametersVersion	M	INTEGER(0..65535)		R-ITS-S V-ITS-S	Unique identifier for the set of station parameters generated by the C-ITS-S.	scm - stationParameters
citsSoftwareEnabled	M	BOOLEAN		R-ITS-S V-ITS-S	True if the device is to run the use-case applications. This can be used to stop the device operating in the case that a participant leaves the pilot.	scm - stationParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
securityEnable	M	BOOLEAN		R-ITS-S V-ITS-S	True if the device must sign transmitted messages and must verify signatures of incoming messages	scm - stationParameters
spmExceptionLoggingLevel	M	ENUMERATED {critical(0), error(1), information(2), debug(3)}		R-ITS-S V-ITS-S	Controls the level of device logging data returned to the C-ITS-F. 0 – critical errors that disrupt the normal operation of the station 1 – errors that occur and allow that the station to continue operating normally afterward. Includes "critical" level errors 2 – informational errors that do not affect the operation of the station. Includes "error" and "critical" level errors 3 – debug level. Logging is defined by the needs of the vendor for debugging purposes	scm - stationParameters
camDirection	M	ENUMERATED {none(0),transmit(1), receive(2), both(3)}		R-ITS-S V-ITS-S	Controls which messages are included in CSEM sent by the station for the message type CAM. 0 – do not log any messages received or sent 1 – log only messages transmitted by the station 2 – log only messages received by the station 3 – log messages both sent and received	scm - stationParameters
denmDirection	M	ENUMERATED {none(0),transmit(1), receive(2), both(3)}		R-ITS-S V-ITS-S	Controls which messages are included in CSEM sent by the station for the message type DENM. 0 – do not log any messages received or sent 1 – log only messages transmitted by the station 2 – log only messages received by the station 3 – log messages both sent and received	scm - stationParameters
ivimDirection	M	ENUMERATED {none(0),transmit(1), receive(2), both(3)}		R-ITS-S V-ITS-S	Controls which messages are included in CSEM sent by the station for the message type IVIM. 0 – do not log any messages received or sent 1 – log only messages transmitted by the station 2 – log only messages received by the station 3 – log messages both sent and received	scm - stationParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
mapemDirection	M	ENUMERATED {none(0),transmit(1), receive(2), both(3)}		R-ITS-S V-ITS-S	Controls which messages are included in CSEM sent by the station for the message type MAPEM. 0 – do not log any messages received or sent 1 – log only messages transmitted by the station 2 – log only messages received by the station 3 – log messages both sent and received	scm - stationParameters
spatemDirection	M	ENUMERATED {none(0),transmit(1), receive(2), both(3)}		R-ITS-S V-ITS-S	Controls which messages are included in CSEM sent by the station for the message type SPATEM. 0 – do not log any messages received or sent 1 – log only messages transmitted by the station 2 – log only messages received by the station 3 – log messages both sent and received	scm - stationParameters
storageThreshold	M	INTEGER { eightyFivePercent(85) } (50..95)		R-ITS-S V-ITS-S	The storage threshold above which an exception is reported.	scm - stationParameters
dopThreshold	M	INTEGER { four(4) } (1..10)		R-ITS-S V-ITS-S	Dilution of Precision (DOP) above which an exception is reported	scm - stationParameters
minNumberOfSatellitesThreshold	M	INTEGER { fourSatellites(4) } (2..5)		R-ITS-S V-ITS-S	As indicated in the NMEA GSA string. Required to achieve acceptable positioning accuracy	scm - stationParameters
mqttTopics	M	SEQUENCE {logCme Topic, logCsem Topic, logSpm Topic, tileLevel0 Topic OPTIONAL, mapem Topic OPTIONAL, ...}		R-ITS-S V-ITS-S	The data frame containing the MQTT topics to be used by the station. These topics are in a templated format, for example <i>&lt;deploymentPrefix&gt;/tile/&lt;tileId&gt;/signedCitsMessageVinit /&lt;stationName&gt;</i> The station substitutes its configured values for topic components in angle brackets. For example, with deployment "it2", tileId of "AU-QLD-CAV13" and stationName of "QCVCWA240248" the topic to be used by the station is: <i>it2/tile/AU-QLD-CAV13/signedCitsMessageVinit/QCVCWA240248.</i> See PSTS007 for details.	scm - stationParameters
logCme	M			R-ITS-S V-ITS-S	The data frame containing the attributes that specify a topic and its endpoint.	scm – stationParameters – mqttTopics

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
brokerName	M	IA5String(SIZE(1..256))		R-ITS-S V-ITS-S	The endpoint of the MQTT broker serving this tile. This allows for off-loading tile serving to brokers in separate jurisdictions.	scm – stationParameters – mqttTopics - logCme
topic	M	IA5String(SIZE(1..256))		R-ITS-S V-ITS-S	The MQTT topic name.	scm – stationParameters – mqttTopics - logCme
logCsem	M			R-ITS-S V-ITS-S	The data frame containing the attributes that specify a topic and its endpoint.	scm – stationParameters – mqttTopics
brokerName	M	IA5String(SIZE(1..256))		R-ITS-S V-ITS-S	The endpoint of the MQTT broker serving this tile. This allows for off-loading tile serving to brokers in separate jurisdictions.	scm – stationParameters – mqttTopics - logCsem
topic	M	IA5String(SIZE(1..256))		R-ITS-S V-ITS-S	The MQTT topic name.	scm – stationParameters – mqttTopics - logCsem
logSpm	M			R-ITS-S V-ITS-S	The data frame containing the attributes that specify a topic and its endpoint.	scm – stationParameters – mqttTopics
brokerName	M	IA5String(SIZE(1..256))		R-ITS-S V-ITS-S	The endpoint of the MQTT broker serving this tile. This allows for off-loading tile serving to brokers in separate jurisdictions.	scm – stationParameters – mqttTopics - logSpm
topic	M	IA5String(SIZE(1..256))		R-ITS-S V-ITS-S	The MQTT topic name.	scm – stationParameters – mqttTopics - logSpm
tileLevel0	O			V-ITS-S	The data frame containing the attributes that specify a topic and its endpoint.	scm – stationParameters – mqttTopics
brokerName	M	IA5String(SIZE(1..256))		V-ITS-S	The endpoint of the MQTT broker serving this tile. This allows for off-loading tile serving to brokers in separate jurisdictions.	scm – stationParameters – mqttTopics – tileLevel0



Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
topic	M	IA5String(SIZE(1..256))		V-ITS-S	The MQTT topic name.	scm – stationParameters – mqttTopics – tileLevel0
mapem	O			R-ITS-S	The data frame containing the attributes that specify a topic and its endpoint.	scm – stationParameters – mqttTopics
brokerName	M	IA5String(SIZE(1..256))		R-ITS-S	The endpoint of the MQTT broker serving this tile. This allows for off-loading tile serving to brokers in separate jurisdictions.	scm – stationParameters – mqttTopics - mapem
topic	M	IA5String(SIZE(1..256))		R-ITS-S	The MQTT topic name.	scm – stationParameters – mqttTopics - mapem
ritssParameters	O			R-ITS-S	A data frame that contains the R-ITS-S specific parameters	scm – stationParameters – ritssParameters
spatSourceTimeDiffThreshold	M	INTEGER { threeHundredMilliseconds(300) } (50..500)		R-ITS-S	The threshold of the difference between the timestamp of the SPATEM sent by the FP and the time on the R-ITS-S above which an error is raised	scm – stationParameters – ritssParameters
mapemVersionNumber	M	INTEGER (0..127)		R-ITS-S	Used by the R-ITS-S to determine if it needs to download an updated MAPEM	scm – stationParameters – ritssParameters
csemCamLogLimit	M	INTEGER {default(150)} (1..600)		R-ITS-S	The count of CAM captured after which a CSEM is generated and logged.	scm – stationParameters – ritssParameters
csemDenmLogLimit	M	INTEGER (1..600)		R-ITS-S	The count of DENM captured after which a CSEM is generated and logged.	scm – stationParameters – ritssParameters
csemIvimLogLimit	M	INTEGER (1..600)		R-ITS-S	The count of IVIM captured after which a CSEM is generated and logged.	scm – stationParameters – ritssParameters
csemMapemLogLimit	M	INTEGER (1..600)		R-ITS-S	The count of MAPEM captured after which a CSEM is generated and logged.	scm – stationParameters – ritssParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
csemSpatemLogLimit	M	INTEGER (1..600)		R-ITS-S	The count of SPATEM captured after which a CSEM is generated and logged.	scm – stationParameters – ritssParameters
ritssSoftwareUpdate	M	IA5String(SIZE(1..2083))		R-ITS-S	The URL from which the R-ITS-S software package can be downloaded by the device	scm – stationParameters – ritssParameters
ritssSoftwareCurrentVersion	M	IA5String(SIZE(1..32))		R-ITS-S	The value used by the R-ITS-S to determine whether a new software package needs to be download and installed.	scm – stationParameters – ritssParameters
vitssParameters	O			V-ITS-S	A data frame containing the V-ITS-S specific parameters	scm – stationParameters – vitssParameters
participants	M	SEQUENCE SIZE(1..4) OF IA5String (SIZE(1..7))		V-ITS-S	A data frame containing the <i>participantCode</i> 's that are registered for this vehicle	scm – stationParameters – vitssParameters
hmiEnabled	M	BOOLEAN		V-ITS-S	Determines whether the HMI will display data. This is used to maintain use-case operation and logging but disable display of message for the control group of participants.	scm – stationParameters – vitssParameters
presentationTtl	M	INTEGER { twoSeconds(2000) } (1..2500)		V-ITS-S	The timeout in milliseconds between the HMI presentation manager making a display request to the HMI and the HMI response for the same <i>presentedId</i> after which is it deemed that the HMI has not responded to the request and an error is generated.	scm – stationParameters – vitssParameters
tileApproachBuffer	M	INTEGER { fiveHundredMetres(500) } (0..1000)		V-ITS-S	Within this distance from a tile to which the V-ITS-S has not yet subscribed for C-ITS messages, the V-ITS-S will subscribe to the tile's C-ITS messages. This distance is set so that the travel time of the vehicle before it enters the new tile exceeds the time required to download the required C-ITS messages from the C-ITS-S.	scm – stationParameters – vitssParameters
collectADR	M	BOOLEAN		V-ITS-S	Cohda specific parameter that when set to true causes the V-ITS-S to upload Advanced Diagnostic Records (ADR) diagnostic files to the server.	scm – stationParameters – vitssParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
ucArlwEnabled ucBoqEnabled ucEeblEnabled ucIvsEnabled ucRhwEnabled ucRwwEnabled ucSsvEnabled ucTwvrEabled	M	BOOLEAN		V-ITS-S	When set to true the specified ICVP use-case application operates on the station providing <i>citsSoftwareEnabled</i> is true	scm – stationParameters – vitssParameters
ucArlwPresentationEnabled ucBoqPresentationEnabled ucEeblPresentationEnabled ucIvsPresentationEnabled ucRhwPresentationEnabled ucRwwPresentationEnabled ucSsvPresentationEnabled ucTwvrPresentationEabled	M	BOOLEAN		V-ITS-S	This element depends on <i>citsSoftwareEnabled</i> , <i>uc*Enabled</i> and <i>hmiEnabled</i> to be true. When this element is set to true then the use-case application displays messages to the HMI otherwise message generated by the application are ignored by the HMI Presentation Manager. This allows for individual control of use-case HMI displays	scm – stationParameters – vitssParameters
tileSetVersion	M	INTEGER(0..65535)		V-ITS-S	Used by the V-ITS-S to determine whether a new tile set is to be downloaded.	scm – stationParameters – vitssParameters
staticSpeedIvimSetVersion	M	INTEGER(0..65535)		V-ITS-S	Used by the V-ITS-S to determine whether a new static speed IVIM is to be downloaded	scm – stationParameters – vitssParameters
csemCamLogLimit	M	INTEGER {default(150)} (1..600)		V-ITS-S	The count of CAM captured after which a CSEM is generated and logged.	scm – stationParameters – vitssParameters
csemDenmLogLimit	M	INTEGER (1..600)		V-ITS-S	The count of DENM captured after which a CSEM is generated and logged.	scm – stationParameters – vitssParameters
csemIvimLogLimit	M	INTEGER (1..600)		V-ITS-S	The count of IVIM captured after which a CSEM is generated and logged.	scm – stationParameters – vitssParameters
csemMapemLogLimit	M	INTEGER (1..600)		V-ITS-S	The count of MAPEM captured after which a CSEM is generated and logged.	scm – stationParameters – vitssParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
csemSpatemLogLimit	M	INTEGER (1..600)		V-ITS-S	The count of SPATEM captured after which a CSEM is generated and logged.	scm – stationParameters – vitssParameters
vitssSoftwareUpdate	M	IA5String(SIZE(1..2083))		V-ITS-S	The URL from which the V-ITS-S software package can be downloaded by the device	scm – stationParameters – vitssParameters
vitssSoftwareCurrentVersion	M	IA5String(SIZE(1..32))		V-ITS-S	The value used by the V-ITS-S to determine whether a new software package needs to be download and installed.	scm – stationParameters – vitssParameters
systemParameters	M			R-ITS-S V-ITS-S	The data frame containing the system-wide parameters	scm – systemParameters
systemParametersVersion	M	IA5String(SIZE(1..32))		R-ITS-S V-ITS-S	The value used by the station to determine whether the parameters have changed and need to be applied.	scm – systemParameters
camRate	M	INTEGER(1..10)	10	R-ITS-S V-ITS-S	Rate at which CAMS are produced by the station. Unit: times/seconds	scm- system-collection
logFrequency	M	INTEGER {defaultOneMinute(60)} (5..300)	60	R-ITS-S V-ITS-S	This element applies to CME and SPM only. CSEM controlled by csemLogWatchdogTimeout	scm – systemParameters
csemLogWatchdogTimeout	M	INTEGER { defaultTenMinutes(10)} (1..1440)		R-ITS-S V-ITS-S	CSEM are typically sent based on the accumulation of C-ITS messages (see <i>csem*LogLimit</i> parameters). If a CSEM has not been sent for this time then a CSEM is sent with the current messages and counts	scm – systemParameters
logMessageRetentionWindow	M	INTEGER {minutesOneDay(1440)} (1..4320)		R-ITS-S V-ITS-S	The period, up to which the station must retain log messages that can't be uploaded to the C-ITS-F because of connectivity issues. These messages will be uploaded when communications is re-established	scm – systemParameters
positionAugmentation	M	BOOLEAN		V-ITS-S	TRUE – enable position augmentation FALSE – disable position augmentation	scm – systemParameters
scmsEA	M	IA5String(SIZE(1..2083))		R-ITS-S V-ITS-S	The endpoint of the Enrolment Authority	scm – systemParameters
scmsAA	M	IA5String(SIZE(1..2083))		R-ITS-S V-ITS-S	The endpoint of the Authorisation Authority	scm – systemParameters
arlwParameters	O			V-ITS-S	A data frame containing the ARLW use-case parameters to be used by the station	scm – systemParameters - arlwParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
speedMin	M	INTEGER (0..200)		V-ITS-S	See PSTS013 Unit: km/hr	scm – systemParameters - arlwParameters
speedMax	M	INTEGER (0..200)		V-ITS-S	See PSTS013 Unit: km/hr	scm – systemParameters - arlwParameters
speedClear	M	INTEGER (0..200)		V-ITS-S	See PSTS013 Unit: km/hr	scm – systemParameters - arlwParameters
decelerationSafe	M	INTEGER(0..100)		V-ITS-S	See PSTS013 Unit: decimetre/sec/sec	scm – systemParameters - arlwParameters
decelerationMin	M	INTEGER(0..100)		V-ITS-S	See PSTS013 Unit: decimetre/sec/sec	scm – systemParameters - arlwParameters
thresholdHigh	M	INTEGER { eebThresholdHigh(30), eebThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS013 Unit: decisecond	scm – systemParameters - arlwParameters
thresholdMedium	M	INTEGER { eebThresholdHigh(30), eebThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS013 Unit: decisecond	scm – systemParameters - arlwParameters
thresholdLow	M	INTEGER { eebThresholdHigh(30), eebThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS013 Unit: decisecond	scm – systemParameters - arlwParameters
boqParameters	O			V-ITS-S	The data frame containing the BOQ use-case parameters to be used by the station	scm – systemParameters - boqParameters
lateralOffset	M	INTEGER { default2meters(200) } (0..10000)		V-ITS-S	See PSTS017	scm – systemParameters - boqParameters
updateRate	M	INTEGER { default120sec(120) } (0..10800)		V-ITS-S	See PSTS017	scm – systemParameters - boqParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
speedMin	M	INTEGER (0..200)		V-ITS-S	See PSTS017 Unit: km/hr	scm – systemParameters - boqParameters
speedMax	M	INTEGER (0..200)		V-ITS-S	See PSTS017 Unit: km/hr	scm – systemParameters - boqParameters
speedClear	M	INTEGER (0..200)		V-ITS-S	See PSTS017 Unit: km/hr	scm – systemParameters - boqParameters
decelerationSafe	M	INTEGER(0..100)		V-ITS-S	See PSTS017 Unit: decimetre/sec/sec	scm – systemParameters - boqParameters
decelerationMin	M	INTEGER(0..100)		V-ITS-S	See PSTS017 Unit: decimetre/sec/sec	scm – systemParameters - boqParameters
thresholdHigh	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS017 Unit: decisecond	scm – systemParameters - boqParameters
thresholdMedium	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS017 Unit: decisecond	scm – systemParameters - boqParameters
thresholdLow	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS017 Unit: decisecond	scm – systemParameters - boqParameters
eeblParameters	O			V-ITS-S	The data frame containing the EEBL use-case parameters to be used by the station	scm – systemParameters - eeblParameters
relevanceDistance	O	ENUMERATED {lessThan50m(0), lessThan100m(1), lessThan200m(2), lessThan500m(3), lessThan1000m(4), lessThan5km(5), lessThan10km(6), over10km(7)}		V-ITS-S	See PSTS011	scm – systemParameters - eeblParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
traceLength	M	INTEGER { noTrace(0), eebIdefault300m(300) } (0..1000)		V-ITS-S	See PSTS011	scm – systemParameters - eebIParameters
lateralOffset	M	INTEGER { default2meters(200) } (0..10000)		V-ITS-S	See PSTS011	scm – systemParameters - eebIParameters
tvspeedMin	M	INTEGER (0..200)			See PSTS011 Unit: km/hr	scm – systemParameters - eebIParameters
tvspeedMax	M	INTEGER (0..200)			See PSTS011 Unit: km/hr	scm – systemParameters - eebIParameters
tvDeceleration	M	INTEGER(0..100)			See PSTS011 Unit: decimetre/sec/sec	scm – systemParameters - eebIParameters
validityDuration	M	INTEGER { defaultTwoSeconds(2) } (0..86400)		V-ITS-S	See PSTS011	scm – systemParameters - eebIParameters
speedMin	M	INTEGER (0..200)		V-ITS-S	See PSTS011 Unit: km/hr	scm – systemParameters - eebIParameters
speedMax	M	INTEGER (0..200)		V-ITS-S	See PSTS011 Unit: km/hr	scm – systemParameters - eebIParameters
speedClear	M	INTEGER (0..200)		V-ITS-S	See PSTS011 Unit: km/hr	scm – systemParameters - eebIParameters
speedFinal	M	INTEGER (0..200)		V-ITS-S	See PSTS011 Unit: km/hr	scm – systemParameters - eebIParameters
decelerationSafe	M	INTEGER(0..100)		V-ITS-S	See PSTS011 Unit: decimetre/sec/sec	scm – systemParameters - eebIParameters
decelerationMin	M	INTEGER(0..100)		V-ITS-S	See PSTS011 Unit: decimetre/sec/sec	scm – systemParameters - eebIParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
thresholdHigh	M	INTEGER { eebIThresholdHigh(30), eebIThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS011 Unit: decisecond	scm – systemParameters - eebIParameters
thresholdMedium	M	INTEGER { eebIThresholdHigh(30), eebIThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS011 Unit: decisecond	scm – systemParameters - eebIParameters
thresholdLow	M	INTEGER { eebIThresholdHigh(30), eebIThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS011 Unit: decisecond	scm – systemParameters - eebIParameters
hopLimit	M	INTEGER { noHops(0) } (0..5)		V-ITS-S	See PSTS011	scm – systemParameters - eebIParameters
ivsParameters	O			V-ITS-S	The data frame containing the IVS use-case parameters to be used by the station	scm – systemParameters - ivsParameters
updateRate	M	INTEGER { default120sec(120) } (0..10800)		V-ITS-S	See PSTS018	scm – systemParameters - ivsParameters
rhwParameters	O			V-ITS-S	The data frame containing the RHW use-case parameters to be used by the station	scm – systemParameters – rhwParameters
lateralOffset	M	INTEGER { default2meters(200) } (0..10000)		V-ITS-S	See PSTS016	scm – systemParameters – rhwParameters
updateRate	M	INTEGER { default120sec(120) } (0..10800)		V-ITS-S	See PSTS016	scm – systemParameters – rhwParameters
speedMin	M	INTEGER (0..200)		V-ITS-S	See PSTS016 Unit: km/hr	scm – systemParameters – rhwParameters
speedMax	M	INTEGER (0..200)		V-ITS-S	See PSTS016 Unit: km/hr	scm – systemParameters – rhwParameters



Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
speedClear	M	INTEGER (0..200)		V-ITS-S	See PSTS016 Unit: km/hr	scm – systemParameters – rhwParameters
decelerationSafe	M	INTEGER(0..100)		V-ITS-S	See PSTS016 Unit: decimetre/sec/sec	scm – systemParameters – rhwParameters
decelerationMin	M	INTEGER(0..100)		V-ITS-S	See PSTS016 Unit: decimetre/sec/sec	scm – systemParameters – rhwParameters
thresholdHigh	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS016 Unit: decisecond	scm – systemParameters – rhwParameters
thresholdMedium	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS016 Unit: decisecond	scm – systemParameters – rhwParameters
thresholdLow	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS016 Unit: decisecond	scm – systemParameters – rhwParameters
rwwParameters	O			V-ITS-S	The data frame containing the RWW use-case parameters to be used by the station	scm – systemParameters – rwwParameters
lateralOffset	M	INTEGER { default2meters(200) } (0..10000)		V-ITS-S	See PSTS015	scm – systemParameters – rwwParameters
updateRate	M	INTEGER { default120sec(120) } (0..10800)		V-ITS-S	See PSTS015	scm – systemParameters – rwwParameters
speedMin	M	INTEGER (0..200)		V-ITS-S	See PSTS015 Unit: km/hr	scm – systemParameters – rwwParameters
speedMax	M	INTEGER (0..200)		V-ITS-S	See PSTS015 Unit: km/hr	scm – systemParameters – rwwParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
speedClear	M	INTEGER (0..200)		V-ITS-S	See PSTS015 Unit: km/hr	scm – systemParameters – rwwParameters
decelerationSafe	M	INTEGER(0..100)		V-ITS-S	See PSTS015 Unit: decimetre/sec/sec	scm – systemParameters – rwwParameters
decelerationMin	M	INTEGER(0..100)		V-ITS-S	See PSTS015 Unit: decimetre/sec/sec	scm – systemParameters – rwwParameters
thresholdHigh	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS015 Unit: decisecond	scm – systemParameters – rwwParameters
thresholdMedium	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS015 Unit: decisecond	scm – systemParameters – rwwParameters
thresholdLow	M	INTEGER { eeblThresholdHigh(30), eeblThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS015 Unit: decisecond	scm – systemParameters – rwwParameters
ssvParameters	O			V-ITS-S	The data frame containing the EEBL use-case parameters to be used by the station	scm – systemParameters - ssvParameters
lateralOffset	M	INTEGER { default2meters(200) } (0..10000)		V-ITS-S	See PSTS012	scm – systemParameters - ssvParameters
camTimeout	M	INTEGER { ssvCamTimeoutOneSecondDefault(10) } (1..100)		V-ITS-S	See PSTS012	scm – systemParameters - ssvParameters
tvspedMin		INTEGER (0..200)			See PSTS012 Unit: km/hr	scm – systemParameters - ssvParameters
tvspedMax		INTEGER (0..200)			See PSTS012 Unit: km/hr	scm – systemParameters - ssvParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
tvspeedMax		INTEGER (0..200)			See PSTS012 Unit: km/hr	scm – systemParameters - ssvParameters
speedMin	M	INTEGER (0..200)		V-ITS-S	See PSTS012 Unit: km/hr	scm – systemParameters - ssvParameters
speedMax	M	INTEGER (0..200)		V-ITS-S	See PSTS012 Unit: km/hr	scm – systemParameters - ssvParameters
speedClear	M	INTEGER (0..200)		V-ITS-S	See PSTS012 Unit: km/hr	scm – systemParameters - ssvParameters
speedFinal	M	INTEGER (0..200)		V-ITS-S	See PSTS012 Unit: km/hr	scm – systemParameters - ssvParameters
decelerationSafe	M	INTEGER(0..100)		V-ITS-S	See PSTS012 Unit: decimetre/sec/sec	scm – systemParameters - ssvParameters
decelerationMin	M	INTEGER(0..100)		V-ITS-S	See PSTS012 Unit: decimetre/sec/sec	scm – systemParameters - ssvParameters
thresholdHigh	M	INTEGER { eebThresholdHigh(30), eebThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS012 Unit: decisecond	scm – systemParameters - ssvParameters
thresholdMedium	M	INTEGER { eebThresholdHigh(30), eebThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS012 Unit: decisecond	scm – systemParameters - ssvParameters
thresholdLow	M	INTEGER { eebThresholdHigh(30), eebThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS012 Unit: decisecond	scm – systemParameters - ssvParameters
twvrParameters	O			V-ITS-S	The data frame containing the TWVR use-case parameters to be used by the station	scm – systemParameters - twvrParameters

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
speedMin	M	INTEGER (0..200)		V-ITS-S	See PSTS014 Unit: km/hr	scm – systemParameters - arlwParameters
speedMax	M	INTEGER (0..200)		V-ITS-S	See PSTS014 Unit: km/hr	scm – systemParameters - twvrParameters
speedClear	M	INTEGER (0..200)		V-ITS-S	See PSTS014 Unit: km/hr	scm – systemParameters - twvrParameters
decelerationSafe	M	INTEGER(0..100)		V-ITS-S	See PSTS014 Unit: decimetre/sec/sec	scm – systemParameters - twvrParameters
decelerationMin	M	INTEGER(0..100)		V-ITS-S	See PSTS014 Unit: decimetre/sec/sec	scm – systemParameters - twvrParameters
thresholdHigh	M	INTEGER { eebIThresholdHigh(30), eebIThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS014 Unit: decisecond	scm – systemParameters - twvrParameters
thresholdMedium	M	INTEGER { eebIThresholdHigh(30), eebIThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS014 Unit: decisecond	scm – systemParameters - twvrParameters
thresholdLow	M	INTEGER { eebIThresholdHigh(30), eebIThresholdMedium(100) } (0..250)		V-ITS-S	See PSTS014 Unit: decisecond	scm – systemParameters - twvrParameters

### 13 Geomessaging Tile (GTM) Data Elements

The GTM implements the distribution of tile data to the stations. Tiles are hierarchal. For example, the world tile has Australia (AU) as a tile and the AU tile has Queensland (QLD) as a tile. This hierarchy continues until the tile size has limited the number of C-ITS messages applicable to a tile to a number that is manageable by a V-ITS-S software.

**Table 13-1 - Geomessaging Tile Data Specification**

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
protocolVersion	M	INTEGER{ currentVersion(1) }(0..255)	1	V-ITS-S	The DE <i>protocolVersion</i> is used to select the appropriate protocol decoder at the receiving ITS-S. <i>currentVersion</i> shall be set to '1'	header
stationID	M	INTEGER(0..4294967295)		V-ITS-S	Identifier for an ITS-S. The ITS-S ID may be a pseudonym. It may change over space and/or over time.	header
stationName	M	UTF8String(SIZE(1..23))		V-ITS-S	The stationName DE is synonymous to MQTT's Client Identifier and is used to uniquely identify the client to the server.	header
caviMessageld	M	INTEGER {cme(0), csem(1), gtm(2), scm(3), spm(4), v(5), vss(6), r(7)} (0..255)		All	Indicates the type of message that was received or transmitted. 0 – CME, C-ITS message event 1 – CSEM, Safety Evaluation data message 2 – GTM, geo-tiling message 3 – SCM, station configuration message 4 – SPM, station platform message 5 – C-ITS messages, excluding static speed 6 – static speed IVIM 7 – MAPEM for the R-ITS-S	header
gtm	M			V-ITS-S	The data frame containing the geo-tile message elements	gtm
management	M			V-ITS-S	The data frame containing the management elements	gtm – management
timeStamp	M	INTEGER{ utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		V-ITS-S	The timeStamp represents the time at which the geoTile message was generated for transmission to the client.  Unit: milliseconds	gtm – management

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
tiles	M	SEQUENCE SIZE (1..1500) OF TileData		V-ITS-S	The data frame containing the collection of tiles	gtm – tiles
tileId	M	IA5String (SIZE(1..32))		V-ITS-S	The unique identifier of the tile, for example, AU-QLD-CAV115	gtm – tiles
tileVersion	M	INTEGER (0..65535)		V-ITS-S	Used to identify the version of the tile	gtm – tiles
referral	M	SEQUENCE SIZE (1..8) OF Topic		V-ITS-S	The data frame used to identify if there are more levels of tiles in the hierarchy below this level	gtm – tiles
brokerName	M	UTF8String(SIZE(1..256))		V-ITS-S	A DE is used to identify an MQTT broker for a topic. When <i>nextLevel</i> is true <i>brokerName</i> and <i>topic</i> refers to the MQTT topic that contains the sub-tiles of this tile. When <i>nextLevel</i> is false then at least one and optionally up to eight sets of <i>brokerName</i> and <i>topic</i> may be specified that refer to the topics that have the C-ITS message for the tile.	gtm – tiles – referral
topic	M	UTF8String(SIZE(1..256))		V-ITS-S	A topic DE is the fully qualified name of the AWS IoT MQTT topic. When <i>nextLevel</i> is true <i>brokerName</i> and <i>topic</i> refers to the MQTT topic that contains the sub-tiles of this tile. When <i>nextLevel</i> is false then at least one and optionally up to eight sets of <i>brokerName</i> and <i>topic</i> may be specified that refer to the topics that have the C-ITS message for the tile.	gtm – tiles – referral
parentTile	O	IA5String (SIZE(1..32))		V-ITS-S	Used to navigate up through the tile hierarchy when a station moves between tiles	gtm – tiles
nextLevel	M	BOOLEAN		V-ITS-S	True if this tileId has child tiles. False otherwise. When False	gtm – tiles
rtkStations	O	SEQUENCE SIZE (1..3) OF IA5String (SIZE(1..128))		V-ITS-S	The full MQTT topic name for the collection of AUSCORS relevant to this tile	gtm – tiles
geography	O	CHOICE {rectangle RectTile, polygon SEQUENCE (SIZE(3..999)) OF Vertex}		V-ITS-S	The data frame containing the geography of the tile as a rectangular tile (future use) or a polygon.	gtm – tiles – geography
rectangle	O			V-ITS-S	The data frame containing the geography of the tile as a rectangular tile.	gtm – tiles – geography

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
north south	O	INTEGER (-900000000..900000001)		V-ITS-S	The <i>latitude</i> part of the specification of a <i>rectangle</i> . Optional because of the CHOICE between <i>rectangle</i> and <i>polygon</i> .	gtm – tiles - geography - rectangle
east west	O	INTEGER (-1799999999..1800000001)		V-ITS-S	The <i>longitude</i> part of the specification of a <i>rectangle</i> . Optional because of the CHOICE between <i>rectangle</i> and <i>polygon</i> .	gtm – tiles - geography - rectangle
polygon				V-ITS-S	The data frame containing the geography of the tile as a polygon.	gtm – tiles – geography
latitude	O	INTEGER (-900000000..900000001)		V-ITS-S	The <i>latitude</i> part of the specification of a <i>polygon</i> . Optional because of the CHOICE between <i>rectangle</i> and <i>polygon</i> .	gtm – tiles - geography - polygon
longitude	O	INTEGER (-1799999999..1800000001)		V-ITS-S	The <i>longitude</i> part of the specification of a <i>polygon</i> . Optional because of the CHOICE between <i>rectangle</i> and <i>polygon</i> .	gtm – tiles - geography - polygon
usageTags	O	SEQUENCE OF IA5String(SIZE(1..64))		V-ITS-S	Collection for general use with the usage agreed by application. For example, may be used to specify whether a use case is active for a tile "<RHW: false>"	gtm – tiles

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## 14 EtsiMessageCollection Data Elements

This message is used to publish collections of C-ITS messages. Current this is only used for publishing static speed IVIM. There is up to 2,500 static speed IVM per tile in the ICVP pilot area. This number of tiles is too large to publish separately via MQTT. This message is used to aggregate static speed IVIM into packets limited by the AWS IoT MQTT package size limit.

Data Element Identifier	Use (M/O)	Format	Default Value	Station	Description/purpose	Message Tree Reference
uniqueId	M	IA5String (SIZE(1..256))		V-ITS-S	When the collection of C-ITS messages published using this message exceeds the facilities layer maximum packet size the collection is split into several packets. This element is a unique identifier for the collection of packets (containers) containing the messages.	
creationTime	M	INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)		V-ITS-S	ETSI TS 102 894-2 TimestampITS data element of the time that the message was displayed on the HMI	
tileId	M	IA5String (SIZE(1..32))		V-ITS-S	The unique identifier of the tile, for example, AU-QLD-CAVI15	
collectionVersionNumber	M	INTEGER(0..65535)		V-ITS-S	A version number for the collection of messages contained in this message. For example, the <i>staticSpeedIvimSetVersion</i>	
containerNumber	M	INTEGER(0..127)		V-ITS-S	The number of this container within the set	
containerNumberTotal	M	INTEGER(0..127)		V-ITS-S	The total number of containers in this set	
messageCount	M	INTEGER(0..4294967295)		V-ITS-S	The number of messages in this container	
totalMessageCount	M	INTEGER(0..4294967295)		V-ITS-S	The total number of messages in all containers of the set	
messages	M	SEQUENCE OF OCTET STRING		V-ITS-S	The collection of UPER encoded messages.	



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