



French C-ITS Deployment Coordination committee

Master technical specifications for I2V use cases

2.4.1.2_M_Master_I2V

Activity 2: Studies

Sub Activity 2.4 > Specifications

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Information on the document

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23/04/2021	4.70	J.DIEZ	<ul style="list-style-type: none"> SSP of IVIM : 3 containers added following COCSIC E 2021-04 (action #1203) 	COCSIC
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31/03/2022	4.90	J.DIEZ	<ul style="list-style-type: none"> Modification of the IVI message following the release 2.0 of the C-Roads Platform: mostly new utilisation of GIC and possibility to use textContainer. Few mistakes corrected in MAPEM/SPATEM. All modifications appear as editions from the previous version. Removal of multiple colors in the whole document are not tracked as editions. RoadConfigurationContainer added in IVIM description. Some examples added for IVI messages. 	COCSIC
13/07/2022	4.100	J.DIEZ	<ul style="list-style-type: none"> Retroaction n°1364 (connectedIVIStructure made optional) Retroaction n°1323 (distance in SPATEM-advisoryspeed not used) Retroaction n°967 (confidence of likelyTime updated in SPATEM profile) Retroaction n°1157 (bit of Store Carry Forward at 0 for all messages) Retroaction n°1279 (MAPEM/dElevation and 2 regional extensions made optional for G7 UC). 	COCSIC

			<ul style="list-style-type: none"> • Max 4 lines & 32 characters per TcPart. • Retroaction n°1318 (maximum hoplimit at 1 instead of 0 for MAPEM) 	
<u>31/08/2022</u>	<u>4.101</u>	<u>J.DIEZ</u>	<ul style="list-style-type: none"> • <u>Retroaction n°1278 (regional in MAPEM/SPATEM).</u> • <u>Retroaction n°1163 (gestion of not used DE/DF).</u> • <u>Retroaction n°1413 (short introduction to chapters).</u> • <u>Retroaction n°1427 (validTo for cancellation messages & iviStatus).</u> • <u>Retroaction n°1331 (D11 use case).</u> • <u>Retroaction n°1023 (SSP of Vro).</u> • <u>Retroaction n°1189 (Destination area of POI messages).</u> • <u>Retroaction n°1195 (eventPositionHeading)</u> • <u>Retroaction n°1023 (SSP for Vro).</u> • <u>Clarification of eventHistory and traces in DENM.</u> • <u>Rétroaction 1337: Zones in IVIM start at reference position.</u> • <u>Update of the IVIM logigram of use cases.</u> 	<u>COCSIC Studies</u>
<u>06/09/2022</u>	<u>4.102</u>	<u>A. FOULQUIÉ (Viveris AMO DMR)</u>	<ul style="list-style-type: none"> • <u>Minor updates and formatting</u> • <u>Presented to COCSIC Studies of Sept</u> 	<u>COCSIC Studies</u>
<u>05/10/2022</u>	<u>4.103</u>	<u>A. FOULQUIÉ</u>	<u>Integrating remarks from COCSIC Studies</u>	<u>Draft</u>
<u>09/05/2023</u>	<u>4.105</u>	<u>A.LE CALVEZ</u>	<u>Adding of GIC, IVS and TC in the Acronyms section.</u> <ul style="list-style-type: none"> • <u>Retroaction n°1300 (Deletion of DENM types 11/1 and 11/3)</u> • <u>Retroaction n°1489 (external temperature data in DENM).</u> • <u>Retroaction n°1562: form change in Production SSP table for DENM</u> • <u>Step back on retroaction n°1337 (Zones in IVIM start at reference position) due to IVI standard evolution</u> • <u>Step back on retroaction n°1423 (Harmonization of specifications for CAM-I): CAM-I not allowed in production</u> • <u>Retroaction n°1488: Detail on IssuerIdentifier for Bordeaux Metropole</u> • <u>Retroaction n°1561: new IssuerIdentifier attribution - 04 VINCI production, 05 VINCI pre-production, 06 free to use</u> • <u>Retroaction n°1586: modification of the incorrect production SSP for RSU/Nfr</u> • <u>Retroaction n°1552: adding ETM and SAEM in the validation SSP part</u> 	<u>Draft</u>

<u>20/06/2023</u>	<u>4.110</u>	<u>A.LE CALVEZ</u>	<u>Integrating remarks from COCSIC Studies of May.</u> <u>Adding precision on DENM traces to match with 2.4.1.2_M_Master and C2CC BSP.</u> <u>Suppression of changes on the 2 retroactions:</u> <ul style="list-style-type: none"> <u>Retro n°1300 (Deletion of DENM types 11/1 and 11/3)</u> <u>Retro n°1561: IssuerIdentifier attribution for Vinci</u> 	<u>COCSIC</u>
<u>26/06/2023</u>	<u>4.110</u>	<u>T. BELLACHE</u>	<u>Approved document (may 2023)</u>	<u>COCSIC</u>

Black highlighted text are problem with standards.

The following legend is used on master document tables (next sub-chapters) and on profiles in each UC documents:

Standard / Field: if status is mandatory in standard: **bold**, If optional: *italic*.

Profile / Status:

- If mandatory: **V**
- If optional in standard:
 - Used (**U**) when always used
 - Not used (**N**) when never used. However, at reception, ITS-S receiving a message with not used **N** DE shall not discard the message.
 - Sometimes (**S**) when it depends.

Profile / Content: important settings or information are in ***bold italic pink underline***.

Quality rules

Reference to the version administration

Version number to be composed of 3 digits > vR.XY

- **R** corresponds to the release number: it is upgraded each time SC Studies validates the diffusion of a new release,
 - **X** is the major version number: it is upgraded each time SC Studies validates the deliverable,
 - **Y** is the minor version number: it is upgraded each time a contributor changes anything.
- Once the deliverable is approved, its version number is upgraded from vR.XY to vR.(X+1)0
Once the deliverable is release, its version number is upgraded from vR.XY to v(R+1).00

As illustration:

- 0.03 > Work in progress version
- 0.10 > Del. Approved by SC Studies but not released
- 2.00 > Del. approved & released (in release 2)
- 2.05 > Del. Updated - in progress version

Requirements identification & traceability

In this document, the following verbal forms are used to indicate requirements: **Shall / Shall not**

Recommendations shall be indicated by the verbal forms: **Should / Should not**

Permissions shall be indicated by the verbal forms: **May / May not**

Possibility and capability shall be indicated by the verbal forms: **Can / Cannot**

Inevitability used to describe behaviour of systems beyond of the scope of this del. shall be indicated by: **Will / Will not**

Facts shall be indicated by the verbal forms: **Is / Is not**

In the table here below:

2.4.X.XX > is the number given to the deliverable (e.g. 2.4.4.8)

YYYY > for digit are given to identifying which component/entity the requirement is addressing (e.g. LTCA for long term certificate authority)

ZZZ > is the numeration of the requirement

ID	2.4.X.XX-YYYY-ZZZ
Component(s)	(e.g.) Vru-ITS-S, Vrq-ITS-S, R-ITS-S, PKI
Requirement	(e.g) An ITS station SHALL be able to request and get a Long term Certificate (LTC) from the SCOOP Public Key Infrastructure (PKI).
Acceptance	(e.g) CA1: Vru-ITS-S sends a LTC request to the LTCA CA2: R-ITS-S relays the LTC request CA3: The LTCA verifies the request and sends a response CA4: The R-ITS-S relays the response CA5: The response is received by the Vru-ITS-S and is valid
Additional information	

Acronyms & abbreviations

CAM	Cooperative Awareness Message
CC/SCC	causeCode/subCauseCode
C-ITS	Cooperative Intelligent Transport Systems
C-ITS-S	Cooperative ITS Station
DE	Data Element
DENM	Decentralized Environmental Notification Message
DF	Data Frame
DSL	Dynamic Speed Limit
ETA	Estimated Time of Arrival
eVMS	embedded VMS
GIC	<u>General IVI Container</u>
GLOSA	Green Light Optimal Speed Advisory
HMI	Human-Machine Interface
I2V	Infrastructure To Vehicle
ITS	Intelligent Transport Systems
ITS AID	ITS-Application Identifier
IVI	Infrastructure to Vehicle Information
IVS	<u>In-Vehicle Signage</u>
MAP	Map data
MAPPF	Map data Platform
MCTO	Multimodal Cargo Transport Optimization
Nfr-ITS-S	French National ITS Station
PF	Platform
R-ITS-S	Roadside ITS Station (RSU in the French Terminology)
RLT	Road and Lane Topology
RR-ITS	Regulatory Region ITS
RWW+	RoadWorks Warning enhanced
SPAT	Signal Phase and Timing
SPATPF	Signal Phase and Timing Platform
SSP	Service Specific Permissions
TC	<u>Text Container</u>
TCC	Traffic Control Centre
TLM	Traffic Light Maneuver
TMS	Traffic Management System
UC	Use Case
VDS	Vehicle Descriptor Section
V-ITS-S	Vehicular ITS Station
VMS	Variable Message Sign
Vev-ITS-S	Emergency vehicle V-ITS-S
Vlev-ITS-S	Law enforcement vehicle V-ITS-S
Vro-ITS-S	Road operator V-ITS-S
Vru-ITS-S	Road user V-ITS-S
WMI	World Manufacturer Identifier
WWD	Wrong-Way Driving

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1. Introduction

1.1. Purpose of the document

This Master_I2V document contains the common technical specifications for I2V C-ITS use cases in France. They are valid for each use case of the 2.4.1.2_M activity.

Note that 2.4.1.2_M activity does not explain architecture concerns, which are described in 2.4.1_M deliverable, nor functional descriptions that are detailed in 2.2_H / catalog deliverable.

1.2. Set of 2.4.1.2_M documents

The set of 2.4.1.2_M document is composed of:

- **Master_I2V document (this document)**
 - annex 1 : defining TS14823 road sign coding (in IVIM)
 - annex 2 : ASN definition of CAM-I messages
 - annex 3 : ASN definition of POI_extended messages
- B1a&B1b - Road Work Warning enhanced (Road Work Warning – Alert planned closure (partly adapted for automated driving systems) (I2V)
- B4 – Dangerous vehicle approaching road works: warning to the dangerous vehicle (I2V)
- B5– Dangerous vehicle approaching road works: warning to workers (I2P)
- C2 - Dynamic Speed Limit (I2V)
- C3 - embedded VMS (I2V)
- C4 – Toll station approaching: orientation of drivers (I2V)
- C8 – Toll Barrier Crossing for Automated Vehicles (I2V)
- D7 - Wrong Way Driving (I2V)
- D9a – Alert temporary mountain pass route closure (I2V)
- D9b – Alert approaching a closed mountain pass route (I2V)
- E1 – Traffic information about snow on the road (I2V)
- E7 - Traffic Jam Ahead (I2V)
- F1 - Information on parking lots location, availability and services (I2V), including trucks parkings
- G1a - Green Light Optimal Speed Advisory (I2V)
- G1b - Time to Green (I2V)
- G5 - In-vehicle signage at a merge for vehicles on the entry slip road (I2V)
- G6 - In-vehicle signage at a merge for vehicles on the main road (I2V)
- G7 - HD cartography on intersections (I2V)
- H2 - Permanent and dynamic traffic ban to specific vehicles (InterCor)(I2V)
- H4 - Dynamic Lane Management - Reserved Lane (I2V)
- H6 - No overtaking for trucks (InterCor)(I2V)
- I3 - Road Worker in the Field (P2V)
- K1 – Level crossing status (I2V)
- K7 – Level crossing for automated vehicles (I2V)
- M1 – Payment service at a toll station (I2V)

J1 (estimated time of arrival (ETA) for trucks), J2 (assigning a slot to a given vehicle for cross-channel traffic), J3 (Information on the site's access conditions) and J4 (Guide the truck in the port (terminal or truck parking)), which are use cases of J (Multimodal Cargo Transport Optimization), are specified apart by 2.4.1.2_Bis_H document(s).

Exception: this document contains directly the details on SCOOP₁ I2V use-cases in a dedicated chapter “SCOOP₁ I2V use cases”: B1c, D1-2-3-4-5-6-8-11 and E6 (but not B1a and B1b, which is detailed in an independent deliverable).

For each use case (UC documents):

- 1) A figure is given. A sequence diagram is presented with a paragraph that give further explanations. Those explanations include non-technical approach and technical constraints issued from technical specification chosen.
- 2) A message description is given. Technical details on data elements are given.

2. Master technical choices in I2V context

2.1. CAM-I

The following chapter gives the description of the CAM according to the standard ETSI EN 302 637-2 (V1.4.1, 04-2019) and the general choices for CAM and CAM-I (not standardized yet) made for the implementation in the French projects. Any technical aspect that depends on the use case is described in the concerned use case deliverable.

~~CAM-I is an extension of the CAM format of ETSI. In case the R-ITS-S is set to broadcast CAM instead of CAM-I, the field and element related to the CAM-I extension are just not included.~~

Important: note that the following chapter only apply to static R-ITS-S. Even when a Vro-ITS-S acts as a R-ITS-S (when relaying I2V information), the Vro-ITS-S doesn't broadcast CAM-I (it broadcast CAM only with the stationType corresponding to the vehicle).

<u>ID</u>	<u>2.4.1.2_M_Master_CAMMessageProfile</u>
<u>Component(s)</u>	Broadcast: R-ITS-S, Nfr-ITS-S Receive: V-ITS-S
<u>Requirement</u>	The CAM-I transmitted by the infrastructure shall respect what is expected in the following table.
<u>Acceptance</u>	
<u>Additional information</u>	Based on ETSI standard EN 302 637-2 (V1.4.1, 04-2019)

Table 2.1-1 : CAM-I Master choices

CAM ETSI Standard status		CAM-I Master choices		
Field	Type of data	Status	I2VComments	Value set
Header				
protocolVersion	INTEGER (0..255)	✓	Version for is ETSI EN 302 637-2 1.3.1 (2019-04), referenced in the DA, is 2.	(is 2)
messageID	denm(1), cam(2), poi(3), spatem(4), mapem(5), ivim(6), ev-rsr(7), tistpgtransaction(8), srem(9), ssem(10), evcsn(11), saem(12), rtcmem(13)	✓	cam (2)	(is 2)
stationID	INTEGER(0..4294967295)	✓	INTEGER (0.4294967295) StationID is computed from the pseudonym certificate, see deliverable 2.4.4.8_M	
CoopAwareness				
generationDeltaTime	INTEGER { oneMilliSec(1) } (0..65535)	✓	Generation time of the CAM « The value of the DE shall be wrapped to 65 536. This value shall be set as the remainder of the corresponding value of TimestampPlts divided by 65 536 as below: generationDeltaTime = TimestampPlts mod 65 536 »	

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CAM ETSI Standard status		CAM-I Master choices		
Field	Type of data	Status	I2VComments	Value set
>BasicContainer				
StationType	(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)	✓	The R-ITS-S shall use the code (15).	(is 15)
ReferencePosition >	SEQUENCE (see four next lines)	✓	R-ITS-S position and related precision. This position is updated in real time, it shall correspond to the current position of the R-ITS-S.	
>latitude	INTEGER {oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(900000001) } (-900000000..900000001)	✓	latitude of the R-ITS-S	
>longitude	INTEGER {oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(1800000001) } (-1800000000..1800000001)	✓	longitude of the R-ITS-S	
>confidencePositionElipse	SEQUENCE { semiMajorConfidence SemiAxisLength, semiMinorConfidence SemiAxisLength, semiMajorOrientation HeadingValue}	✓	The precision, obtained based on a PositionEllipse Confidence, should be 95% Failing this, it is declared unavailable.	
>altitude	SEQUENCE { altitudeValue AltitudeValue, altitudeConfidence AltitudeConfidence}	✓	If known. If not, set to unavailable value.	
>HighFrequencyContainer > CHOICE -> rsuContainerHighFrequency				
protectedCommunicationZonesRSU	SEQUENCE (SIZE(1..16)) OF ProtectedCommunicationZone ProtectedCommunicationZone ::= SEQUENCE { protectedZoneType ProtectedZoneType, expiryTime TimestampPlts OPTIONAL, protectedZoneLatitude Latitude, protectedZoneLongitude Longitude, protectedZoneRadius ProtectedZoneRadius OPTIONAL, protectedZoneID ProtectedZoneID OPTIONAL, ...} ProtectedZoneType ::= ENUMERATED { permanentCenDsrcTolling (0), ..., temporaryCenDsrcTolling (1) }	S	CAMs transmitted by the R-ITSs shall use this field when there is protected communication zones in the vicinity (e.g toll station). A protected zone SHALL comply with RS_RSP_100 (roadside profile document of C-Roads PF) : "A Protected Zone shall be defined as follows: If a tolling location only consists of a single CEN-DSRC RSU, then a Protection Zone with the default radius of 55m shall be defined, having the location of the CEN-DSRC RSU as centre position. In case there are multiple CEN-DSRC RSUs nearby, overlaps of Protected Zones should be avoided as much as possible through combined Protected Zones. A combined Protected Zone shall use the geographical centre (circumcentre) of all contained DSRC RSUs as a centre position; the radius shall be given by the circumradius + 55 m (See Figure 2). In any case, the maximum radius of 255 m shall not be exceeded. NOTE: Due to the maximum radius of 255 m, overlaps can not always be avoided."	
>basicVehicleContainerLow Frequency		✗	Not appropriate for a R-ITS-S	
>SpecialVehicleContainer		✗	Not appropriate for a R-ITS-S	

CAM-I is an extension of the CAM format of ETSI. In case the R-ITS-S is set to broadcast CAM instead of CAM-I, the field and element related to the CAM-I extension are just not included.

Following table presents the blocks added to CAM to make it a CAM-I. The following data fields have the same rank than protectedCommunicationZonesRSU (i.e the following DF are in the HighFrequencyContainer wich contains a SEQUENCE of: protectedCommunicationZonesRSU, serviceAdvertismentContainer, positionEnhancementContainer and environmentAndContextContainer)

Table 2.1-2 : CAM-I Master choices

		CAM-I Master choices		
Field	Type of data	Status	I2VComments	Value set
>>serviceAdvertismentContainer	SEQUENCE of 6 following DE	✓	Mandatory	
advertisedServiceId	INTEGER(0.. 255)	✓	Advertised Service ID= 0 if PKI service supported Advertised Service ID= 1 if upload log service supported	is 0 or 1
serviceAccessCapabilities	BIT STRING { globalNetwork (0), continuousExchangeCapability (1), storeForwardCapability (2) } (SIZE(8))	✓	The choice of access policy for vehicles depends on the global access policy selected by each road operator. _ The first bit indicates if a private access or a global access is available. If bit n°1=0 the R-ITS-S provides access to a private network and if bit n°1=1 the R-ITS-S provides access to a global. _ The bit n°2, when having the value " 1 " indicates the capacity of the R-ITS-S to establish a continuous exchange with a remote server via the private/global global network. If this one has the value " 0 ", the R-ITS-S does not possess this capacity. _ The bit n°3, when having the value " 1 " indicates the capacity of the R-ITS-S to store locally a message and to transmit it as soon as possible towards a remote server (store and forward) via the private/global network, as soon as this one is available. If this bit has the value " 0 ", the R-ITS-S does not possess this capacity. _ The bits n°4-5-6-7 and 8 are reserved for a future usage.	
channelUsedByTheAdvertisedService	ENUMERATED {cch(0),sch1(1), sch2(2), sch3(3), sch4(4), sch5(5), sch6(6)}	✓	SCH1 shall be used	is 1
communicationProfileUsedForTheService	ENUMERATED {btppgeonet(0),tcpipv4(1), tcpiv6(2)}	✓	For this service, it shall be IPv6 over LLC and G5 SCH1 which is coded in L 2.4.1 as CP8 (if TCP) or CP9 (if UDP)	
rsuMacAddress	RsuMacAddress ::= OCTET STRING (SIZE(6))	✓	This field indicates the MAC address of the R-ITS-S	

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		CAM-I Master choices		
Field	Type of data	Status	I2VComments	Value set
rsulpAddress	<p>RsulPAddress ::= CHOICE { rsuiPv4Andv6Address lPv4Andv6, rsuiPv4Address lPv4Address, rsuiPv6Address lPv6Address}</p> <p>lPv4Andv6 ::= SEQUENCE { rsuiPv4Address lPv4Address, rsuiPv6Address lPv6Address}</p> <p>lPv4Address ::= OCTET STRING (SIZE(4))</p> <p>lPv6Address ::= OCTET STRING (SIZE(16))</p>	✓	This field indicates the IP address of the R-ITS-S. If IPv4 is supported the field contains the IPv4 address of the R-ITS-S. If IPv6 is supported the field contains the IPv6 address of the R-ITS-S. If both IPv4 and lPv6 are supported, the field contains both addresses. Since the IPv6 address of the R-ITS-S is sent to V-ITS through RA (router advertisement) messages we can choose to not send it again through CAM-I message. In this case, there is no need to set this address statically in V-ITS-S.	
>>positionEnhancementContainer	SEQUENCE of 5 following DE	✓	Mandatory	
gpsPositionDeltaLatitude	DeltaLatitude ::= INTEGER {oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(131072)} (-131071..131072)	S	Optional, enable to correct positioning error by comparing the RSU accurate position with the given RSU GPS position.	
gpsPositionDeltaLongitude	DeltaLongitude ::= INTEGER {oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(131072)} (-131071..131072)	S	Optional, enable to correct positioning error by comparing the RSU accurate position with the given RSU GPS position.	
gpsPositionDeltaAltitude	DeltaAltitude ::= INTEGER {oneCentimeterUp (1), oneCentimeterDown (-1), unavailable(12800)} (-12700..12800)	S	Optional, enable to correct positioning error by comparing the RSU accurate position with the given RSU GPS position.	
satelliteConstellationLocallyAvailable	SatelliteConstellationLocallyAvailable ::= INTEGER(0..255)	S	Enable the use of correction if the vehicle detects the same satellite constellation.	
tracesLeadingToTheRsu	TracesLeadingToTheRsu ::= SEQUENCE SIZE(1..7) OF PathHistory	S	Enable the improvement of the vehicle position and the computation of the time window for RSU exchange.	
>>environmentAndContextContainer		✓	Mandatory	
localMeteorologicalData	LocalMeteorologicalData ::= BIT STRING (SIZE(8))	S	Provide local meteorological data for environmental characterization.	
roadEnvironment	RoadEnvironment ::= INTEGER(0..255)	S	Provide the road environment type in which the RSU is positioned	
trafficCondition	TrafficCondition ::= INTEGER(0..255)	S	Provide the current traffic condition.	

Other data elements (which are mandatory in the interface Geonetworking/BTP stack):

Table 2.1-3 : CAM Geonetworking elements

CAM ETSI Standard status		CAM Master choices V2X		
Field	Type of data	Status	Comments	Value set
Traffic class	itsGnTrafficClass Integer32 (0..255) SCF : 1 bit Channel Offload : 1 bit TC ID : 6-bit unsigned integer	✓	“As defined in ETSI EN 302 636-4-1.” SCF bit is 0. Channel offload bit is 0 (see RS_RSP_042 (C-Roads PF Roadside profile) based on RS_BSP_262) TC ID value is “2”.	is 2
Maximum packet lifetime	Shall not exceed 1 000 ms	✓	Set to 1s	is 1s

2.2. DENM

The following chapter gives the description of the DENM according to the standard ETSI EN 302 637-3 (V1.3.1, 04-2019) and the general choices made for the implementation in the French projects. Any technical aspect that depends on the use case is described in the concerned use case deliverable.


ID	2.4.1.2 M Master DENMessageProfile
Component(s)	Broadcast: R-ITS-S, Nfr-ITS-S Receive: V-ITS-S
Requirement	The DENM transmitted by the infrastructure shall respect what is expected in the following table.
Acceptance	
Additional information	Based on ETSI standard EN 302 637-3 (V1.3.1, 04-2019)

Table 2.2-1 : DENM Master choices

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
Header					
protocol Version	"Version of the C-ITS message and/or communication protocol."	INTEGER (0..255)	✓	Version for is ETSI EN 302 637-2 1.3.1 (2019-04), referenced in the DA, is 2.	is 2
messageID	"Type of the C-ITS message."	INTEGER{ denm(1),cam(2), poi(3), spatem(4), mapem(5), ivim(6), ev-rsr(7), tistpgtransaction(8), srem(9), ssem(10), evcsn(11), saem(12), rtcmem(13) } (0..255),	✓	denm(1)	is 1
stationID	"The identifier of the C-ITS-S that generates the C-ITS message in question." This is the ID of the station broadcasting the message.	INTEGER(0..4294967295)	✓	ID of the R-ITS-S or Nfr-ITS-S for I2V (ID of OBU for V2V)	by R-ITS-S or Nfr-ITS-S
Management container					
actionID	SEQUENCE : StationID + SequenceNumber "It is used by a receiving C-ITS-S to process information for DENMs that are multiply received."	SEQUENCE {originatingStationID StationID, sequenceNumber SequenceNumber } StationID ::= INTEGER(0..4294967295) SequenceNumber ::= INTEGER (0..65535)	✓	The actionID has to be same for DENMs relating to the same event, even for updates and cancel. So it is given by PF in I2V. So, in actionID, the stationID is the one of PF (and not the one of the R-ITS-S). Each PF shall have the same stationID in actionID of DENM than issuerIdentifier of IVIM. The actionID is unique ID of the event.	by PF

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
detection Time	<p>"Time at which the event is detected by the originating ITS-S. For the DENM repetition, this DE shall remain unchanged. For the DENM update, this DE shall be the time at which the event update is detected. For the DENM termination, this DE shall be the time at which the termination of the event is detected."</p>	Timestamps ::= INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)	V	<p>In I2v: originally time set by TCC operator in TMS for the beginning of an event, and then time for its update or termination by PF or from TMS (update or termination by operator).</p> <p>For an event without an end time set in TMS, detectionTime is also updated as long as the event is active in TMS (e.g. triggering conditions are still active) and that event will be over within 10% of the validityDuration. In that case, detectionTime is set to current time and validity duration is still set to the default time (end time unknown).</p> <p>Justification: validityDuration is defined since detectionTime (in standard). See also validityDuration DE.</p> <p>This DE is used as versioning of the event (identified by its actionID).</p>	from TMS then by PF
reference Time	<p>"This DE refers to the time at which a new DENM, an update DENM or a cancellation DENM is generated."</p>	Timestamps ::= INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103)	V	Time of encoding of the message by R-ITS-S.	by R-ITS-S
termination	<p>This DF is used to cancel the DENM from the originating C-ITS-S (cancellation) or another C-ITS-S (negation).</p>	ENUMERATED {isCancellation(0), isNegation(1)}	S	<p>Only present when cancel or termination is done by TCC operator in TMS.</p> <p>isNegation not used in FR (unwanted because the right to negate the DENMs issued from another station is not allowed) so if this DE is present in DENM, it will be an isCancellation (0)</p> <p>The termination message is sent with the same Repetition Interval as the message it terminates. Its validityDuration (and Repetition Duration) corresponds to the max value of all previous OverallEndtime of the event it terminates.</p>	from TMS

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
event Position	<p>"Geographical position of the detected event."</p> <p>"When the event position corresponds to the position of a vehicle C-ITS-S, the eventPosition shall be set to the position of the vehicle C-ITS-S at detectionTime.</p> <p>This DF shall be presented as specified in ETSI TS 102 894-2 ReferencePosition" (Réf. DF A.124)</p>	<p>SEQUENCE</p> <p>See next 4 DE (latitude, longitude, confidencePositionEllipse and altitude)</p>	✓	See four next lines	▼▼▼
>latitude	<p>"latitude of the geographical point; it shall be presented as specified in clause A.41 Latitude,"</p> <p>"Absolute geographical latitude in a WGS84 coordinate system, providing a range of 90 degrees in north or in south hemisphere."</p>	<p>INTEGER</p> <p>{oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(9000000001) } (-9000000000..9000000001)</p>	✓	<p>Latitude of eventPosition</p> <p>See each UC for details</p> <p>Latitude is calculated by PF (using position set in TMS)</p>	from TMS by PF
>longitude	<p>"longitude of the geographical point; it shall be presented as specified in clause A.44 Longitude,"</p> <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>INTEGER</p> <p>{oneMicrodegreeEast (10), oneMicrodegreeWest (-10), unavailable(18000000001) } (-18000000000..18000000001)</p>	✓	<p>Longitude of eventPosition</p> <p>See each UC for details</p> <p>Longitude is calculated by PF (using position set in TMS)</p>	from TMS by PF
>confidence Position Ellipse	<p>"positionConfidenceEllipse: accuracy of the geographical position; it shall be presented as specified in clause A.119 PosConfidenceEllipse,"</p>	<p>SEQUENCE {</p> <p>semiMajorConfidence</p> <p>SemiAxisLength,</p> <p>semiMinorConfidence</p> <p>SemiAxisLength,</p> <p>semiMajorOrientation</p> <p>HeadingValue}</p>	✓	<p>Given only because mandatory in standard.</p> <p>To not be discard by vehicle-receiver, set to "perfect precision" {0, 0, 0}</p>	is {0, 0, 0}
>altitude	<p>"altitude and altitude accuracy of the geographical point; it shall be presented as specified in clause A.103 Altitude."</p>	<p>SEQUENCE {</p> <p>altitudeValue AltitudeValue,</p> <p>altitudeConfidence</p> <p>AltitudeConfidence}</p>	✓	<p>Always given because mandatory in standard.</p> <p>Can be set to the values corresponding to 'unavailable' e.g. {800001, unavailable (15)} when no possibility to provide it.</p>	is {800001, unavailable (15)} or current altitude
relevance Distance	<p>DE describing a distance of relevance for information indicated in a message, for example, it may be used to describe the distance of relevance of an event indicated in a DENM as defined in ETSI EN 302 637-3."</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>ENUMERATED</p> <p>{lessThan50m(0), lessThan100m(1), lessThan200m(2), lessThan500m(3), lessThan1000m(4), lessThan5km(5), lessThan10km(6), over10km(7)}</p>	✗	<p>The usefulness of these DEs is unclear, so not used => Appropriate displaying on on-board HMI is automotive constructors domain.</p>	

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
<i>relevance Traffic Direction</i>	<p>"DE describing a traffic direction that is relevant to information indicated in a message. For example, it may be used to describe traffic direction which is relevant to an event indicated by a DENM as defined in ETSI EN 302 637-3 [i.3]. The terms "upstream", "downstream" and "oppositeTraffic" are relative to the event position." "The traffic direction along which the event information is relevant for the receiving ITS-S, as defined in clause 6.1.3.1." This DF indicates for which traffic direction the message is relevant (from the perspective of the sender).</p>	<p>ENUMERATED {allTrafficDirections(0), upstreamTraffic(1), downstreamTraffic(2), oppositeTraffic(3)}</p>		<p>If a vehicle receives an upstreamTraffic or an allTrafficDirections event and is on one traces of the event, it is concerned by event.</p> <p>To clarify the process that could be done by a vehicle-receiver of a DENM and determine if the event is relevant or not for the vehicle-receiver due to the relevanceTrafficDirection, the following logic may be followed :</p> <ul style="list-style-type: none"> - upstream : receiver checks if on (one) trace of the event. If yes, concerned. - downstream : receiver checks if event is on its pathHistory AND if the heading of the event is quite the same compares to its own. If yes, concerned. - allTrafficDirection : receiver is concerned if approaching the event point (or eventHistory). - oppositeTraffic : receiver is concerned if approaching the event (or eventHistory) and if its pathHistory is going to complete as a line (one) traces of the event, without superposition (as soon as superposed, the receiver is downstream of the event and thus no more concerned). <p>See each UC for details.</p>	by PF

2.4.1.2_M_Master technical specifications for I2V use cases



DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
validityDuration	<p>"Validity duration of a DENM. The validityDuration is set by the originating ITS-S. Therefore, it represents an estimation of how long the event may persist. It implies the duration over which the DENM should be kept at the DEN basic service of the receiving ITS-S and the DENM dissemination be maintained in the relevance area or destination area, until the expiration of validityDuration. In case the expiry time of the event cannot be estimated at the originating ITS-S, a default value is used for the DENM protocol operation. This DE may be renewed by the originating ITS-S, if the pre-set expiry time has reached to its limit and the originating ITS-S detects that the event persists." "The DE is represented as a time offset in the unit of second since detectionTime. This DE is optional. It shall be present if the information is required by the ITS application. If the DE is not present in DENM, a default value defaultValidity is assumed."</p>	<p>INTEGER {timeOfDetection(0), oneSecondAfterDetection(1)} (0..86400)" e.g. time in seconds. And if unknown, not present, a defaultValidity is assumed (is 600s e.g. 10mn)</p>	<p>✓</p>	<p>ValidityDuration is an estimated duration of event since detectionTime (cf. standard)</p> <p>For I2V use cases:</p> <p>- If end time of the event is known and is less than 24 hours (86400 seconds), validityDuration is set to duration to the end of the event.</p> <p>If end time of event is known and is more than 24 hours (86400 seconds), validityDuration is set to 86400 seconds.</p> <p>- If end time of event is unknown the default validityDuration is a default value (see each UC).</p> <p>These policy on duration may change during experiment to find the best compromise between uses of short, medium or long time.</p>	by PF
transmissionInterval	<p>"Time interval between two consecutive message transmissions." "Time interval for DENM transmission as defined by the originating ITS-S. This DE informs the receiving ITS-Ss about the intended transmission interval of two consecutive DENM transmissions. It is used for the forwarding ITS-S operation."</p>	<p>INTEGER {oneMilliSecond(1), tenSeconds(10000)} (1..10000)</p>	<p>✗</p>	Not used.	
stationType	<p>"This DE provides the station type information of the originating ITS-S." This defines the type of the station broadcasting the DENM.</p>	<p>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>	<p>✓</p>	<p>For I2V UC is set to 15 (roadSideUnit). This is true for fixed R-ITS-S, portable or mobile R-ITS-S (including Vro when they are broadcasting TCC triggered event) and also for message emitted by the N-ITS-S.</p> <p>(Can be 9 (trailer) or 10 (SpecialVehicles) for other UC than those treated in this set of documents, which are I2V only)</p>	is 15 (R-ITS-S)

2.4.1.2_M_Master technical specifications for I2V use cases

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
Situation container					
information Quality	"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."	INTEGER {unavailable(0), lowest(1), highest(7)} (0..7)	V	<p>This can be set to one of eight different values (0..7). ETSI does not specify what the different values mean, but 0 when quality is unknown.</p> <p>As a conclusion of C-Roads PF discussion, road operator shall use the following values in I2V :</p> <ul style="list-style-type: none"> - 2 for risk of - 4 for probable - 6 for certain <p>See each UC for details</p>	by PF
eventType	"Description for the event type, including direct cause and sub cause." See table 10 ETSI EN 302 637-3 for further details	CauseCodeType and SubCauseCodeType are INTEGER (0..255)	V	<p>See each UC for details</p> <p>Note that during an update, the eventType can change e.g when the road operator gets new information about a situation.</p>	by PF
<i>linkedCause</i>	"Description for a linked event of the provided eventType, including direct cause and sub cause of the linked event."	CauseCodeType and SubCauseCodeType are INTEGER (0..255)	S	<p>Seems globally not useful. So not given in most of cases. Can be used for road work action due to an ongoing incident. In that case, only CC/SCC of a specified UC through C-ITS projects is admitted (no new CC/SCC pair which is not related to a specified UC).</p> <p>See RWW+ UC for details. Optional.</p>	by PF

<p>eventHistory</p>	<p>"This DF indicates the list of positions that a plain event has been detected prior to the eventPosition"</p> <p>"The DF consists of a list of event points which represents the dimension of a plain event in a predefined order. In case that the plain event is detected by a vehicle ITS-S, the DF consists of a list of event detection points along the path that the detecting ITS-S has travelled over some past time and/or distance. Each event point corresponds to a point at which the same event was detected along the path. In the present document up to 40 23 EventPoint may be added in this DF. The generation of each EventPoint is specified in the related ITS application requirements". (Note that 40 points is written on DENM standard but max 23 points for eventHistory is written in common data dictionary)</p>	<p>SEQUENCE (SIZE(1..23)) OF EventPoint</p> <p>EventPoint ::= SEQUENCE { eventPosition DeltaReferencePosition, eventDeltaTime PathDeltaTime OPTIONAL, informationQuality InformationQuality }</p> <p>DeltaReferencePosition ::= SEQUENCE { deltaLatitude DeltaLatitude, deltaLongitude DeltaLongitude, deltaAltitude DeltaAltitude }</p> <p>DeltaLatitude ::= INTEGER {oneMicrodegreeNorth (10), oneMicrodegreeSouth (-10), unavailable(131072)} (-131071..131072)</p> <p>...</p>	<p>S</p> <p><u>eventHistory is a sequence of points, which together form a path from the eventPosition to the end of linear event.</u></p> <p><u>Shall be limited to 23 points.</u></p> <p><u>For I2V, when present, always used without pathDeltaTime, as it is, U used for describing a linear event and not for giving previous position of a punctual moving event.</u></p> <p>eventHistory is a sequence of points, which together form a path from the eventPosition to the end of linear event.</p> <p>informationQuality in the DF of EventPoint is set to the same value than the informationQuality of the event.</p> <p><u>Additional information :</u></p> <p><u>2 consecutive positions in the sequence shall respect a maximum of 131071 microdegree difference, according to the standard. In France, an interval lower than 910 meters always respects this condition.</u></p> <p><u>The max distance between the eventposition and the last point of the event history calculated for FR is 20,9km. The max interval between two event points calculated for FR is 910m. Those will be the max values implemented in the PF.</u></p> <p><u>For the creation of eventHistory, it would be ideal to use Design Method One as specified in Appendix A.5 to SAE J2945/1, but it is possible to use another method such as equidistant points.</u></p> <p><u>For practical purposes, when the dimension of the event is 100m, it may be split in 23 points by the PF with a minimum of max distance between points of 50m when urban context and 100m when context.</u></p> <p>Here are the detail of the calculations (max length): - The max number of points is 23. - This is a sequence of delta positions from point to point,</p>	<p>by PF sequence of delta position without pathDeltaTime</p>
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2.4.1.2_M_Master technical specifications for I2V use cases

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
				with a max of 131071 microdegree from point to point. -1° latitude is 111,11 km. So, 131071*0,000001*11,11 => 1,46 km -1° longitude is 78,85 km at Bordeaux. Is 55,80 km at St-Petersburg... North of France, assimilated to Greenwich, 1° longitude is 69,47km and used as reference for FR. -So, 131071*0,000001*6,947 => 0,91 km (Greenwich). -So, 23 times 0,91 km can be assumed anyway by eventHistory in France. It is approximately 20,9 km.	
Location container					
<i>eventSpeed</i>	<p>"Moving speed of a detected event and the confidence of the moving speed information."</p> <p>"When the eventPosition corresponds to the position of a vehicle ITS-S, the eventSpeed shall be set to the vehicle speed at detectionTime."</p>	<p>Speed ::= SEQUENCE {speedValue SpeedValue, speedConfidence SpeedConfidence}</p> <p>SpeedValue ::= INTEGER {standstill(0), oneCentimeterPerSec(1), unavailable(16383)} (0..16383)</p> <p>SpeedConfidence ::= INTEGER {equalOrWithinOneCentimeterPerSec(1), equalOrWithinOneMeterPerSec(100), outOfRange(126), unavailable(127)} (1..127)</p>		As we have only I2V use cases in the set of documents and we won't really know event speeds, this DF won't be used.	
<i>event Position Heading</i>	"The heading direction of the event and the confidence of the heading information, if applicable."	<p>Heading ::= SEQUENCE {headingValue HeadingValue, headingConfidence HeadingConfidence}</p> <p>HeadingValue ::= INTEGER {wgs84North(0), wgs84East(900), wgs84South(1800), wgs84West(2700), unavailable(3601)} (0..3601)</p> <p>HeadingConfidence ::= INTEGER {equalOrWithinZeroPointOneDegree (1), equalOrWithinOneDegree (10), outOfRange(126), unavailable(127)} (1..127)</p>		<p>For moving event, <u>direction of the movement</u>, For static event, or set as the direction of the carriageway concerned by the event, <u>at the eventPosition</u>.</p> <p>HeadingConfidence is set as 127 (unavailable) if unknown.</p> <p>See each UC</p>	by PF

<p>traces</p>	<p>"This DF is the location referencing information of eventPosition. It includes a group of traces as defined in clause 6.1.3.2.</p> <p>Each trace describes a set of consecutive PathPoint positions leading to the event position.</p> <p>ITS-S located near to or inside this trace path may be concerned by the event.</p> <p>Multiple traces may be defined in case multiple road sections or traffic flows are leading to the event position. In the present standards, up to seven traces may be added in a DENM.</p> <p>For each trace, multiple PathPoint positions are provided to describe the trace path."</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 and optionally an offset travel time with regards to the previous PathPoint."</p> <p>"When the event position corresponds to the position of a vehicle ITS-S, the first trace in the DF shall be the PathHistory of the vehicle as defined in the CA basic service ETSI EN 302 637 – 2 7."</p>	<p>SEQUENCE SIZE(1..7) OF PathHistory</p> <p>PathHistory ::= SEQUENCE (SIZE(0..40)) OF PathPoint</p> <p>PathPoint ::= SEQUENCE { pathPosition DeltaReferencePosition, pathDeltaTime PathDeltaTime OPTIONAL}</p>	<p>V</p> <p>This DF consists of minimum 1, maximum 7 traces of type PathHistory. These traces consist of points describing the path towards the eventLocation. These are used by approaching vehicles to determine whether the DENM is relevant or not.</p> <p><u>Each PathHistory It is a sequence of minimum 2 (start and end) and maximum 40 delta positions. The maximum number of points a trace can hold is assumed to be 40, the minimum number of points is 2 (start and end). This is a sequence of delta positions from point-to-point.</u></p> <p><u>Sequence of delta positions from event position to the beginning of the way(s) leading to the eventPosition.</u></p> <p><u>Additional information:-</u></p> <p><u>. 2 consecutive positions in the sequence shall respect a maximum of 131071 microdegree difference, according to the standard. In France, an interval lower than 910 meters always respects this condition.</u></p> <p><u>. If possible, it is preferred to use Design Method One to build traces.</u></p> <p><u>The maximum distance between the eventposition and the last point of the trace calculated for France is 36,4km (40 times 910m). The maximum interval between two path points calculated for France is 910 meters.</u></p> <p><u>Those will be the maximum parameters implemented in the platform.</u></p> <p><u>See the details of calculations in DENM/eventHistory.</u></p> <p><u>Warning:</u></p> <p><u>Describing several traces with lots of points may lead to create an oversized DENM regarding GeoNetworking layer capacity. Traces should have at most 40 points distant of max 22.5m as described in the C-Roads PF MSP. This way the trace length does not exceed 1 km.</u></p>	<p>by PF</p>
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2.4.1.2_M_Master technical specifications for I2V use cases

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
				In addition, C2C has defined a 1km max length of each trace in V2X context and a moderate length of each trace seems needed to avoid too heavy messages. That's why TCC may transmit to R-ITS-S e.g up to 23 points max per trace with delta of: - 50m in non-urban context (so 1-150km max length per trace) - 10m in urban context (so 230m max length per trace)	
roadType	"The road type information at the event position."	ENUMERATED {urban-NoStructuralSeparationToOppositeLanes(0), urban-WithStructuralSeparationToOppositeLanes(1), nonUrban-NoStructuralSeparationToOppositeLanes(2), nonUrban-WithStructuralSeparationToOppositeLanes(3)}	S	For I2V, providing this information presents no difficulty except with the referential which does not contain directly these information. So it is given if doable. It is the road type at the <i>eventPosition</i> (may vary through <i>traces</i> or <i>eventHistory</i>)	by PF
À la carte container					
lanePosition	"The lane position of the event position in the road counted from the outside boarder of the road. This DE is included in the alacarte container. If this data is provided, the originating ITS-S is required to determine the lane position with a predefined confidence level as defined by the ITS applications (e.g. 95 %)."	LanePosition ::= INTEGER {offTheRoad(-1), innerHardShoulder(0), innermostDrivingLane(1), secondLaneFromInside(2), outerHardShoulder(14)} (-1..14) in text part (of CDD) LanePosition ::= INTEGER {offTheRoad(-1), hardShoulder(0), outermostDrivingLane(1), secondLaneFromOutside(2), (-1..14)} in asn part (end of CDD)	S	See each UC for details. It is assumed that text part definition are used (C-Roads PF decision) : => 0 is innerHardShoulder, etc.	by PF
impactReduction	"It contains the vehicle detailed information required for mitigating the consequences of a collision."	SEQUENCE See next DE from heightLonCarLeft to requestResponseIndication	X	Not needed and not appropriate for the use cases of this document	
>heightLonCarLeft >heightLonCarRight	"Height of [left/right] longitudinal carrier of the vehicle from base to top. The [left/right] carrier refers to the [left/right] side seen from vehicle rear to vehicle front."	HeightLonCarr ::= INTEGER {oneCentimeter(1), unavailable(100)} (1..100)	▲		
>posLonCarLeft >posLonCarRight	"Distance from the centre of vehicle front bumper to the front of the [left/right] longitudinal carrier of vehicle. The [left/right] carrier refers to the [left/right] side seen from vehicle rear to vehicle front."	PosLonCarr ::= INTEGER {oneCentimeter(1), unavailable(127)} (1..127)	▲		

2.4.1.2_M_Master technical specifications for I2V use cases

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
>positionOfPillars	"The positionOfPillars contains a list of distance, which refers to the perpendicular distance between centre of vehicle front bumper to vehicle A pillar, between neighbour vehicle pillars until the last pillar of the vehicle."	PosPillar ::= INTEGER {tenCentimeters(1), unavailable(30)} (1..30)	▲		
>posCentMass	"Perpendicular distance from centre of mass of an empty charged vehicle to vehicle front bumper."	INTEGER {tenCentimeters(1), unavailable(63)} (1..63)	▲		
>wheelBaseVehicle	Perpendicular distance between front and rear axle of the wheel base of a passenger vehicle.	INTEGER {tenCentimeters(1), unavailable(127)} (1..127)	▲		
>turningRadius	"The turning radius of a vehicle is the size of the smallest circular turn (i.e. U-turn) that the vehicle is capable of making."	INTEGER {point4Meters(1), unavailable(255)} (1..255)	▲		
>posFrontAx	"Perpendicular distance between the front wheel axle and front bumper."	INTEGER {tenCentimeters(1), unavailable(20)} (1..20)	▲		
>positionOfOccupants	"This DF indicates whether a in vehicle seat is occupied at the moment when the impactReduction is generated. The in vehicle seats layout is defined in rows from the front to the rear of the vehicle. The left seat of a row refers to the left side with regards to the vehicle heading direction."	BIT STRING { row1LeftOccupied (0), row1RightOccupied (1), row1MidOccupied (2), row1NotDetectable (3), row1NotPresent (4), row2LeftOccupied (5), row2RightOccupied (6), row2MidOccupied (7), row2NotDetectable (8), row2NotPresent (9), row3LeftOccupied (10), row3RightOccupied (11), row3MidOccupied (12), row3NotDetectable (13), row3NotPresent (14), row4LeftOccupied (15), row4RightOccupied (16), row4MidOccupied (17), row4NotDetectable (18), row4NotPresent (19) } (SIZE(20))	▲		
>vehicleMass	"This DE indicates the mass of an empty load vehicle."	INTEGER {hundredKg(1), unavailable(1024)} (1..1024)	▲		
>requestResponseIndication	"This DE is included in impactReduction DF in the alacarte container. It indicates whether the originating ITS-S transmitting the impactReduction DF is requesting the receiving ITS-S to provide also its impactReduction DF. On reception of a DENM with this DE set to 0, the receiving ITS-S may in turn transmit a DENM with its impactReduction DF as response to the request."	ENUMERATED {request(0), response(1)}	▲		

2.4.1.2_M_Master technical specifications for I2V use cases

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
<i>external Temperature</i>	"Information included in the alacarte container for the adverse weather condition use case as specified in ETSI TS 101 539-1 [i.4]."	Temperature ::= INTEGER {equalOrSmallerThanMinus60Deg (-60), oneDegreeCelsius(1), equalOrGreaterThan67Deg(67)} (-60..67)	S	<u>Data used in subcases of UC D1 and D6 linked to winter conditions. Providing this information is useful for UC E6. See each UC for details. Not used for the UC of this document as none are about "adverse weather condition".</u>	
<i>roadWorks</i>	"It includes information of the road work zone and specific access conditions."	SEQUENCE See next DE from lightBarSirenInUse to referenceDenms	S	See next lines for details. (when this DF is used by the UC)	▼▼▼
<i>>lightBar SirenInUse</i>	"This DE indicates whether a roadwork vehicle has switched on the light bar or siren."	BIT STRING {lightBarActivated (0), sirenActivated (1)} (SIZE(2))	X	Not used in the UC of this document. Not appropriate for UC.	
<i>>closedLanes</i>	This DF indicates the opening/closure status of a lane or a set of lanes. HardShoulderStatus: "indicates the current status of a hard shoulder lane whether it is available for special usage (e.g. for stopping or for driving) or closed for all vehicles." DrivingLaneStatus: "indicates whether a driving lane is open to traffic. A lane is counted from inside boarder of the road. The numbering is matched to LanePosition DE as defined in clause A.40. If a lane is closed to traffic, the corresponding bit shall be set to 1. Otherwise, it shall be set to 0."	SEQUENCE { innerhardShoulderStatus HardShoulderStatus OPTIONAL, outerhardShoulderStatus HardShoulderStatus OPTIONAL, drivingLaneStatus DrivingLaneStatus OPTIONAL, ... } HardShoulderStatus ::= ENUMERATED {availableForStopping(0), closed(1), availableForDriving(2)} DrivingLaneStatus ::= BIT STRING {outermostLaneClosed(1), secondLaneFromOutsideClosed(2)} (SIZE (1..14)) BIT STRING (SIZE (1..13))	S	See UC for details.	by PF
<i>>restriction</i>	"This DF indicates the types of vehicles that are restricted to access the road work zone. More than one vehicle types may be provided by this DF if the restriction apply to multiple vehicle types."	RestrictedTypes ::= SEQUENCE (SIZE(1..3, ...)) OF StationType StationType ::= 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)	X	Not needed as: - restricted lane should be described via IVI format (not DENM) - give restriction of the access of a road work zone. Kind of things not done in FR.	
<i>>speedLimit</i>	"This DE indicates the speed limitation applied to the roadwork zone."	INTEGER {oneKmPerHour(1)} (1..255)	S	See UC for details.	by PF
<i>>incident Indication</i>	"This DF indicates the incident related to the roadworks to provide additional information of the roadworks zone."	CauseCode ::= SEQUENCE {causeCode CauseCodeType, subCauseCode SubCauseCodeType}	X	If needed to link road work to a cause, <u>linkedCause</u> will be used (and not <u>incidentIndication</u>). This DF is a redundancy in standard from the point of view of FR.	

2.4.1.2_M_Master technical specifications for I2V use cases

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
>recommendedPath	<p>"This DF indicates the recommended itinerary in order to contour the roadworks zone. A recommended path is presented with a list of path points in the order from the starting point closest to the roadworks zone to the end point of the recommended path."</p> <p>"This DF shall be presented as specified in ETSI TS 102 894-2 [5] ItineraryPath."</p>	<p>ItineraryPath ::= SEQUENCE SIZE(1..40) OF ReferencePosition</p> <p>ReferencePosition ::= SEQUENCE {latitude Latitude, longitude Longitude, positionConfidenceEllipse positionConfidenceEllipse, posConfidenceEllipse PosConfidenceEllipse, altitude Altitude}</p>	S	See UC for details. Optional.	by PF
>startingPointSpeedLimit	<p>"The DF indicates the effective starting position of a speed limit being applied to the roadwork zone. Generally speaking, the speed limit applies a certain 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 shall be presented as specified in ETSI TS 102 894-2 [5] DeltaReferencePosition."</p>	<p>DeltaReferencePosition ::= SEQUENCE {deltaLatitude DeltaLatitude, deltaLongitude DeltaLongitude, deltaAltitude DeltaAltitude}</p>	S	See UC for details. Optional.	by PF
>trafficFlowRule	<p>"The DE indicates the side of the road to which the traffic should flow around a roadwork. The traffic could flow to the left or to the right of the roadwork."</p> <p>"This DE shall be presented as specified in ETSI TS 102 894-2 [5] TrafficRule."</p>	<p>TrafficRule ::= ENUMERATED {noPassing(0), noPassingForTrucks(1), passToRight(2), passToLeft(3), ... }</p>	S	See UC for details. Sadly, for the moment, an ENUMERATED for passToLeftOrRight is missing (and may be needed)	by PF
>referenceDenms	<p>"The DF indicates is a sequence of actionIDs for different DENMs that describe the same event. If it is available it is part of all DENMs describing this event."</p> <p>"This DF consists of list of other DENMs describing the same road work event. Each DENM shall be presented as specified in ETSI TS 102 894-2 [5] ActionID."</p>	<p>SEQUENCE (SIZE(1..8, ...)) OF ActionID</p>	S	See UC for details.	by PF
positioningSolution	<p>"This DE indicates technical solution being used by the originating ITS-S to estimate the event position. Typically, this DE may be included for events that are caused by vehicle ITS-S."</p>	<p>PositioningSolutionType ::= ENUMERATED {noPositioningSolution(0), sGNSS(1), dGNSS(2), sGNSSplusDR(3), dGNSSplusDR(4), dR(5), ...}</p>	X	<p>As this set of documents is about I2V UC, this DE is not given (appropriate in V2X context only).</p> <p>Sadly, in the standard no ENUMERATED are included for position given by roadOperator from TCC (mouse click on a map or assimilated)</p>	
stationaryVehicle	<p>"DF included in the alacarte container for the stationary vehicle use case as specified in ETSI TS 101 539-1 [i.4]. It provides information of the stationary vehicle."</p>	<p>SEQUENCE</p> <p>See next DE from stationarySince to energyStorageType</p>	X	Not needed and not appropriate for the use cases of this set of 2.4.1.2_M documents.	

2.4.1.2_M_Master technical specifications for I2V use cases

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
>stationarySi nce	"This DE provides the time duration of the stationary vehicle being stationary."	StationarySince ::= ENUMERATED {lessThan1Minute(0), lessThan2Minutes(1), lessThan15Minutes(2), equalOrGreater15Minutes(3)}	▲		
>stationaryCa use	"This DE provides additional information to describe causes of the stationary vehicle event such as human problem as defined in ETSI TS 101 539-1 [i.4]." "This DE shall be presented as specified in ETSI TS 102 894-2 [5] CauseCode."	CauseCode ::= SEQUENCE {causeCode CauseCodeType, subCauseCode SubCauseCodeType}	▲		
>carryingDan gerousGoods	"DF included in the stationaryVehicle DF in the alacarte container if a vehicle carrying dangerous goods is involved in a stationary vehicle event. It provides information on the type of dangerous goods, the required emergency action and other information." "This DF shall be presented as specified in ETSI TS 102 894-2 [5] DangerousGoodsExtended."	DangerousGoodsExtended ::= SEQUENCE {dangerousGoodsType DangerousGoodsBasic, unNumber INTEGER (0..9999), elevatedTemperature BOOLEAN, tunnelsRestricted BOOLEAN, limitedQuantity BOOLEAN, emergencyActionCode IA5String (SIZE(1..24)) OPTIONAL, phoneNumber IA5String (SIZE(1..24)) OPTIONAL, companyName UTF8String (SIZE(1..24)) OPTIONAL}	▲		
>numberOfO ccupants	"This DE provides the estimated number of occupants involved in the stationary vehicle event as specified in ETSI TS 101 539-1 [i.4]." "Number of occupants in a vehicle. For values equal to or higher than 126, the value shall be set to 126. If the information is not available, the value shall be set to 127."	NTEGER {oneOccupant (1), unavailable (127)} (0 .. 127)	▲		
>vehicleIdenti fication	"This DF provides the vehicle identification of the stationary vehicle as specified in ETSI TS 101 539-1 [i.4], including the World Manufacturer Identifier (WMI) code and the Vehicle Descriptor Section (VDS) as defined in ISO 3779 [i.15]." WMInumber: "World Manufacturer Identifier (WMI). The values are assigned according to ISO 3779 [i.7]." VDS: "Vehicle Descriptor Section (VDS). The values are assigned according to ISO 3779 [i.7]."	SEQUENCE {wMInumber WMInumber OPTIONAL, vDS VDS OPTIONAL, ...} WMInumber ::= IA5String (SIZE(1..3)) VDS ::= IA5String (SIZE(6))	▲		

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
>energyStorageType	"This DE provides the vehicle energy storage type information of the stationary vehicle as specified in ETSI TS 101 539-1 [i.4], such as electric, diesel, etc." "Type of energy being used and stored in vehicle. If a storage type is used by the vehicle, the corresponding bit shall be set to 1. Otherwise, the corresponding bit shall be set to 0."	BIT STRING {hydrogenStorage(0), electricEnergyStorage(1), liquidPropaneGas(2), compressedNaturalGas(3), diesel(4), gasoline(5), ammonia(6)} (SIZE(7))	▲		

Other elements from IF.DEN.1 (transmission) :

Table 2.2-2 : DENM transmission elements

DENM standard (ETSI EN 302 637-3)			DENM Master choices I2V		
Field	Definition / Meaning	Type of data	Status	Content	Value set
repetitionDuration	"Duration of the DENM repetition in units of milliseconds."	ms	✓	Until the end of the validityDuration	
repetitionInterval	"Interval of DENM repetition in units of milliseconds."	ms	✓	500ms	is 500ms
Destination area	"Destination area for DENM dissemination as specified in ETSI EN 302 931." "itsGnMaxGeoAreaSize ; 10 ; Maximum size of the geographical area for a GBC and GAC packet [km2]. If the geographical area size exceeds the maximum value, the GeoNetworking packet shall not be sent (source) and not be forwarded (forwarder)"	GeoAreaPosLatitude [1/10 microdegree] GeoAreaPosLongitude [1/10 microdegree] Distance a [m] Distance b [m] Angle [°]	✓	Generally defined as a circle of distance a and b equal to 5000m, centred on the eventPosition. By consequence, less than or equal to 80km ² as defined through C-Roads PF (see also annex II table 1 of the draft of DA) For I2V, this max value is retained. It can be reduced e.g in case of a high density of R-ITS-S to cover a zone	(area of 80km ²)
Maximum Hop Limit	"The Maximum Hop Limit specifies the number of hops a packet is allowed to have in the network, i.e. how often the packet is allowed to be forwarded." "itsGnDefaultHopLimit : 10 : Default hop limit indicating the maximum number of hops a packet travels"	itsGnDefaultHopLimit Integer8 (0..255)	✓	For the moment, no complication seems linked to the choice of a high value. So that 10 hop is chosen.	is 10
Traffic class	"GN traffic class of the DENM as defined in ETSI EN 302 636-4-1 if GeoNetworking/BTP is used."	itsGnTrafficClass Integer32 (0..255) SCF : 1 bit Channel Offload : 1 bit TC ID : 6-bit unsigned integer	✓	SCF bit is 0. Channel offload bit is 0 (see RS_RSP_042 (C-Roads PF Roadside profile) based on RS_BSP_262) TC ID value is "1" for DENM (see RS_RSP_063 (C-Roads PF Roadside profile))	is 1

Unicity of the DENM messages in I2V (general rule):

Whatever route G5 or cellular the information has followed, DENM of an event shall have the same actionID and the same detectionTime. So that vehicle treats one message or the other, but not both of them.

General display principles:

The process of vehicle-receiver can be as followed:

1. The vehicle checks actionID and detectionTime to verify if event is already known, if it is a new event or if it is an update.
2. The vehicle checks validityDuration to know if event is still active.
3. The vehicle checks eventPosition to determine how far from its position the event is and calculate its time-to-event.
4. The vehicle checks causeCode / subCauseCode and relevanceTrafficDirection.
5. The relevanceTrafficDirection (see relevanceTrafficDirection section in the DENM profile in the current document) has to be considered to determine if concerned or not (difference between headings should be more or less about +/- 30°).
6. If concerned, the vehicle displays the event at the proper moment (car manufacturer domain).

2.1.1.2.2.1. General note on timestamps

As a reminder, here is how the timestampITS should be computed within the ITS stations:

TimestampITS = UTC_Time_system – UTC_Time_startof2004 + leap_seconds_since2004

The UTC_Time_system and the way to update the leap seconds (GNSS update, manual configuration, etc.) are under the provider responsibility.

The timestamps of Datex II messages do not take into account the computation of leap seconds. Hence, when receiving a Datex II from the road operator platform, R-ITS-S **must** ensure the conversion between the timestamps as well.

While all the other types of messages use timestampITS time, the SPAT and MAP messages use UTCtime system (without leap seconds). It is especially important for DE Timemark of SPATEM.

2.2.2.3. IVIM

The following chapter gives the description of the IVIM according to the standard ISO/TS 19321 and the general choices made for the implementation in the French projects. Any technical aspect that depends on the use case is described in the concerned use case deliverable.




FR choice: using the IVI message structure of ISO/TS 19321. Indeed, this standard seems sufficient to cover needs, so that ISO/TS 17425 (IVS) does not seem to provide any real additional advantage.

<u>ID</u>	<u>2.4.1.2_M_Master IVIMessageProfile</u>
<u>Component(s)</u>	Broadcast: R-ITS-S, Nfr-ITS-S Receive: V-ITS-S
<u>Requirement</u>	The IVIM transmitted by the infrastructure shall respect what is expected in the following table.
<u>Acceptance</u>	
<u>Additional information</u>	Based on standard ISO/TS 19321

Table 2.3-1 : IVIM Master choices

IVI standard (ISO TS 19321)			IVI Master choices I2V		
FieldIVI	Description / Meaning	Type of data	Status	Content	Value set
Header					

2.4.1.2_M_Master technical specifications for I2V use cases

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
protocolVersion	"Version of the ITS message and/or communication protocol."	INTEGER (0..255)		Version for is ETSI EN 302 637-2 1.3.1 (2019-04), referenced in the DA, is 2.	is 2
messageID	"Type of the ITS message."	INTEGER{ denm(1),cam(2), poi(3), spatem(4), mapem(5), ivim(6), ev-rsr(7), tistpgtransaction(8), srem(9), ssem(10), evcsn(11), saem(12), rtcmem(13) } (0..255),		ivim (6)	is 6
stationID	"The identifier of the ITS-S that generates the ITS message in question." This is the ID of the station broadcasting the message.	INTEGER(0..4294967295)		ID of the R-ITS-S or Nfr-ITS-S as we have only I2V use cases in this document	by R-ITS-S or Nfr-ITS-S

2.4.1.2_M_Master technical specifications for I2V use cases

IVI standard (ISO TS 19321)			IVI Master choices I2V		
FieldIVI	Description / Meaning	Type of data	Status	Content	Value set
Management container		<i>IviManagementContainer::= SEQUENCE { serviceProviderId, iviIdentificationNumber, timestamp OPTIONAL, validFrom OPTIONAL, validTo OPTIONAL, connectedIviStructures OPTIONAL, iviStatus, connectedDENMS OPTIONAL }</i>			







IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
service ProviderId	<p>"Identifies the organization that provided the IVI by using the DE Provider; contains a country code according to ISO 3166-1.1. Numbers shall be assigned on national basis. See ISO 14816 for registration."</p> <p>"The data element Provider contains the ID of the service provider through its two components:</p> <ul style="list-style-type: none"> - CountryCode indicates the ISO 3166-1 country code; - IssuerIdentifier indicates the identifier of the service provider as registered." <p>"ISO 3166-1 two characters country code of the catalogue." ISO17425(IVS)</p> 	<p>SEQUENCE of CountryCode and IssuerIdentification</p> <p>CountryCode is octetString (size(2))</p> <p>IssuerIdentifier::= INTEGER(0 .. 16383)</p>	V	<p>CountryCode for France is : 10110 01010</p> <p>Indeed, as specified in ISO 3166-1: France is code "FR" and as specified in table ITA-2 of ISO 14816:</p> <ul style="list-style-type: none"> - F is coded 10110 - R is coded 01010 <p>IssuerIdentifier: one by road operator. Given as following:</p> <ul style="list-style-type: none"> - xx for SCA with xx is RTTT Coding structure CS1 for toll station (01 = ASFA Test ; 02 = SFTRF ; 03 = AREA ; 04 = ASF ; 05 = COFIROUTE ; 06 = ESCOTA ; 07 = SANEF ; 08 = SAPN ; 09 = APRR ; 10 = ATMB ; 11 = BPNL ; 12 = ALIS ; 13 = CEVM ; 14 = ARCOUR ; 15 = ADELAC ; 16 = TFREJUS ; 17 = ALICORNE ; 18 = ALIENOR ; 19 = ATLANDES ; 20 = ALBEA ; 41 = REPA ; 42 = REORA ; 48 = Euro Toll ; 49 = Axxès ; 50 = SMTPC ; 51 = CCIH ; 52 = TOTAL ; 53 = INDIGO ; 54 = PARK+ ; 55 = REC ; 60 = ATMB PARK ; 70 = RPAS ; 77 = OSS ; 90 = TEA ; 91 = TEV.) - postal code divided by 10 for city (3300 = Bordeaux Métropole; 2200 = St Brieuc Agglo ; etc.) <p><u>Details for Bordeaux:</u> IVI – PMV Zone 30 : 3303 IVI – PMV Urbain : 3304 IVI – PMV Park&Ride : 3305 DENM – Evénements travaux : 3302 POI – Parking : 3308</p> <ul style="list-style-type: none"> - 10 0xx for DIRs with xx the number of department of the central siege (10 033 = DIRA; 10 035 = DIRO ; 10 059 = DIR Nord ; 10 067 = DIR Est ; 10 069 = DIRCE ; 10 094 = DIRIF ; etc.) + 10 000 for Nfr (to be determined if ever used or not, in link with the subject of SSPs) - 10 100 for Coopits, 10 101 for Renault, 10 102 for Stellantis (PSA), ... (to be completed at each request for a code for a PF of a car manufacturer in FR) - 10 2xx for department with xx the number of the department (10 222 = CD22 ; 10 235 = CD35 ; ...) - 10 3xx for region if needed, with xx the number of department of central siege (10 335 = Région Bzh; ...) - 10 4xx for private partners (testing or public transport, etc.) with 10 400 for punctual testing and no code dedicated to the partner (default), 10 401 for Transpolis, 10 402 for Transdev, 10 403 for Valeo, 10 404 for Vedecom, 10 405 for Tom-Tom (to be completed at each request for a code) - 14 000 to 14 499 are reserved for port operator (MCTO UC) - 15 000 : SNCF <p>Each PF shall have the same issuerIdentifier of IVIM than stationID in actionID of DENM.</p>	by PF

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
ivi Identification Number	"Identifier of the IVI Structure, as assigned by the Service Provider using the DE <i>IvidentificationNumber</i> ." This component serves as the ID of the message and can be used by other related messages as a reference.	IvidentificationNumber ::= INTEGER(1..32767,...)	V	Similar to actionID for DENMs, the combination of serviceProviderId + ividentificationNumber unique ID of an IVI event. Same pair when updates and cancel. serviceProviderID + ividentificationNumber is unique ID of each IVI event.	by PF
<i>timestamp</i>	"Timestamp of the generation or last change of information content." The message is valid from this time if <i>validFrom</i> is omitted.	TimestampPlts ::= INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103) OPTIONAL	U	Used as versioning of IVI. Has to change when update (including repetition loop) or cancel. Is kind of versioning of the event (as detectionTime for DENM).	by PF
<i>validFrom</i>	"Start time of the validity period of the message."	TimestampPlts ::= INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103) OPTIONAL	S	Useful for scheduled event. If not set in TCC, start time of event is considered equal to timestamp.	from TMS
<i>validTo</i>	"End time of the validity period of the message."	TimestampPlts ::= INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103) OPTIONAL	US	<u>For cancellation messages, when DE <i>iviStatus</i> is filled with 2 (cancellation), <i>validTo</i> is absent.</u> <u>Otherwise, it shall be present.</u> If end time is unknown by road operator, validTo (of the first iteration of the message) is a shift of default value (see each UC) since validFrom. If event is still active in TMS within 10% of this default value before validTo and end time is still not given by TMS, validTo is extended of another time this default value (through an update). The termination message is sent with the same Repetition Interval as the message it terminates. Its validTo (and Repetition Duration) corresponds to the max value of all previous OverallEndtime of the event it terminates. These policy on duration may change during experiment to find the best compromise between use of short, medium or long unknown duration till end time.	from TMS or by PF
<i>connected IviStructures</i>	"List of other <i>ividentificationNumber</i> identifying other IVI Structures of the same authority which are connected to the IVI Structure using the DE <i>IvidentificationNumber</i> ."	IvidentificationNumbers ::= SEQUENCE (SIZE(1..8)) OF IvidentificationNumber OPTIONAL	S	If one IVI message is not sufficient to describe the total number of lanes concerned by the message, this attribute shall enumerate the list of the linked ividentificationNumber(s) used to describe the area.	by PF

2.4.1.2_M_Master technical specifications for I2V use cases

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
iviStatus	"Status of the IVI Structure using the DE <i>IviStatus</i> ."	IviStatus ::= INTEGER {new (0), update (1), cancellation (2), negation (3) } (0..7)	V	No negation (as in SCooP1). So only new, update or cancel status will be used by FR.	<u>comp</u> <u>uted</u> <u>by</u> <u>ITS-S</u> <u>depen</u> <u>ding</u> <u>on</u> <u>ValidT</u> <u>o</u> <u>value</u> <u>by PF</u>
connectedDenms		ConnectedDenms ::= SEQUENCE (SIZE(1..8, ...)) OF ActionID -- new DF in V2 OPTIONAL	X	Not used for the moment (probably to be reconsidered later on)	
optional	<u>List of the containers in the message</u>	<u>IviContainers OPTIONAL ::= SEQUENCE (SIZE (1..8,...)) OF IviContainer.</u>	S	<u>The following containers are not used in the case of a termination message (cancel or negation)</u>	
glc Geographic Location Container		SEQUENCE { referencePosition, referencePositionTime OPTIONAL, referencePositionHeading OPTIONAL, referencePositionSpeed OPTIONAL, parts, ... }			
reference Position	"Any suitable position which serves as reference for the polygonal line, using the DE <i>ReferencePosition</i> ."	ReferencePosition ::= SEQUENCE {latitude Latitude, longitude Longitude, positionConfidenceEllipse PosConfidenceEllipse, altitude Altitude}	V	This DE is used as a reference point for all zones within GLC (Geographical Location Container). The Reference point for IVI is defined at the UC level. The Altitude may be set to unavailable if unknown. If the altitude is provided, it is the altitude of the road. The mobile ITS-S reference coordinate systems shall follow EN 302 890-2. As specified in the standard, the altitude information is interpreted as height above WGS84 Ellipsoid.	by PF
reference Position Time	"Time at which the Reference Position, if dynamic, was valid."	Timestamppls ::= INTEGER {utcStartOf2004(0), oneMillisecAfterUTCStartOf2004(1)} (0..4398046511103) OPTIONAL	X	No moving event (in IVI) for the set of 2.4.1.2_M UC.	
reference Position Heading	"Direction of the Reference Position, if dynamic, using the DE <i>Heading</i> ."	Heading ::= SEQUENCE {headingValue HeadingValue, headingConfidence HeadingConfidence} OPTIONAL HeadingValue ::= INTEGER {wgs84North(0), wgs84East(900), wgs84South(1800), wgs84West(2700), unavailable(3601)} (0..3601) HeadingConfidence ::= INTEGER {equalOrWithinZeroPointOneDegree (1), equalOrWithinOneDegree (10), outOfRange(126), unavailable(127)} (1..127)	X	See zoneHeading.	

2.4.1.2_M_Master technical specifications for I2V use cases

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
<i>reference Position Speed</i>	"Actual speed of the Reference Position, if dynamic, using the DE <i>Speed</i> ." [km/h]	Speed ::= SEQUENCE {speedValue SpeedValue, speedConfidence SpeedConfidence} OPTIONAL SpeedValue ::= INTEGER {standstill(0), oneCentimeterPerSec(1), unavailable(16383)} (0..16383) SpeedConfidence ::= INTEGER {equalOrWithinOneCentimeterPerSec(1), equalOrWithinOneMeterPerSec(100), outOfRange(126), unavailable(127)} (1..127)		No moving event (in IVI) for the set of 2.4.1.2_M UC.	
parts	(1..16) GlcPart. Minimum is one part	GlcParts ::= SEQUENCE (SIZE (1..16,...)) OF GlcPart GlcPart ::= SEQUENCE of DE from zoneld to zone (see the next five DE)		See 5 next lines.	▼▼ ▼
>zoneld	"Identifier of the definition of the zone, using the DE <i>Zid</i> ." There shall be at least one zone (i.e. the detection zone) e.g as traces (DENM)	Zid ::= INTEGER (1..32,...)		First zone(s) Id(s) may be used to define the "detection zone(s)", approach of the event position (as traces in DENM). Then, next zone(s) Id(s) may be used to define "relevance zone(s)" in which the event is relevant (as eventHistory in DENM). At least one detection zone and one relevance zone shall be provided for each message.	by PF
>laneNumber	"Identification of the lane represented by the Location Container using the DE <i>LaneNumber</i> ." Note that <i>laneNumber</i> is not in data dictionary, only <i>lanePosition</i> . asn.1 of IVI confirm that <i>laneNumber</i> is equal to <i>lanePosition</i>	LanePosition ::= INTEGER {offTheRoad(-1), hardShoulder(0), outermostDrivingLane(1), secondLaneFromOutside(2)} (-1..14) OPTIONAL		Not used as zone are described as linear (opened polygonalLines) with points centred on carriageway. UC with lane specificity will use applicableLanes (see below) but doesn't need laneNumber to do so.	
>zone Extension	"Extension of the zone as a circular area around the Reference Position in 10m units."	INTEGER (0..255) OPTIONAL		No needed for the UC of this set of documents.	
>zoneHeading	"Applicable heading of the zone, e.g. the effective direction of applicability of the sign, at the Reference Position, using the DE <i>Heading</i> ."	HeadingValue ::= INTEGER {wgs84North(0), wgs84East(900), wgs84South(1800), wgs84West(2700), unavailable(3601)} (0..3601) OPTIONAL		Set as the direction of the carriageway concerned by the event at referencePosition point. The DE direction will refer to this heading. See each UC for details	

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
>zone	Definition of a zone using the DF Zone. [shall] contain the definition of a zone according to one of the following options: : segment, area (closed PolygonalLine) or computedSegment. DF Segment contain : component line (polygonal line : sequence of delta points with respect to the previous position, with latitude and longitude, as coded by the data element DeltaPosition, the first position being the referencePosition in the locationContainer) and laneWidth (width of segment in cm. Is optional and only used when a single lane is referenced within the zone))	Zone ::= CHOICE {segment Segment, area PolygonalLine, computedSegment ComputedSegment, ...} OPTIONAL Segment ::= SEQUENCE { line PolygonalLine, laneWidth LaneWidth OPTIONAL} PolygonalLine ::= CHOICE {deltaPositions SEQUENCE (SIZE (1..32,...)) OF DeltaPosition, deltaPositionsWithAltitude SEQUENCE (SIZE (1..32,...)) OF DeltaReferencePosition, absolutePositions SEQUENCE (SIZE (1..8,...)) OF AbsolutePosition, absolutePositionsWithAltitude SEQUENCE (SIZE (1..8,...)) OF AbsolutePositionWithAltitude, ... (18),} DeltaPosition ::= SEQUENCE { deltaLatitude DeltaLatitude, deltaLongitude DeltaLongitude } ComputedSegment ::= SEQUENCE { zoneld, laneNumber LanePosition, laneWidth offsetDistance INTEGER (-32768..32767) OPTIONAL, offsetPosition DeltaReferencePosition }	U	FR will use the Segment option: PolygonalLine as a line constructed with deltaPosition as for DENM lines a (deltaLatitude and deltaLongitude, similar to DENM / deltaReferencePosition) and without laneWidth. The maximum distance between the referenceposition and the end of the segment calculated for France is 29,1km (32 times 910m). The maximum interval between two positions calculated for France is 910 meters. Those will be the maximum parameters implemented in the platform. See the details of calculations in DENM/eventhistory For practical purpose, zone may be set as following : - For zone which are set for detection purpose => 23 points max point with e.g delta of : 50m in non-urban context (so 1 150km max length detectionZone) and 10m in urban context (so 230m max length detectionZone) - For zone which are set for relevance purpose => real relevance zone split e.g in 32 points with a threshold of minimum distance between points of 50m in non-urban context and 10m in urban context. <u>All zones set for detection or relevance purposes shall start at the referencePosition.</u>	by PF
General IVI Container		SEQUENCE (1.. 16) of GicPart GicPart ::= SEQUENCE { detectionZoneIds OPTIONAL, its-Rrid OPTIONAL, relevanceZoneIds OPTIONAL, direction OPTIONAL, driverAwarenessZoneIds OPTIONAL, minimumAwarenessTime OPTIONAL, applicableLanes OPTIONAL, iviType IviType, iviPurpose OPTIONAL, laneStatus OPTIONAL, vehicleCharacteristics OPTIONAL, driverCharacteristics OPTIONAL, layoutId OPTIONAL, preStoredLayoutId OPTIONAL, roadSignCodes, extraText OPTIONAL }	S	This container is used to send information about traffic signs. One GicPart per traffic sign. Note: while one GicPart could in theory support up to 4 traffic signs via RSCode, these are reserved for additional signs (subsigns) that may be attached to the main sign.	
detection ZoneIds	"List of Identifier(s) of the definition(s) of the Detection Zone(s), using the DE Zid."	Zonelds ::= SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL	U	As traces to the event. Minimum one waypoint to the event.	By PF

2.4.1.2_M_Master technical specifications for I2V use cases

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
<i>its-rrid</i>	"Identifier of the ITS Regulatory Region to which the IVS Container is applicable. See DE <i>Its-Rrid</i> ." "Used to uniquely identify an ITS regulatory region (ITS-RR) in the ITS-S communication profile selection process specified in ISO/TS 17423. The following types of regulatory regions are identified: radio regulation, security regulation, privacy regulation, traffic regulation"	ITSrrID ::= VarLengthNumber OPTIONAL	X	Unclear and not needed.	
<i>relevance Zonelds</i>	"List of Identifier(s) of the definition(s) of the Relevance Zone(s), to which the IVS Container applies, using the DE <i>Zid</i> ."	Zonelds ::= SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL	U	As eventHistory from event position. Minimum one Zid as relevance section of the event.	by TMS or PF
<i>direction</i>	"Direction of relevance within the relevance zone using the DE <i>direction</i> ."	Direction ::= INTEGER{ sameDirection (0), oppositeDirection (1), bothDirections (2), valueNotUsed } (0..3) OPTIONAL	U	Is always set to sameDirection (0) with respect to the <i>zoneHeading</i> .	is 0.
<i>driver Awareness Zonelds</i>	"List of Identifier(s) of the definition(s) of the Driver Awareness Zone(s), using the DE <i>Zid</i> ."	Zonelds ::= SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL	X	For FR, appropriate displaying on on-board HMI is automotive constructors' domain only.	
<i>minimum Awareness Time</i>	"Time in tenths of seconds before the vehicle enters the relevance area, in which the IVI should be available as a minimum."	INTEGER (0..255) OPTIONAL	X	Same that above. For FR, appropriate displaying on on-board HMI is automotive constructors' domain only.	
<i>applicable Lanes</i>	List of identifiers of the lane(s) to which the IVS Container applies using the DE <i>LaneNumber</i> .	LanePositions ::= SEQUENCE (SIZE (1..8,...)) OF LanePosition OPTIONAL LanePosition ::= INTEGER {offTheRoad(-1), innerHardShoulder(0), innermostDrivingLane(1), secondLaneFromInside(2), outerHardShoulder(14) } (-1..14) in text part (of CDD) LanePosition ::= INTEGER {offTheRoad(-1), hardShoulder(0), outermostDrivingLane(1), secondLaneFromOutside(2)} (-1..14) in asn part (end of CDD)	S	See each UC: If applicable to all lanes on a carriageway this DF may be absent. Otherwise mandatory if lane specific. Numbering to be used is from inner to outer.	by PF
<i>iviType</i>	"Priority of the Container information within the overall context of IVI. See DE <i>IVIType</i> ." This DE is used to determine the priority of the IVI message. Higher priority message are : 0 and 1 Lower priority message are : 2, 3 and 4	IviType ::= INTEGER { immediateDangerWarningMessages (0), regulatoryMessages (1), trafficRelatedInformationMessages (2), pollutionMessages (3), notTrafficRelatedInformationMessages (4) } (0..7)	V	See each UC	by PF

2.4.1.2_M_Master technical specifications for I2V use cases

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
<i>iviPurpose</i>	"The data element <i>iviPurpose</i> provides the purpose of the IVI for further usage by the receiving ITS-S." This informs the receiving ITS-S on how the message should be used.	<i>iviPurpose</i> ::= INTEGER { safety (0), environmental (1), trafficOptimisation (2) } (0..3) OPTIONAL	X	Not really needed, no real additive information compared with <i>iviType</i> .	
<i>laneStatus</i>	Status of the lane(s) to which the Application Container Part applies. See DE <i>LaneStatus</i> .	INTEGER { open (0), closed (1), mergeR (2), mergeL (3), mergeLR (4), provisionallyOpen (5), diverging (6) — value 7 reserved for future use } (0..7, ...) OPTIONAL	X	Not used.	
<i>vehicle Characteristics</i>	"Characteristics of vehicle, for which the IVI is applicable. See DE <i>CompleteVehicleCharacteristics</i> . The applicable regulations, such as limits, are defined as part of the <i>roadSignCode</i> component." Can be used to communicate vehicle restrictions within the relevance zone.]	<i>VehicleCharacteristicsList</i> ::= SEQUENCE (SIZE (1..8, ...)) OF <i>CompleteVehicleCharacteristics</i> OPTIONAL <i>CompleteVehicleCharacteristic</i> ::= SEQUENCE { tractorTractorCharacteristics OPTIONAL, trailerTrailerCharacteristicsList OPTIONAL, trainTrainCharacteristics OPTIONAL } <i>TrainCharacteristics</i> ::= <i>TractorCharacteristics</i> Then, see the next table on <i>TractorCharacteristics</i> .	S	Expresses the "who" is concerned by the part. To be provided when IVI concerns specific type of vehicles. Optional. In case train is used with ranges, all DE of the DF used are filled (e.g <i>vehicleWeightLimits</i> contains 3 DE). For Int2 data it is assumed that the value "0" means "noEntry" (not literally explained in the ISO 14906 standard for Int2 values but several DE uses "0" for "noEntry" (e.g <i>euroValue</i>, <i>copValue</i>, <i>DescriptiveCharacteristics</i>, ...)) Recommended options to be used for <i>vehicleCharacteristics</i> are in bold in the next table : for the time being, C-Roads France opts to describe vehicle characteristics by the use of ranges and weight of train (it seems the simplest way to do so for the moment)	by PF
<i>driver Characteristics</i>	"Driver characteristics relevant for regulations. See DE <i>DriverCharacteristics</i> ."	<i>DriverCharacteristics</i> ::= INTEGER { unexperiencedDrivers (0), experiencedDrivers (1), rfu1 (2), rfu2 (3) } (0..3) OPTIONAL	X	Not needed for the UC of this set of documents (and seems useless in any case)	
<i>layoutId</i>	"Identifier of the connected layout definition in the IVI Structure."	INTEGER(1..4,...) OPTIONAL ref. to <i>LayoutContainer</i>	X	C-Roads PF choice is: no intrusion on how to display on HMI through IVI. So <i>layoutId</i> won't be used, because <i>layoutContainer</i> won't be defined.	
<i>preStored LayoutId</i>	"Identifier of a pre-stored layout definition." "the component <i>preStoredLayoutId</i> to connect the content of the IVS container to a pre-stored layout template defined by the Service Provider."	INTEGER(1..64,...) OPTIONAL	X	C-Roads PF choice is: no intrusion on how to display on HMI through IVI. As for <i>LayoutId</i> and <i>layoutComponent</i> , <i>preStoredLayoutId</i> won't be used.	









IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
roadSign Codes	"Ordered list of applicable road sign codes according to the selected catalogue, including additional attributes, using the DF RSCode. If present, an additional panel shall follow the sign to which it is associated."	<p>RoadSignCodes ::= SEQUENCE (SIZE (1..4),...) OF RSCode</p> <p>RSCode ::= SEQUENCE { layoutComponentId INTEGER(1..4,...) OPTIONAL, code CHOICE { viennaConvention VcCode, ISO14823 ISO14823Code, itisCodes INTEGER (0..65535), anyCatalogue AnyCatalogue, ... } }</p> <p>ISO14823Code ::= SEQUENCE { pictogramCode SEQUENCE { countryCode OCTET STRING (SIZE (2)) OPTIONAL, serviceCategoryCode CHOICE { trafficSignPictogram ENUMERATED { dangerWarning, regulatory, informative, ... }, publicFacilitiesPictogram ENUMERATED { publicFacilities, ... }, ambientOrRoadConditionPictogram ENUMERATED { ambientCondition, roadCondition, ... }, ... }, pictogram CategoryCode nature INTEGER (1..9), serialNumber INTEGER (0..99) }, Attributes ISO14823Attributes OPTIONAL }</p>	V	<p>There can be up to 4 RSCode. The first one is mandatory and it is the main traffic sign of the GicPart. There can be up to 3 subsigns attach to the first traffic sign.</p> <p>C-Roads PF chooses to opt for TS14823:2017.</p> <p>Some examples (nature / serialNumber):</p> <ul style="list-style-type: none"> - Lane closed (6 / 59), - Lane free (6 / 60) - Clear lane to left (6 / 61), - Clear lane to right (6 / 62), - Overtaking prohibited (5 / 42), - Overtaking by goods vehicles prohibited (5 / 44), - Maximum speed (5 / 57), - Other danger (9 / 99) <p>...</p> <p>For FR, it involves to have a table to pass from IISR9 (French standard and references used by TCC) to TS14823:2017. ► A document deals with this subject. (see annex #1 of the Master)</p>	by PF
extraText	"List of text lines associated to the ordered list of road sign codes. Each piece contains language code plus extra, limited-size text in the selected language using the DF Text."	<p>ConstraintTextLines1 ::= SEQUENCE (SIZE (1..4),...) OF Text (WITH COMPONENTS { layoutComponentId, language, textContent (SIZE(1..32)) }) OPTIONAL</p> <p>Text ::= SEQUENCE { layoutComponentId INTEGER(1..4,...) OPTIONAL, language BIT STRING (SIZE(10)), textContent UTF8String }</p>	S	<p>Can be used to present additional text associated to a sign, such as subpanel text.</p> <p>If there is no text to fill for any of the subpanels, this DE may be absent. If at least one subpanel has text, this DE must be filled with as many items as there are in DE roadSignCodes. One line of Text with a maximum of 32 letters per RSCode (sign or subsign) used in the GicPart. Ordered, so the first line of text corresponds to the first RSCode, the second line to the second RSCode, with a maximum of 4 lines.</p> <p>For each RSCode that does not need additional text, textContent shall be set to 0x00.</p> <p>In order to be backwards compatible to version 1 of the ISO 19321 standard, layoutComponentId is mandatory here and statically set to "1" even when textContent is 0x00.</p> <p>Language should be set to "10110 01010" for FR/France (see serviceProviderId/countryCode) due to difficulties to do multiple languages (no possibility to set in TMS multiple languages and automatic translation word by word is not appropriate) even when textContent is 0x00.</p>	by TCC

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
<i>rcc</i> Road Configuration Container		SEQUENCE (SIZE (1..16,...)) OF RccPart RccPart ::= SEQUENCE { relevanceZonelds, roadType, laneConfiguration, ... }	S	Describes the lane configuration for a zone. Mandatory when applicableLanes is filled for at least one GicPart. If applicableLanes is always absent, it is optional and considered as complementary information.	
relevanceZonelds	"List of Identifier(s) of the definition(s) of the Zone(s), to which the RccPart applies."	Zonelds ::= SEQUENCE (SIZE (1..8,...)) OF Zid	✓	Each Rcc part is used for all zones in an IVIM that have the same characteristics, i.e. same number of lanes.	by PF
roadType	"Type of road in the zone."	RoadType ::= ENUMERATED { urban-NoStructuralSeparationToOppositeLanes(0), urban-WithStructuralSeparationToOppositeLanes(1), nonUrban-NoStructuralSeparationToOppositeLanes(2), nonUrban-WithStructuralSeparationToOppositeLanes(3)}	✓	As defined in ETSI/TS 102 894-2 (common data dictionary).	by PF
laneConfiguration	"List of information records about single lanes composing the road."	SEQUENCE (SIZE (1..16,...)) OF LaneInformation LaneInformation ::= SEQUENCE { laneNumber, direction, validity OPTIONAL, laneType, laneStatus, laneWidth OPTIONAL, ... }	✓	Is a list of (1..16) instances of LaneInformation. The number of elements in the list represents the total number of lanes (including hard shoulders) of the road. See next 7 lines	▼▼ ▼
>laneNumber	"Identification of the lane represented by the Location Container using the DE <i>laneNumber</i> ." Note that <i>laneNumber</i> is not in data dictionary, only <i>lanePosition</i> . asn.1 of IVI confirm that <i>laneNumber</i> is equal to <i>lanePosition</i> "	LanePosition ::= INTEGER {offTheRoad(-1), innerHardShoulder(0), innermostDrivingLane(1), secondLaneFromInside(2), outerHardShoulder(14) } (-1..14) in text part (of CDD) LanePosition ::= INTEGER {offTheRoad(-1), innerHardShoulder(0), innermostDrivingLane(1), secondLaneFromInside(2), outerHardShoulder(14) } (-1..14) in asn part (end of CDD)	✓	Numbering to be used is from inner to outer.	By PF
>direction	"Direction of relevance within the relevance zone using the DE <i>direction</i> ."	INTEGER { sameDirection (0), oppositeDirection (1), bothDirections (2), valueNotUsed } (0..3)	✓	Is always set to sameDirection (0) with respect to the <i>zoneHeading</i> .	is 0.

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
>validity	"validity period of the information contained in the data frame"	DTM ::= SEQUENCE { year SEQUENCE { – contains SYR and EYR syr INTEGER(2000..2127,...), eyr INTEGER(2000..2127,...) } OPTIONAL, month-day SEQUENCE { – contains SMD and EMD smd MonthDay, emd MonthDay } OPTIONAL, pmd PMD OPTIONAL, hourMinutes SEQUENCE { – contains SHM and EHM shm HoursMinutes, ehm HoursMinutes } OPTIONAL, dayOfWeek DayOfWeek OPTIONAL, – corresponds to SDY and EDY period HoursMinutes OPTIONAL – corresponds to LDM } OPTIONAL	S	Per default absent. May be set if known in case of lane management if laneType = emergency and laneStatus = provisionallyOpen (hardshoulder opened for a specific duration).	By PF
>laneType	"The data element LaneType defines the type of lane with respect to the permitted movements of specific vehicles"	INTEGER{ traffic (0), through (1), reversible (2), acceleration (3), deceleration (4), leftHandTurning (5), rightHandTurning (6), dedicatedVehicle (7), bus (8), taxi (9), hov (10), hot (11), pedestrian (12), bikeLane (13), median (14), striping (15), trackedVehicle (16), parking (17), emergency (18), verge (19), minimumRiskManoeuvre (20), – values 21 to 31 reserved for future use } (0..31)	V	For motorway use cases one of the following values are typically used: <ul style="list-style-type: none"> • traffic (0) for lanes dedicated to the movement of vehicles, • acceleration (3) for merging lanes, • deceleration (4) of exiting lanes, • emergency (18) for hard shoulders. Other values can be used, see each UC.	By PF
>laneStatus	Status of the lane(s) to which the Rcc Part applies during the indicated validity period.	INTEGER { open (0), closed (1), mergeR (2), mergeL (3), mergeLR (4), provisionallyOpen (5), diverging (6) – value 7 reserved for future use } (0..7, ...)	V	The status is given with regards to traffic. 0 must be used when lane is open to traffic and 1 when closed to traffic (this is the case of hard shoulders in a nominal situation).	By PF
>laneWidth	Width of the lane in centimeters.	IVILaneWidth ::= INTEGER (0..1023) OPTIONAL	S	If present, contains the width of the lane in centimetres measured at the first position of the polygonal line indicated by Zonelds.	By PF

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
<i>tc Text Container</i>		SEQUENCE (SIZE (1..16,...)) OF TcPart TcPart ::= SEQUENCE { detectionZoneIds OPTIONAL, relevanceZoneIds, direction, driverAwarenessZoneIds OPTIONAL, minimumAwarenessTime OPTIONAL, applicableLanes OPTIONAL, layoutId OPTIONAL, preStoredLayoutId OPTIONAL, text OPTIONAL, data OCTET STRING, ... }	S	This container is used to send text information. One TcPart per text message. If a single VMS is displaying alternatively two different messages, each one is included in a single TcPart. Note: one TcPart can support up to 4 lines via DF text.	
<i>detectionZoneIds</i>	"List of Identifier(s) of the definition(s) of the Detection Zone(s), using the DE <i>Zid</i> ."	Zonelds ::= SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL,	U	As traces to the event. Minimum one waypoint to the event. If there is a General IVI Container, the detection Zones shall be the same in the TC and in the GIC.	by PF
<i>relevanceZoneIds</i>	"List of Identifier(s) of the definition(s) of the Relevance Zone(s), to which the IVS Container applies, using the DE <i>Zid</i> ."	Zonelds ::= SEQUENCE (SIZE (1..8,...)) OF Zid	V	As eventHistory from event position. Minimum one Zid as relevance section of the event. If there is a General IVI Container, the relevance Zones shall be the same in the TC and in the GIC.	by TMS or PF
<i>direction</i>	"Direction of relevance within the relevance zone using the DE <i>direction</i> ."	Direction ::= INTEGER { sameDirection (0), oppositeDirection (1), bothDirections (2), valueNotUsed } (0..3) OPTIONAL	U	Is always set to sameDirection (0) with respect to the <i>zoneHeading</i> .	is 0.
<i>driverAwarenessZoneIds</i>	"List of Identifier(s) of the definition(s) of the Driver Awareness Zone(s), using the DE <i>Zid</i> ."	Zonelds ::= SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL	X	For FR, appropriate displaying on on-board HMI is automotive constructors' domain only.	
<i>minimumAwarenessTime</i>	"Time in tenths of seconds before the vehicle enters the relevance area, in which the IVI should be available as a minimum. "	INTEGER (0..255) OPTIONAL	X	Same that above. For FR, appropriate displaying on on-board HMI is automotive constructors' domain only.	
<i>applicableLanes</i>	List of identifiers of the lane(s) to which the IVS Container applies using the DE <i>LaneNumber</i> .	LanePositions ::= SEQUENCE (SIZE (1..8,...)) OF LanePosition OPTIONAL LanePosition ::= INTEGER { offTheRoad(-1), innerHardShoulder(0), innermostDrivingLane(1), secondLaneFromInside(2), outerHardShoulder(14) } (-1..14) in text part (of CDD) LanePosition ::= INTEGER { offTheRoad(-1), hardShoulder(0), outermostDrivingLane(1), secondLaneFromOutside(2) } (-1..14) in asn part (end of CDD)	S	See each UC: If applicable to all lanes on a carriageway this DF may be absent. Otherwise mandatory if lane specific. Kept as optional to respect release 2.0 of the C-Roads PF but it is not clear whether text information could apply only to some of the lanes. It may be not used at use case description level, after specific analysis. Numbering to be used is from inner to outer.	by PF
<i>layoutId</i>	"Identifier of the connected layout definition in the IVI Structure."	INTEGER(1..4,...) OPTIONAL ref. to LayoutContainer	X	C-Roads PF choice is: no intrusion on how to display on HMI through IVI. So layoutId won't be used, because layoutContainer won't be defined.	

2.4.1.2_M_Master technical specifications for I2V use cases

IVI standard (ISO TS 19321)			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
<i>preStoredLayoutId</i>	"Identifier of a pre-stored layout definition." "the component preStoredLayoutId to connect the content of the IVS container to a pre-stored layout template defined by the Service Provider."	INTEGER(1..64,...) OPTIONAL		C-Roads PF choice is: no intrusion on how to display on HMI through IVI. As for LayoutId and layoutComponent, preStoredLayoutId won't be used.	
<i>text</i>	"List of language codes and text in the selected language, using the DF Text."	TextLines ::= SEQUENCE (SIZE (1..4),...) OF Text Text ::= SEQUENCE { layoutComponentId INTEGER(1..4,...) OPTIONAL, language BIT STRING (SIZE(10)), textContent UTF8String }		LayoutComponentId is not used. Language should be set to "10110 01010" for FR/France (see serviceProviderId/countryCode) due to difficulties to do multiple languages (no possibility to set in TMS multiple languages and automatic translation word by word is not appropriate). A maximum of 4 lines and 32 characters per line should be used.	By PF
data	"Data BLOB of a defined type (file)."	OCTET STRING		Meant for a binary representation of text in a picture. Due to an error in the standard, this DE is mandatory and therefore will be set to an empty string.	Set to ""
lac Layout Container				See next line	
	"The purpose for the Layout Container is to convey information about the suggested layout of the information provided by General IVI Container(s) and/or Text Container(s) being displayed to the driver. This can be used, for example, to present the information in the vehicle with a similar arrangement as is presented on the road, i.e. by reflecting the real layout of the VMS on the road or in other more appropriate ways."	SEQUENCE{ layoutId INTEGER(1..4,...), height width INTEGER(10..265) OPTIONAL, layoutComponents SEQUENCE SIZE (1..4,...) OF LayoutComponent, ... }		FR choice is: no intrusion on how to display on HMI through IVI. So layoutContainer won't be defined.	
<i>avc AutomatedVehicleContainer</i>				Not used for the moment	
<i>mlc MapLocationContainer</i>				Not used for the moment	
<i>rsc RoadSurfaceContainer</i>				Not used for the moment	

VehicleCharacteristics (C-Roads France recommended usage in **bold**) :

```

TractorCharacteristics::=SEQUENCE{
    equalTo VehicleCharacteristicsFixValuesList OPTIONAL,
    notEqualTo VehicleCharacteristicsFixValuesList OPTIONAL,
    ranges VehicleCharacteristicsRangesList OPTIONAL}

VehicleCharacteristicsFixValuesList::= SEQUENCE (SIZE (1..4,...)) OF VehicleCharacteristicsFixValues

VehicleCharacteristicsRangesList::= SEQUENCE (SIZE (1..4,...)) OF VehicleCharacteristicsRanges

VehicleCharacteristicsFixValues::= CHOICE{
    simpleVehicleType StationType,
    euVehicleCategoryCode EuVehicleCategoryCode,
    iso3833VehicleType Iso3833VehicleType,
    euroAndCo2value EnvironmentalCharacteristics,
    engineCharacteristics EngineCharacteristics,
    loadType LoadType,
    usage VehicleRole,...}

VehicleCharacteristicsRanges::= SEQUENCE{
    comparisonOperator ComparisonOperator,
    limits CHOICE{
        numberOfAxles INTEGER(0..7),
        vehicleDimensions VehicleDimensions,
        vehicleWeightLimits VehicleWeightLimits,
        axleWeightLimits AxleWeightLimits,
        passengerCapacity PassengerCapacity,
        exhaustEmissionValues ExhaustEmissionValues,
        dieselEmissionValues DieselEmissionValues,
        soundLevel SoundLevel,...}

ComparisonOperator::= INTEGER {
    greaterThan (0),
    greaterThanOrEqualTo (1),
    lessThan (2),
    lessThanOrEqualTo (3)} (0..3)

VehicleWeightLimits::= SEQUENCE {
    vehicleMaxLadenWeight Int2, #Optional
    vehicleTrainMaximumWeight Int2, #Optional
    vehicleWeightUnladen Int2 #Optional}

Int2 ::= INTEGER(0..65535)
    
```

Note that the data elements of the VehicleWeightLimits do not include any unit. Due to the standard, it is expressed in kilogram. So, due to the limitation of Int2 (INTEGER(0..65535)), no weight over 65,535 kg can be expressed through the VehicleWeightLimits of VehicleCharacteristics. See Mantis #908 for more details.

Other elements for transmission purpose

Table 2.3-2 : IVIM transmission elements

IVI standard (ISO TS 19321) + 103 301			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
repetitionDuration		ms	✓	Since validFrom to validTo	
repetitionInterval		ms	✓	500ms	is 500ms

IVI standard (ISO TS 19321) + 103 301			IVI Master choices I2V		
Field/IVI	Description / Meaning	Type of data	Status	Content	Value set
Destination area	<p>"As specified in ETSI EN 302 931."</p> <p>"itsGnMaxGeoAreaSize ; 10 ; Maximum size of the geographical area for a GBC and GAC packet [km2]. If the geographical area size exceeds the maximum value, the GeoNetworking packet shall not be sent (source) and not be forwarded (forwarder)"</p>	<p>GeoAreaPosLatitude [1/10 microdegree]</p> <p>GeoAreaPosLongitude [1/10 microdegree]</p> <p>Distance a [m]</p> <p>Distance b [m]</p> <p>Angle [°]</p>	✓	<p>Less than or equal to 80km² as defined through C-Roads PF (see also annex II table 1 of the draft of DA)</p> <p>For I2V, this max value is retained.</p>	(area of 80km ²)
Maximum Hop Limit	<p>"The Maximum Hop Limit specifies the number of hops a packet is allowed to have in the network, i.e. how often the packet is allowed to be forwarded."</p> <p>"itsGnDefaultHopLimit : 10 : Default hop limit indicating the maximum number of hops a packet travels"</p>	<p>itsGnDefaultHopLimit Integer8 (0..255)</p>	✓	<p>For the moment, no complication seems linked to the choice of a high value. So that 10 hop is chosen.</p>	is 10
Traffic class	<p>"GN traffic class as defined in ETSI EN 302 636-4-1 if GeoNetworking/BTP is used."</p>	<p>itsGnTrafficClass Integer32 (0..255)</p> <p>SCF : 1 bit</p> <p>Channel Offload : 1 bit</p> <p>TC ID : 6-bit unsigned integer</p>	✓	<p>SCF bit is 0.</p> <p>Channel offload bit is 0 (see RS_RSP_042 (C-Roads PF Roadside profile) based on RS_BSP_262)</p> <p>TC ID value is "1" for C2 and H use-cases. It is "3" for other UC e.g (see also RS_RSP_063 (C-Roads PF Roadside profile))</p>	is 1 (C2) and H use-cases or 3 (others)

Unicity of the IVIM messages in I2V (general rule):

Whatever route the information has followed, IVI must have the same serviceProviderId+ivIdentificationNumber and the same timeStamp. So that vehicle treats one message or the other, but not both of them.

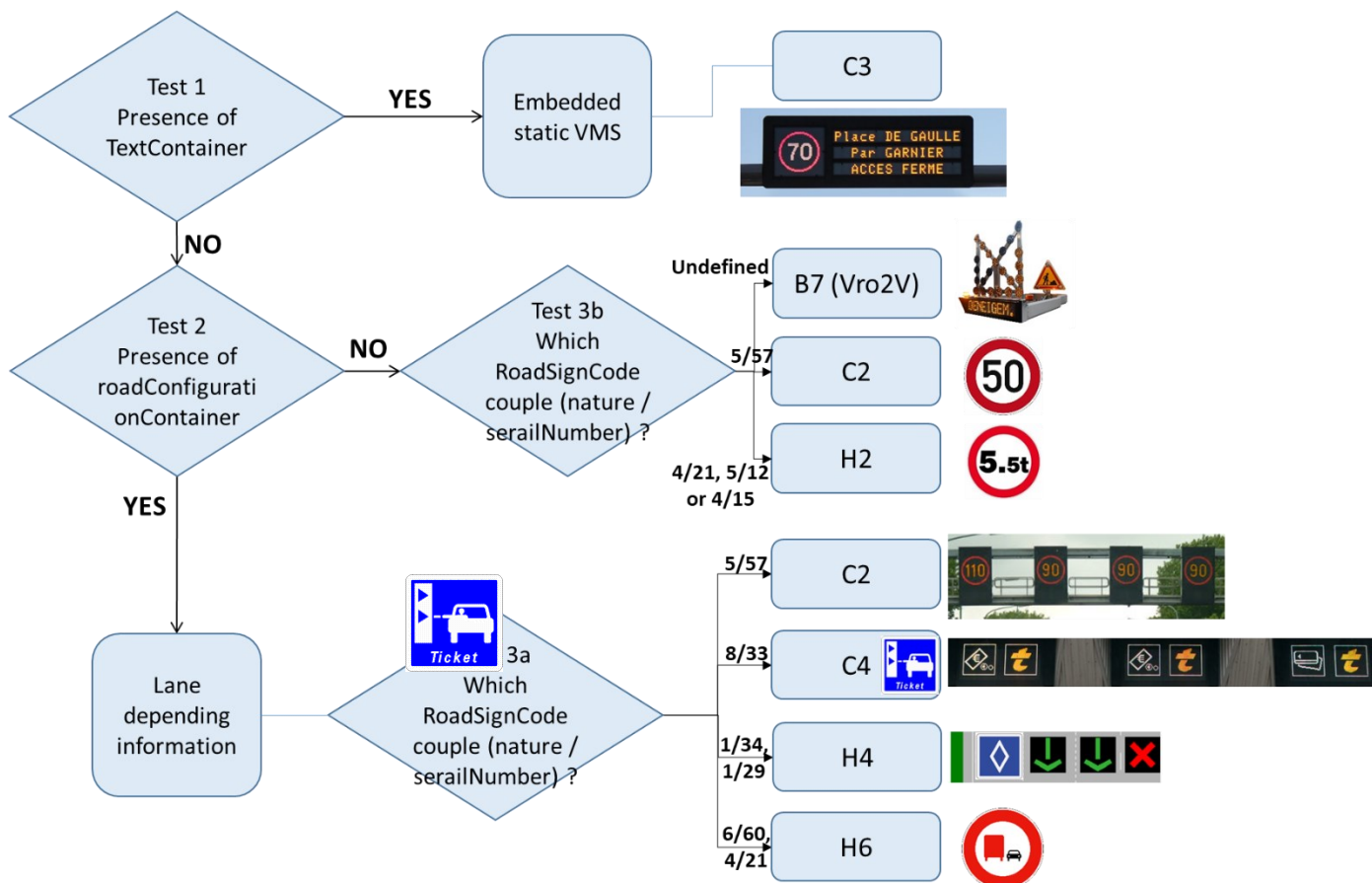
General display principles :

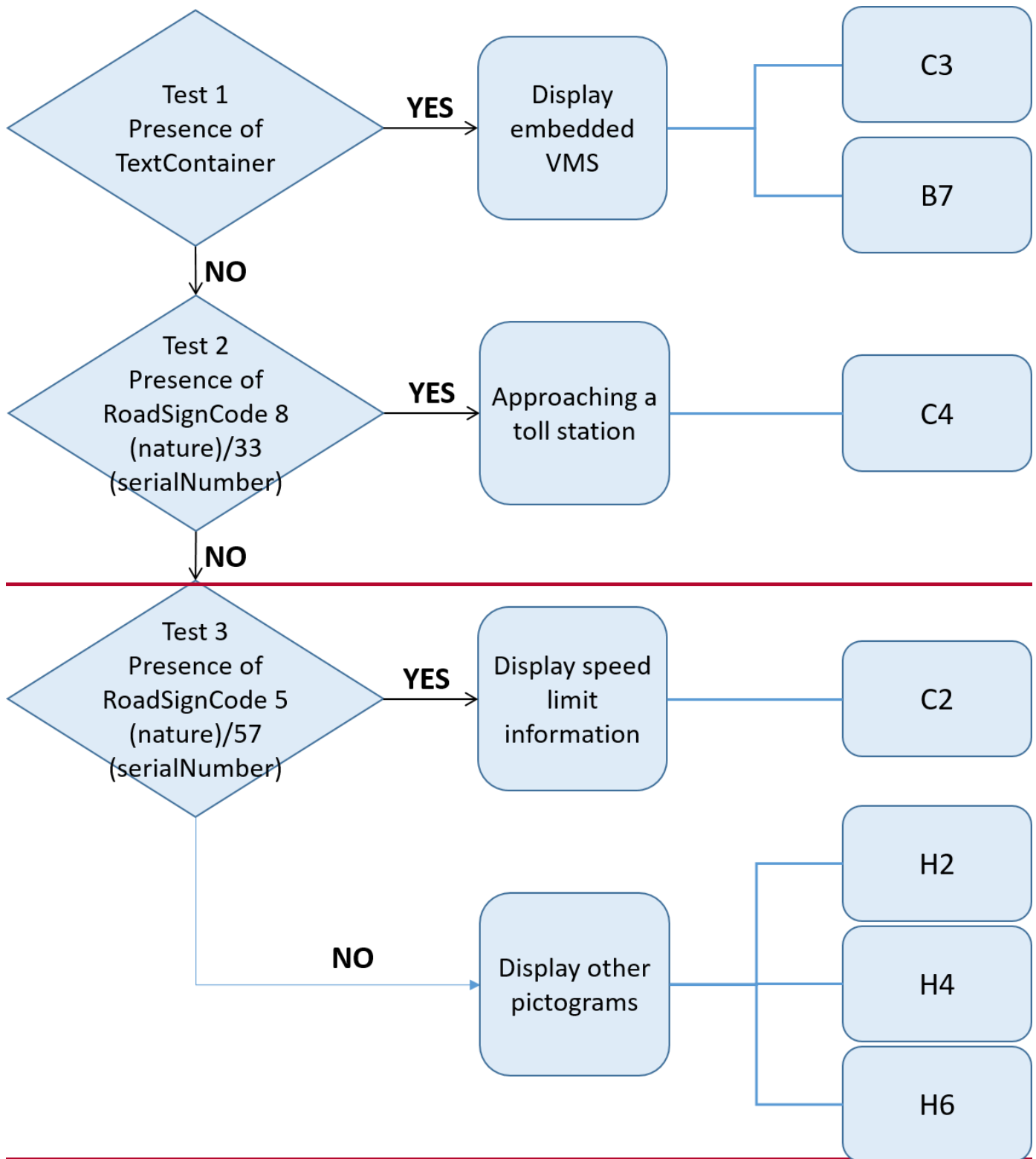
The process of vehicle-receiver can be as followed:

1. The vehicle checks serviceProviderID+ivIdentificationNumber and timestamp to verify if the event is already known, if it is a new event or if it is an update.
2. The vehicle checks validFrom and validTo to determine if the event is active.
3. The vehicle checks the referencePosition to determine how far from its position the event is and calculate its time-to-event.
4. The vehicle checks detectionZone. If vehicle is following the linear described by zone(s), it is concerned by the event. If not, optionally, the vehicle could compare zoneHeading with its own current heading and the way it is approaching the referencePosition by rear to know if it is concerned or not (e.g difference between headings should be more or less about +/- 30°).
5. The vehicle **may** check the presence of applicableLanes, extraText, RoadConfigurationContainer and TextContainer containers to determine the appropriate way to display the information on the HMI.
6. HMI displays the message from referencePosition point (or before) and displays it all along the relevanceZone. However, if vehicleCharacteristics are given by IVI, they can be processed by the vehicle-receiver and if they are not checked (involved the receiver know its own characteristics), the message can be not displayed.
7. The message is displayed properly on the HMI at the proper moment (car manufacturers' domain).

~~2.2.1.~~ 2.3.1. Logigram of use cases

To clarify the process that **could** be done by a vehicle-receiver of an IVI and choose the appropriate format solution to display the IVI message on HMI, the following logigram **may** be followed. The logigram also includes which use case is concerned depending on the situation, giving as well some illustrative examples.





2.2.2.2.3.2. Examples for different cases

These examples do not represent the whole structure of the message but only aim to explain how GIC, extraText and text container must be filled. More detailed examples will be made for each use case in the corresponding document. *RoadConfigurationContainer* is not needed and optional for all these cases but shall be provided if *applicableLanes* is filled.

Example 1



Pseudocoding:
IVIM

Mandatory

Optional: 2 items

Item 0: GLC

Item 1: GIC

Item 0: GicPart

roadSignCode: 1 item

Item 0: ISO 14823 for 30km/h

extratext: 1 item

Item 0: "RAPPEL"

Item 1: GicPart

roadSignCode: 1 item

Item 0: ISO 14823 for Warning

extratext: 1 item

Item 0: "SORTIE DE VEHICULES"



Example 2



Pseudocoding:
IVIM

Mandatory

Optional: 2 items

Item 0: GLC

Item 1: GIC

Item 0: GicPart

roadSignCode: 1 item

Item 0: ISO 14823 for 100 km/h

extratext: 1 item

Item 0: "22-6h"

Item 1: GicPart

roadSignCode: 2 items

Item 0: ISO 14823 for 60 km/h

Item 1: ISO 14823 for applicable to trucks

extratext: 2 items

Item 0: "22-6h"

Item 1: ""



Example 3



Pseudocoding:

IVIM

Mandatory

Optional: 3 items

Item 0: GLC

Item 1: GIC

Item 0: GicPart

roadSignCode: 1 item

Item 0: ISO 14823 for 50 km/h

extratext: 1 item

Item 0: "DANGER"

Item 2: TextContainer

Item 0: TcPart

Textlines: 3 items

Item 0: "ATTENTION"

Item 1: "ACCIDENT A 2 KM"

Item 2: "RALENTISSEZ"








2.3.2.4. MAPEM & SPATEM

The following chapter gives the description of the MAPEM and SPATEM according to the standards ETSI TS 103 301 V2.1.1 (2021- 03) and ISO TS 19091 (2019) and the general choices made for the implementation in the French projects. Any technical aspect that depends on the use case is described in the concerned use case deliverable.

These elements are for transmission purpose:

Table 2.4-1 : MAPEM/SPATEM transmission elements

SPATEM/MAPEM standard (ISO TS 19091) + 103 301			SPATEM/MAPEM Master choices I2V		
Field/VI	Description / Meaning	Type of data	Status	Content	Value set
repetitionDuration		ms		None : live information produced each second and sent 1 time.	N/A
repetitionInterval		ms		None : live information produced each second and sent 1 time.	N/A
Destination area	<p>“As specified in ETSI EN 302 931.”</p> <p>“itsGnMaxGeoAreaSize ; 10 ; Maximum size of the geographical area for a GBC and GAC packet [km2]. If the geographical area size exceeds the maximum value, the GeoNetworking packet shall not be sent (source) and not be forwarded (forwarder)”</p>	<p>GeoAreaPosLatitude [1/10 microdegree]</p> <p>GeoAreaPosLongitude [1/10 microdegree]</p> <p>Distance a [m]</p> <p>Distance b [m]</p> <p>Angle [°]</p>		Defined as a circle of 1km radius around the RSU dedicated to the intersection (or to the group of intersections) or the center of the centers of intersections. (see also 2412H-G1 : each SPATEM / MAPEM contains information about intersections within 100m around the RSU... if there is no RSU for the information, the center of the centers of the intersections is taken instead and each center of intersection has to be distant of less or equal to 100m of other centers of intersections).	(area of 3,14 km²)
Maximum Hop Limit	<p>“The Maximum Hop Limit specifies the number of hops a packet is allowed to have in the network, i.e. how often the packet is allowed to be forwarded.”</p> <p>“itsGnDefaultHopLimit : 10 : Default hop limit indicating the maximum number of hops a packet travels”</p>	itsGnDefaultHopLimit Integer8 (0..255)		No hop for the SPATEM / MAPEM due to the lifetime of information and the range distance around the RSU (in G5).	is 1
Traffic class	“GN traffic class as defined in ETSI EN 302 636-4-1 if GeoNetworking/BTP is used.”	<p>itsGnTrafficClass Integer32 (0..255)</p> <p>SCF : 1 bit</p> <p>Channel Offload : 1 bit</p> <p>TC ID : 6-bit unsigned integer</p>		<p>SCF bit is 0.</p> <p>Channel offload bit is 0 (see RS_RSP_042 (C-Roads PF Roadside profile) based on RS_BSP_262)</p> <p>TC ID value is “3” (see RS_RSP_063 (C-Roads PF Roadside profile))</p>	is 3

2.3.1.2.4.1. MAPEM

For mapping, all static information are initially set in MAPPF system of each road operator. Information are static, e.g they are set one time for all, except when intersection's or road segment's description needs to evolve.

The relationships of the tables of MAPEM are depicted in the figure below:

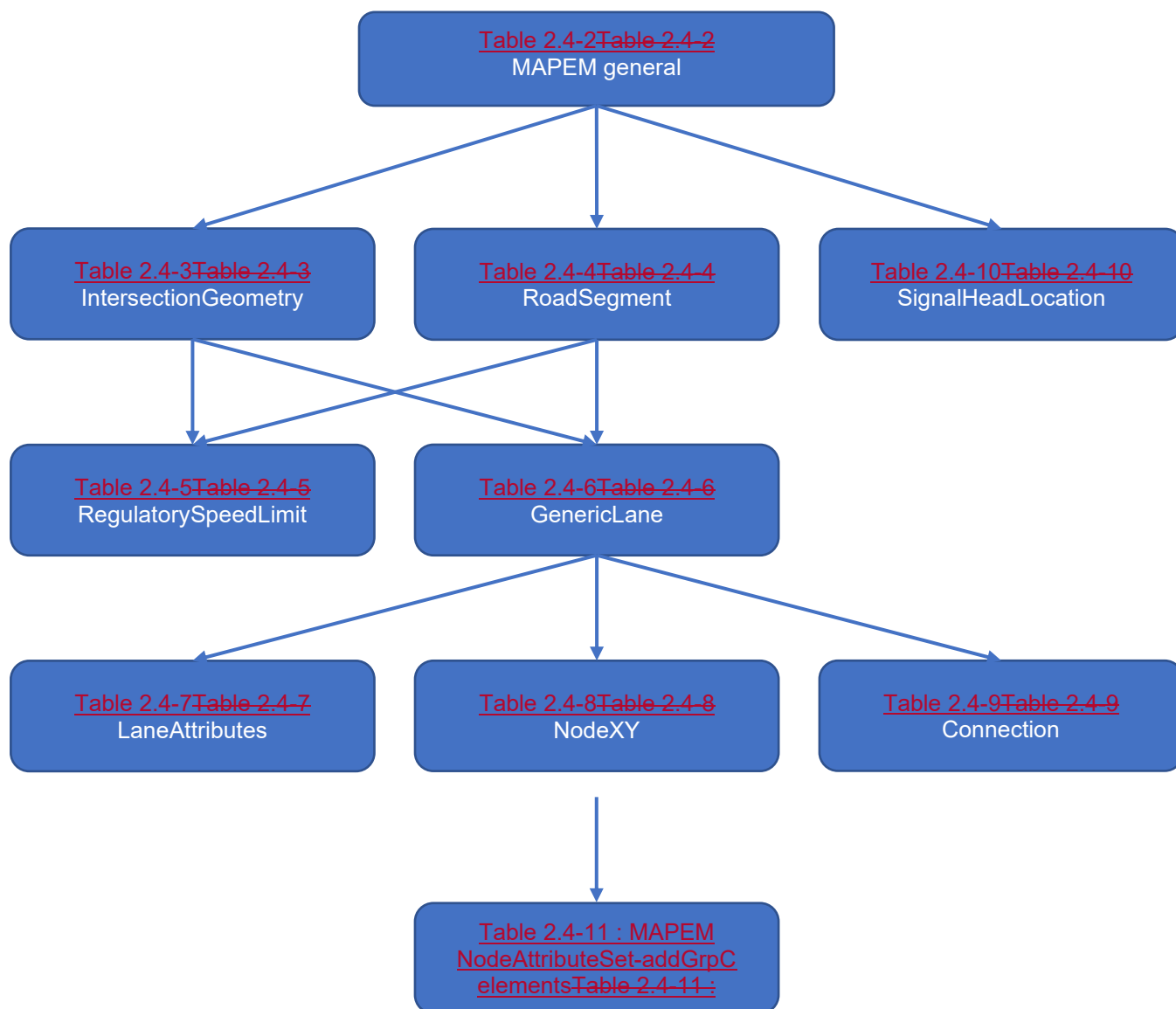


Figure 1 : MAPEM tables

ID	2.4.1.2 M Master MAPEMMessageProfile
Component(s)	Traffic light controller, R-ITS-S, V-ITS-S
Requirement	The MAPEM transmitted by the infrastructure shall respect what is expected in the following table.
Acceptance	
Additional information	

Table 2.4-2 : MAPEM Master choices

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
Header					
protocol Version	"Version of the ITS payload contained in the message as defined for the specific infrastructure service."	INTEGER{ currentVersion(2) } (0..255)	✓	Current version is 2.	is 2
messageID	"Type of the ITS payload contained in the message as defined for the specific infrastructure service."	INTEGER{ denm(1),cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7) } (0..255),	✓	map(5)	is 5
stationID	"Identifier of the ITS-S that generated the message." This is the ID of the station broadcasting the message.	INTEGER(0..4294967295)	✓	ID of the R-ITSS or C-ITSS (I2V)	By R-ITSS or C-ITSS
MapData					
<i>timestamp</i>	The MinuteOfTheYear data element expresses the number of elapsed minutes of the current year in the time system being used (typically UTC time).	MinuteOfTheYear ::= INTEGER (0..527040) OPTIONAL	✗	Not needed because map data is quite very static, the transmission latency is not relevant. Revision number in intersections DF or in RoadSegments DF is sufficient.	
msgIssueRevision	The msgIssueRevision data element is used to provide a revision related to the issued standard, to be able to identify the compatibility.	MsgCount ::= INTEGER (0..127)	✓	This element is used to indicate the revision number of the defining standard. 0 = ISO/TS 19091:2019(E)	is 0
<i>layerType</i>	The LayerType data element is used to uniquely identify the type of information to be found in a layer of a geographic map fragment such as an intersection.	LayerType OPTIONAL	✗	Not clear on what it is used for, so not provided. There is no need to additionally identify the topological content by an additional identifier.	
<i>layerID</i>	The LayerID data element is used to uniquely identify the layers of a geographic map	INTEGER (0..100) OPTIONAL	⚠	Mandatory in profile if, as defined in 19091, two MapData messages are needed. Then	

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
	fragment such as an intersection. Used to identify the number of MapData messages needed to describe the complete topology.			the LayerID of the first is set to 21, and the second to 22. If the complete topology fits into one MapData message, this field is not used.	
<i>intersections</i>	All Intersection definitions.	IntersectionGeometryList OPTIONAL IntersectionGeometryList ::= SEQUENCE (SIZE(1..32)) OF IntersectionGeometry	S	See <u>Table 2.4-3</u> <u>Table 2.4-3</u> on IntersectionGeometry. Used to describe intersections areas or other areas that include traffic lights such as toll stations.	
<i>roadSegments</i>	All roadway descriptions.	RoadSegmentList OPTIONAL RoadSegmentList ::= SEQUENCE (SIZE(1..32)) OF RoadSegment	S	See <u>Table 2.4-4</u> on RoadSegment. Used to describe roadway segments without intersections (e.g. roadworks) and without traffic lights. No SPAT message can be linked to a MapData described with RoadSegments.	
<i>dataParameters</i>	Any meta data regarding the map contents. The DataParameters data frame is used to provide basic (static) information on how a map fragment was processed or determined.	DataParameters OPTIONAL DataParameters ::= SEQUENCE {processMethod OPTIONAL, processAgency OPTIONAL, lastCheckedDate OPTIONAL, geoidUsed OPTIONAL, ...}	S	See four next lines (optional but not really needed: may be provided).	▼▼▼
<i>LprocessMethod</i>		processMethod IA5String(SIZE(1..255)) OPTIONAL,	X	Not used	
<i>LprocessAgency</i>		processAgency IA5String(SIZE(1..255)) OPTIONAL,	S	Optionally used to indicate the creator of the MapData.	by MAPPF
<i>LlastCheckedDate</i>		lastCheckedDate IA5String(SIZE(1..255)) OPTIONAL,	S	Optionally used to indicate the date the source data was last checked. As discussed through C-Roads TF3, format is YYYY-MM-DD (to offer possibility to automatically compare versions)	by MAPPF
<i>LgeoidUsed</i>		geoidUsed IA5String(SIZE(1..255)) OPTIONAL,	X	Not used	

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
<i>restrictionList</i>	Any restriction ID tables which have established for these map entries. The RestrictionClassList data frame is used to enumerate a list of user classes which belong to a given assigned index.	SEQUENCE (SIZE(1..254)) OF RestrictionClassAssignment	X	Not used	
regional	The element is used for additional "regional information", as defined in ISO/PDTS 19091.	SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-MapData}} OPTIONAL Reg-MapData REG-EXT-ID-AND-TYPE ::= { {MapData-addGrpC IDENTIFIED BY addGrpC}, ...} MapData-addGrpC ::= SEQUENCE { signalHeadLocations SignalHeadLocationList OPTIONAL, ...} SignalHeadLocationList ::= SEQUENCE (SIZE(1..64)) OF SignalHeadLocation	S	The European extension 'MapData-addGrpC' defines the 3D location of the signal heads. If used, the signalGroupID must be unique within a MAPEM. That means there are two possibilities : 1. Only one intersection per MAP message 2. Ensure that the signalGroupIDs of different intersections in the same MAP message are all different See Table 2.4-10 Table 2.4-10 Table 2.4-10 Table 2.4-10 on signalHeadLocation.	

Table 2.4-3 : MAPEM IntersectionGeometry elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
IntersectionGeometry					
<i>name</i>	For debug use only	DescriptiveName OPTIONAL DescriptiveName ::= IA5String (SIZE(1..63))	S	Can be used for some use cases. Typically, human readable and recognizable by road authority. Refpoint check can be used to verify concordance between id map and reality.	by MAPPF
Id (IntersectionReferenceID)	A globally unique value set, consisting of a regionID and intersection ID assignment. Must be the same as in the SPATEM.	IntersectionReferenceID IntersectionReferenceID ::= SEQUENCE { region RoadRegulatorID OPTIONAL, id IntersectionID}	V	See two next lines id (type intersectionID) : for each road operator, one unique id by intersection.	▼▼▼
Region (RoadRegulatorID)	RoadRegulatorIDs are managed and assigned nationally, and each road regulator assigns IDs to intersections.	RoadRegulatorID ::= INTEGER (0..65535) OPTIONAL	U	Proposal of similarity to serviceProvider in IVI (example : 10 033 for DIRA, 3300 for Bordeaux-Métropole, etc. ; See IVI/serviceProviderId for more details.	by MAPPF
Id (IntersectionID)	The region-id combination shall be unique within a radius of dRangeIdUnique around each intersection.	IntersectionID ::= INTEGER (0..65535)	V	The values 0 to 255 are allocated for testing purposes. The uniqueness within a radius is to ensure backwards compatibility with ITS-G5 deployments. For long range deployment the additional field countryCode can be used.	by MAPPF
revision		MsgCount	V	The revision number must be increased by 1 each time the MapData of this intersection changes. The revision numbers of SPAT and MAP must be the same as an indication that the right MAP version is used. If a station receives a message with several intersectionGeometry and if one of the revision numbers is higher than in the previous message, it	by MAPPF

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
				should consider it as an update. If the state (SPAT message) of the intersection changes, the revision number should not be increased.	
refPoint	The reference from which subsequent data points are offset until a new point is used.	Position3D	V	The reference point shall be roughly at the center of the conflict area when the MapData describes an intersection. See next 4 lines	▼▼▼
L_{lat}	in 1/10th micro degrees	Latitude	V		by MAPPF
L_{long}	in 1/10th micro degrees	Longitude	V		by MAPPF
L_{elevation}	in 10 cm units	Elevation OPTIONAL	X	Not used. Use of regional altitude instead is preferred, as it is similar to DENM/altitude	
L_{regional}		SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-Position3D}} OPTIONAL	S	Only present for altitude with altitudeConfidence when they are known and can be provided.	
laneWidth	Provides the default width of the lanes, while deviations from this lane width are provided using dWidth.	laneWidth LaneWidth OPTIONAL LaneWidth ::= INTEGER (0..32767)	S	The default width may be the width of the main lane at the intersection or the road segment. The width of each lane will then be specified in dwidth. If no lane width is to be given, then lanewidth is not used. Value given in cm.	by MAPPF
speedLimits	Reference regulatory speed limits used by all subsequent lanes unless a new speed is given Speed in units of 0.02 m/s.	SpeedLimitList OPTIONAL SpeedLimitList ::= SEQUENCE (SIZE(1..9)) OF RegulatorySpeedLimit RegulatorySpeedLimit ::= SEQUENCE { type SpeedLimitType, speed Velocity } }	U	This information should be used by calculate and display system. See Table 2.4-5Table 2.4-5Table 2.4-5 on regulatorySpeedLimit.	by MAPPF
laneSet	Data about one or more lanes (all lane data is found here)	LaneList ::= SEQUENCE (SIZE(1..255)) OF GenericLane	V	See Table 2.4-6Table 2.4-6Table 2.4-6 on GenericLane.	

2.4.1.2_M_Master technical specifications for I2V use cases



standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
<i>preemptPriorityData</i>	data about one or more regional preempt or priority zones	PreemptPriorityList OPTIONAL			
<i>regional</i>	Used to provide the countryCode of origin linked to the RoadRegulatorIDIntersectionGeometry undefined extension.	SEQUENCE (SIZE(1..4)) OF RegionalExtension IntersectionGeometry}} OPTIONAL		Used to provide a Country code of the region (RoadRegulatorID) of the IntersectionReferenceID. countryCode is a bitstring according to ISO-3166-1 : 2-letter country code with International Telegraph Alphabet No. 2 encoding. Example : for France, the bitstring stands for "FR" (Bitstring Code: F (10110) and R (01010) 1011001010 according to ISO-14816.	by SPATPF (static) FR: 1011001010

Table 2.4-4 : MAPEM RoadSegment elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
RoadSegment					
<i>name</i>	For debug use only	DescriptiveName OPTIONAL DescriptiveName ::= IA5String (SIZE(1..63))	S	Can be used for some use cases. Typically, human readable and recognizable by road authority. Refpoint check can be used to verify concordance between id map and reality.	by MAPPF
Id (RoadSegmentReferenceID)	A globally unique value set, consisting of a regionID and road segment ID assignment.	RoadSegmentReferenceID RoadSegmentReferenceID ::= SEQUENCE { region RoadRegulatorID OPTIONAL, id RoadSegmentID}	V	See two next lines id (type roadSegmentID) : for each road operator, one unique id by road segment.	▼▼▼
Region (RoadRegulatorID)	RoadRegulatorIDs are managed and assigned nationally, and each road regulator assigns IDs to road segments.	RoadRegulatorID ::= INTEGER (0..65535) OPTIONAL	U	Proposal of similarity to serviceProvider in IVI (example: 10 033 for DIRA, 3300 for Bordeaux-Métropole, etc; See IVI/serviceProviderId for more details. Same as intersection description.	by MAPPF
Id (RoadSegmentID)	The region-id combination shall be unique within a radius of dRangeIdUnique around each road segment.	RoadSegmentID ::= INTEGER (0..65535)	V	The values 0 to 255 are allocated for testing purposes. The uniqueness within a radius is to ensure backwards compatibility with ITS-G5 deployments. For long range deployment the additional field countryCode can be used.	by MAPPF
revision		MsgCount	V	The revision number must be increased by 1 each time the MapData of this road segment changes. If a station receives a message with several roadSegments and if one of the revision numbers is higher than in the previous message, it should consider it as an update.	by MAPPF
refPoint	The reference from which subsequent data points are offset until a new point is used.	Position3D	V	The reference point can be at the beginning or end of the road section described. See next 4 lines	▼▼▼

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
L_{lat}	in 1/10th micro degrees	Latitude	V		by MAPPF
L_{long}	in 1/10th micro degrees	Longitude	V		by MAPPF
L_{elevation}	in 10 cm units	Elevation OPTIONAL	X	Not used. Use of regional altitude instead is preferred, as it is similar to DENM/altitude	
L_{regional}		SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-Position3D}} OPTIONAL	S	Only present for altitude with altitudeConfidence when they are known and can be provided.	
laneWidth	Provides the default width of the lanes, while deviations from this lane width are provided using dWidth.	laneWidth LaneWidth OPTIONAL LaneWidth ::= INTEGER (0..32767)	S	The default width may be the width of the main lane at the intersection or the road segment. The width of each lane will then be specified in dwidth. If no lane width is to be given, then lanewidth is not used. Value given in cm.	by MAPPF
speedLimits	Reference regulatory speed limits used by all subsequent lanes unless a new speed is given Speed in units of 0.02 m/s.	SpeedLimitList OPTIONAL SpeedLimitList ::= SEQUENCE (SIZE(1..9)) OF RegulatorySpeedLimit RegulatorySpeedLimit ::= SEQUENCE { type SpeedLimitType, speed Velocity }	U	This information should be used by calculate and display system. See Table 2.4-5Table 2.4-5Table 2.4-5 on regulatorySpeedLimit.	by MAPPF
laneSet	Data about one or more lanes (all lane data is found here)	LaneList ::= SEQUENCE (SIZE(1..255)) OF GenericLane	V	See Table 2.4-6Table 2.4-6Table 2.4-6 on GenericLane. LaneSet shall contain all lanes for the road segment, it can also include median lanes and road boundaries, i.e. some types of lane object used to separate traffic lanes.	
regional	Used to provide the countryCode of origin linked to the RoadRegulatorID	SEQUENCE (SIZE(1..4)) OF RegionalExtension IntersectionGeometry}} OPTIONAL	X	Not used.	

Table 2.4-5 : MAPEM RegulatorySpeedLimit elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
RegulatorySpeedLimit					
type	Type of speed concerned by the limit	SpeedLimitType ::= ENUMERATED { unknown, maxSpeedInSchoolZone, maxSpeedInSchoolZoneWhenChildrenArePresent, maxSpeedInConstructionZone, vehicleMinSpeed, vehicleMaxSpeed, - Regulatory speed limit for general traffic vehicleNightMaxSpeed, truckMinSpeed, truckMaxSpeed, truckNightMaxSpeed, vehiclesWithTrailersMinSpeed, vehiclesWithTrailersMaxSpeed, vehiclesWithTrailersNightMaxSpeed, ... }	✓	Type vehicleMaxSpeed shall be used for existing use cases.	by MAPPF
speed	Value of the speed limit	Velocity ::= INTEGER (0..8191)	✓	Be careful of unit in standard (units of 0.02 m/s)	by MAPPF

Table 2.4-6 : MAPEM GenericLane elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
GenericLane					
laneID	The unique ID number assigned to this lane object The value 0 shall be used when the lane ID is not available or not known the value 255 is reserved for future use	LaneID ::= INTEGER (0..255)	V	Provided for each lane of one intersection (see figure next this table for details). Use of 0 should be avoided.	by MAPPF
name	Often for debug use only but at times used to name ped crossings	DescriptiveName OPTIONAL DescriptiveName ::= IA5String (SIZE(1..63))	S	Can be used for some use cases. Used optionally for debug purposes, not always provided.	by MAPPF
ingressApproach	Inbound Approach IDs to which this lane belongs	ApproachID OPTIONAL ApproachID ::= INTEGER (0..15) -- zero to be used when valid value is unknown	S	Must be used if possible. Block of inbound lane ID going to the intersection. The data elements "ingressApproach" and "egressApproach" are used for grouping lanes (e.g. lanes defined in travel direction towards the intersection, lanes in exiting direction and cross walks). For a bidirectional lane, both dataelements are used for the same lane. Ingress and egress approaches of the same arm have the same ApproachID. See figure	by MAPPF
egressApproach	Outbound Approach IDs to which this lane belongs	ApproachID OPTIONAL ApproachID ::= INTEGER (0..15) -- zero to be used when valid value is unknown	S	Must be used if possible. Block of outbound lane ID coming from the intersection. The data elements "ingressApproach" and "egressApproach" are used for grouping lanes (e.g. lanes defined in travel direction towards the intersection, lanes in exiting direction and cross walks). For a bidirectional lane, both dataelements are used for the same lane. Ingress and egress approaches of the same arm have the same ApproachID. See figure	by MAPPF

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
laneAttributes	All Attribute information about the basic selected lane type Directions of use, Geometric co-sharing and Type Specific Attributes. These Attributes are 'lane - global' that is, they are true for the entire length of the lane.	LaneAttributes ::= SEQUENCE { directionalUse LaneDirection, sharedWith LaneSharing, laneType LaneTypeAttributes, regional RegionalExtension {{Reg-LaneAttributes}} OPTIONAL}	✓	See Table 2.4-7Table 2.4-7Table 2.4-7 on LaneAttributes	
maneuvers	The permitted maneuvers for this lane.	AllowedManeuvers OPTIONAL	✗	Not used, because <i>AllowedManeuvers</i> are provided instead in the <i>ConnectsTo</i> data field (for each ingress lane).	
nodeList	Lane spatial path information as well as various Attribute information along the node path. Attributes found here are more general and may come and go over the length of the lane. ► NodeSetXY : a lane made up of two or more XY node points and any attributes defined in those nodes ► ComputedLane : a lane path computed by translating the data defined by another lane	NodeListXY ::= CHOICE { nodes NodeSetXY, computed ComputedLane, ...} NodeSetXY ::= SEQUENCE (SIZE(2..63)) OF NodeXY	✓	Set to "nodes NodeSetXY" as approach with delta is quite typical (same kind of approach in DENM traces, eventHistory or in IVI) See Table 2.4-8 Table 2.4-8 Table 2.4-8 Table 2.4-8 on NodeXY.	By MAPPF
connectsTo	A list of other lanes and their signal group IDs each connecting lane and its signal group ID is given.	ConnectsToList OPTIONAL ConnectsToList ::= SEQUENCE (SIZE(1..16)) OF Connection	S	Always absent for egress lane. Present for ingress lane. In this case, each connection from current lane (ingress) to each egress lane(s) is given (or to ingress lane of next intersection via remote intersection). See table Table 2.4-9Table 2.4-9Table 2.4-9 on Connection.	by MAPPF
overlays	A list of any lanes which have spatial paths that overlay (run on top of, and not simply cross) the path of this lane when used	OverlayLaneList OPTIONAL OverlayLaneList ::= SEQUENCE (SIZE(1..5)) OF LaneID	S	Should be used when one lane is considered above another lane (e.g. for railway crossings).	by MAPPF
regional	Provide a trajectory to get out of the intersection through regional extensions. Relevant for use case scenario safe intersection manoeuvre.	SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-GenericLane}} OPTIONAL	S	Regional extension may be used to provide connection trajectory between two lanes in particular configuration,	by MAPPF

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
		Reg-GenericLane REG-EXT-ID-AND-TYPE ::= { { ConnectionTrajectory-addGrpC IDENTIFIED BY addGrpC}, ... } ConnectionTrajectory-addGrpC ::= SEQUENCE { nodes NodeSetXY, connectionID LaneConnectionID, ... }		e.g. for entering or exiting a round-about. WARNING: In the SAE J2735, the regional extension is empty, which is different from the standard TS 19091.	
L_{nodes}	Nodes that link the end of a lane to the beginning of another one.	NodeSetXY ::= SEQUENCE (SIZE(2..63)) OF NodeXY	✓	A connection trajectory is composed of at least two nodes, i.e. an initial node which corresponds to the end path of current lane and a final node which corresponds to the start of next lane. See Table 2.4-8 : MAPEM NodeXY elements Table 2.4-8 : MAPEM NodeXY elements Table 2.4-8 : MAPEM NodeXY elements Table 2.4-8 : MAPEM NodeXY elements Table 2.4-8 : MAPEM NodeXY elements for details on NodeXY.	by MAPPF
L_{connectionID}	A unique identifier of the connection.	LaneConnectionID ::= INTEGER (0..255)	✓		by MAPPF

Table 2.4-7 : MAPEM LaneAttributes elements




standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
LaneAttributes					
directionalUse	Directions of lane use BIT STRING with bits as defined: - Allowed directions of travel in the lane object - All lanes are described from the stop line outwards ingressPath (0), - travel from rear of path to front is allowed egressPath (1)	LaneDirection ::= BIT STRING { ingressPath (0), egressPath (1)} (SIZE (2))	✓	Examples (with bit string left to right) : - 10 for an ingress - 01 for an egress - 00 for an nor egress nor ingress lane - 11 for an both ways lane Do not use both ways (ingress and egress) for vehicle lanes; this can be used for pedestrians or bidirectional bicycle paths (future use).	is ►'10'B for an ingress lane and is ►'01'B for an egress lane

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
	<p>- travel from front of path to rear is allowed</p> <p>Notes : No Travel, i.e. the lane object type does not support</p> <p>- travel (medians, curbs, etc.) is indicated by not asserting any bit value</p> <p>- Bi-Directional Travel (such as a ped crosswalk) is indicated by asserting both of the bits</p>				
sharedWith	<p>Co-users of the lane path</p> <p>► overlappingLaneDescriptionProvided (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>► multipleLanesTreatedAsOneLane (1) : assert if the lane object path and width details represents multiple lanes within it that are not further described.</p> <p>► otherNonMotorizedTrafficTypes (2) : horse drawn etc.</p> <p>All zeros would indicate 'not shared' and 'not overlapping'</p>	<p>LaneSharing ::= BIT STRING {</p> <p>overlappingLaneDescriptionProvided (0),</p> <p>multipleLanesTreatedAsOneLane (1),</p> <p>otherNonMotorizedTrafficTypes (2),</p> <p>individualMotorizedVehicleTraffic (3),</p> <p>busVehicleTraffic (4),</p> <p>taxiVehicleTraffic (5),</p> <p>pedestriansTraffic (6),</p> <p>cyclistVehicleTraffic (7),</p> <p>trackedVehicleTraffic (8),</p> <p>pedestrianTraffic (9)</p> <p>} (SIZE (10))'</p>	✓	<p>Provided as it is mandatory in standard, fill in as correctly as possible. If any difficulty to do so, can be filled with all bit set to '0' if not really useful for the UC.</p>	By MAPPF
laneType	Specific lane type data	<p>LaneTypeAttributes ::= CHOICE {</p> <p>vehicle LaneAttributes-Vehicle,</p> <p>crosswalk LaneAttributes-Crosswalk,</p> <p>bikeLane LaneAttributes-Bike,</p> <p>sidewalk LaneAttributes-Sidewalk,</p> <p>median LaneAttributes-Barrier,</p> <p>striping LaneAttributes-Striping,</p> <p>trackedVehicle LaneAttributes-TrackedVehicle,</p> <p>parking LaneAttributes-Parking,</p> <p>}</p> <p>LaneAttributes-Vehicle ::= BIT STRING {</p> <p>isVehicleRevocableLane (0),</p> <p>isVehicleFlyOverLane (1),</p>	✓	<p>LaneAttributes-Vehicle is filled as correctly as possible, but if any difficulty to do so, it can be filled with "0" if it is not fully useful for the UC.</p> <p>Crosswalk, bikeLane, trackedVehicle or barrier may also be optionally described in the MAP.</p>	By MAPPF

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
		hovLaneUseOnly (2), restrictedToBusUse (3), restrictedToTaxiUse (4), restrictedFromPublicUse (5), hasIRbeaconCoverage (6), permissionOnRequest (7) } (SIZE (8,...))			
<i>regional</i>		regional RegionalExtension {{Reg- LaneAttributes}} OPTIONAL LaneAttributes-addGrpC ::= SEQUENCE { maxVehicleHeight VehicleHeight OPTIONAL, maxVehicleWeight VehicleMass OPTIONAL, ... }	x	Not used	

Table 2.4-8 : MAPEM NodeXY elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
NodeXY					
delta	<p>A choice of which X,Y offset value to use. This includes various delta values as well as regional choices.</p> <p>Nodes with X,Y content :</p> <ul style="list-style-type: none"> ►Node-XY-20b : node is within 5.11m of last node ►Node-XY-22b : node is within 10.23m of last node ►Node-XY-24b : node is within 20.47m of last node ►Node-XY-26b : node is within 40.96m of last node ►Node-XY-28b : node is within 81.91m of last node ►Node-XY-32b : node is within 327.67m of last node ►Node-LLmD-64b : node is a full 32b Lat/Lon range ►RegionalExtension {{Reg-NodeOffsetPointXY}}: node which follows is of a regional definition type. 	NodeOffsetPointXY ::= CHOICE { node-XY1 Node-XY-20b, node-XY2 Node-XY-22b, node-XY3 Node-XY-24b, node-XY4 Node-XY-26b, node-XY5 Node-XY-28b, node-XY6 Node-XY-32b, node-LatLon Node-LLmD-64b, regional RegionalExtension {{Reg-NodeOffsetPointXY}} }		<p>Nodes XY-20b to XY-32b or Node-LLmD-64b can be used, not RegionalExtension.</p> <p>The benefits of using the description with delta from last node are that it is used at the C-Roads Platform level and it takes lesser space in the message.</p> <p>However, using the description with latitude and longitude is easier to encode for the provider and most of the times faster to decode for the receiver.</p> <p>No choice is made for now in the Master document as the benefits are still difficult to compare.</p>	by MAPPF
attributes	Any optional Attributes which are needed. This includes changes to the current lane width and elevation	NodeAttributeSetXY ::= SEQUENCE { localNode OPTIONAL, disabled OPTIONAL, enabled OPTIONAL, data OPTIONAL, dWidth OPTIONAL, dElevation OPTIONAL, regional OPTIONAL, ...}		Can be used for some use cases.	
L_{localNode}	Can be used to give information about nodes such as to indicate merging nodes.	localNode NodeAttributeXYList OPTIONAL, NodeAttributeXYList ::= SEQUENCE (SIZE(1..8)) OF NodeAttributeXY		<p>See use cases</p> <p>All the node attributes defined in the data frame are valid in the direction of node declaration and not in driving direction, even those with 'left' and 'right' in their name. This allows using attributes in a unambiguous way also for lanes with biderctional driving.</p>	

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
<i>L_{enabled}</i>	Can be used to give information about the segment following the node.	enabled SegmentAttributeXYList OPTIONAL, SegmentAttributeXYList ::= SEQUENCE (SIZE(1..8)) OF SegmentAttributeXY	S	See use cases A SegmentAttributeXY of value doNotBlock shall be present in the disabled list at the first node of the lane thereafter, which may again be blocked by a vehicle. e.g. adjacentParkingOnLeft if there is parking available on the left after the node.	
<i>L_{disabled}</i>	Can be used to give information about the segment following the node.	enabled SegmentAttributeXYList OPTIONAL, SegmentAttributeXYList ::= SEQUENCE (SIZE(1..8)) OF SegmentAttributeXY	S	See use cases A SegmentAttributeXY of value doNotBlock shall be present in the disabled list at the first node of the lane thereafter, which may again be blocked by a vehicle. e.g. adjacentParkingOnLeft if there is no parking available on the left after the node.	
<i>L_{data}</i>	Can be used to give information about nodes such as to indicate merging nodes.	data LaneDataAttributeList OPTIONAL, LaneDataAttributeList ::= SEQUENCE (SIZE(1..8)) OF LaneDataAttribute	X	Not used	
<i>L_{dwidth}</i>	The data element dWidth allows defining different widths of a lane along the sequence of nodes.	dWidth Offset-B10 OPTIONAL Offset-B10 ::= INTEGER (-512..511)	S	The default lane width of the intersection is provided by laneWidth. Any significant lane width difference of at least 0.3 meters to this default width, shall be expressed. The value is given in cm	
<i>L_{elevation}</i>	Can be used to give information about nodes' elevation.	dElevation Offset-B10 OPTIONAL, Offset-B10 ::= INTEGER (-512..511)	S	Elevation field can be set to increase precision of lane elevation with regard to the reference value given.	

Table 2.4-9 : MAPEM Connection elements

standard TS19091			Master_12V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
Connection					
connectingLane	The index of the connecting lane and also the maneuver from the current lane to it.	ConnectingLane ::= SEQUENCE { lane LaneID, maneuver AllowedManeuvers OPTIONAL }	V	See next two lines	▼▼▼
L _{laneID}	Index of the connecting lane.	LaneID ::= INTEGER (0..255)	V	Lane ID of egress lane is provided (for each ingress lane).	By MAPPF
L _{AllowedManeuvers}	The index of the connecting lane and also the maneuver from the current lane to it. ► AllowedManeuvers : the Maneuver between the enclosing lane and this lane at the stop line to connect them. All maneuvers with bits not set are therefore prohibited ! A value of zero shall be used for unknown, indicating no Maneuver ► maneuverLaneChangeAllowed (6) : a movement which changes to an outer	AllowedManeuvers ::= BIT STRING { maneuverStraightAllowed (0), maneuverLeftAllowed (1), maneuverRightAllowed (2), maneuverUTurnAllowed (3), maneuverLeftTurnOnRedAllowed (4), maneuverRightTurnOnRedAllowed (5), maneuverLaneChangeAllowed (6),	U	If the lane described is an egress lane, the manoeuvres is not provided, but if it is an ingress lane manoeuvres are always provided. In details (for ingress lane) : ► bit 0 to 2 are given (set to 0 or 1) ► bit 3 is sometime set to 1, but most often set to 0 (no U-turn allowed)	By MAPPF

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
	<p>lane on the egress side is allowed in this lane</p> <ul style="list-style-type: none"> - (example: left into either outbound lane) ► maneuverNoStoppingAllowed (7) : the vehicle should not stop at the stop line - (example: a flashing green arrow) ► yieldAllwaysRequired (8) : the allowed movements above are not protected - (example: an permanent yellow condition) ► goWithHalt (9) : after making a full stop, may proceed ► caution (10): proceed past stop line with caution ► reserved1 (11) : used to align to 12 Bit Field 	<p>maneuverNoStoppingAllowed (7),</p> <p>yieldAllwaysRequired (8),</p> <p>goWithHalt (9),</p> <p>caution (10),</p> <p>reserved1 (11)</p> <p>} (SIZE(12))</p>		<p>► bit 4 and 5 are set to '0' as this kind of rules doesn't exist in FR</p> <p>► bit 6 is set to '0' as it is a bit unclear</p> <p>► bit 7 is set to '0' as this kind of rule doesn't exist in FR</p> <p>► bit 8, 9 and 10 are sometime provided. (with 8 for flashing yellow), but most of time not given as in the GLOSA UC only traffic light intersection may be broadcasted.</p> <p>► bit 11 is always set to '0' (future use)</p>	
<i>remoteIntersection</i>	<p>This entry is only used when the indicated connecting lane belongs to another intersection layout. This provides a means to create meshes of lanes.</p>	<p>IntersectionReferenceID ::= SEQUENCE {</p> <p>region RoadRegulatorID</p> <p>OPTIONAL,</p> <p>id IntersectionID</p> <p>}</p> <p>OPTIONAL</p>	S	<p>When given, the laneID of connectingLane not refers to the current intersection but refers to lane ID (of an ingress lane) of the targeted intersection (given by remoteIntersection).</p> <p>This option should only be used when map of the targeted intersection and current intersection are described within the same MAP message.</p> <p>This element should not be used when MapData is described with roadSegments.</p>	
<i>signalGroup</i>	<p>The matching signal group sent by the SPAT message for this lane/maneuver.</p> <p>Shall be present unless the connectingLane has no signal group (is un-signalized).</p> <p>The value 0 shall be used when the ID is not available or not known.</p> <p>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>	<p>SignalGroupID ::= INTEGER (0..255) OPTIONAL</p>	S	<p>Depends on the use case.</p> <p>Mandatory if lane is controlled by a traffic light. The ID refers to a group of synchronised traffic light at the current intersection (that are green, orange, red all together at every same instant).</p> <p>Note that there is no 1:1 relation between signal heads and connections, e.g. if a connection is controlled by 2 signals, their combined state</p>	

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
				<p>shall be reflected in the eventState.</p> <p>An exception is when multiple user classes share a lane and each user class is served with separate signals (e.g. public transport). In such a case, a lane may have multiple (overlapping) connections, each with a unique signalGroup and the userClass restriction set.</p> <p>Every given signalGroup /intersectionReferenceID tuple in the MAPEM shall also be found in the SPATEM.</p> <p>This element should not be used when MapData is described with roadSegments.</p>	
<i>userClass</i>	<p>The Restriction Class of users this applies to the use of some lane/maneuver and SignalGroupID pairings are restricted to selected users.</p> <p>When absent, the SignalGroupID applies to all.</p>	RestrictionClassID ::= INTEGER (0..255) OPTIONAL	S	<p>Depends on the use case.</p> <p>It can be used for some specific intersections with maneuvers applying only to some types of vehicles.</p> <p>This element should not be used when MapData is described with roadSegments.</p>	
<i>connectionID</i>	<p>An optional connection index used to relate this lane connection to any dynamic clearance data in the SPAT. Note that the index may be shared with other connections if the clearance data is common.</p>	LaneConnectionID ::= INTEGER (0..255) OPTIONAL	S	<p>It may be useful for some use cases when the connection between nodes are complex such as roundabouts descriptions.</p>	

Table 2.4-10 : MAPEM SignalHeadLocation elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
SignalHeadLocation					
<i>nodeXY</i>	Position where the signal head is located.	NodeOffsetPointXY ::= CHOICE { node-XY1 Node-XY-20b, node-XY2 Node-XY-22b, node-XY3 Node-XY-24b, }	V	<p>Nodes XY-20b to XY-32b or Node-LLmD-64b can be used, not RegionalExtension.</p> <p>The benefits of using the description with delta are</p>	by MAPPF

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
		node-XY4 Node-XY-26b, node-XY5 Node-XY-28b, node-XY6 Node-XY-32b, node-LatLon Node-LLMD-64b, regional RegionalExtension {Reg-NodeOffsetPointXY} }		that it is used at the C-Roads Platform level and it takes lesser space in the message. However, using the description with latitude and longitude is easier to encode for the provider and most of the times faster to decode for the receiver. No choice is made for now in the Master document as the benefits are still difficult to compare.	
nodeZ	Delta of altitude with the regional altitude.	nodeZ DeltaAltitude	✓	Set to 0 if unknown.	by MAPPF
signalGroupID	The signalGroupID located at this described position.	SignalGroupID ::= INTEGER (0..255)	✓	To use this data element, the signalGroupID must be unique within the whole MapData, and not only within each intersection.	by MAPPF

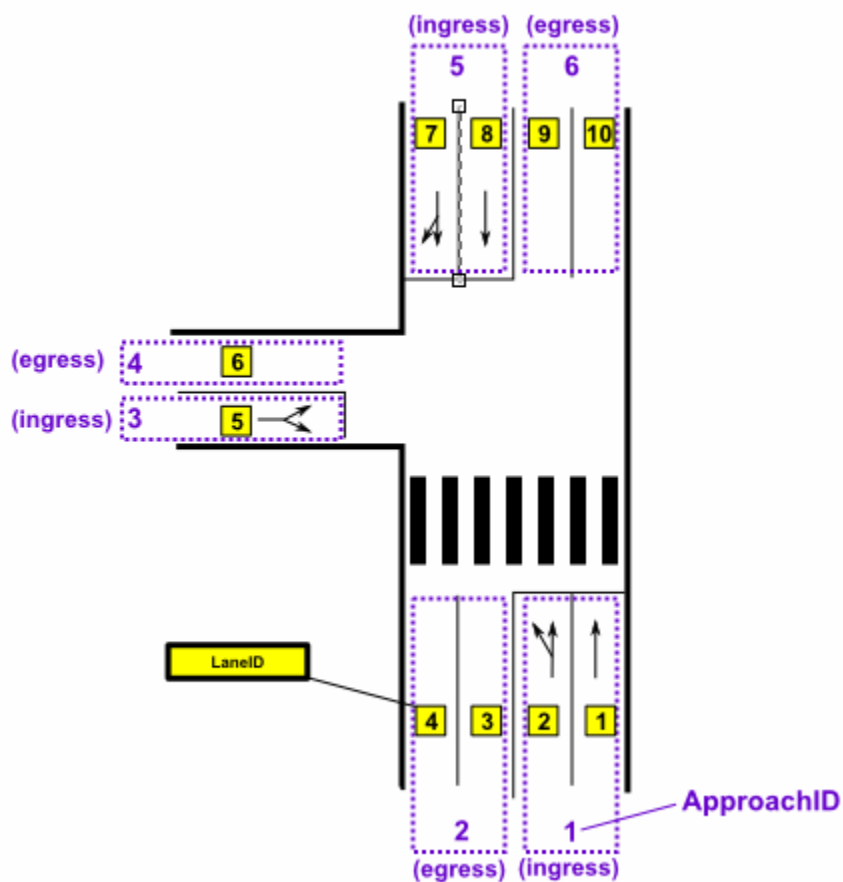
Table 2.4-11 : MAPEM NodeAttributeSet-addGrpC elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
NodeAttributeSet-addGrpC					
ptvRequest	Request made at the location of the node.	ptvRequest PtvRequestType OPTIONAL PtvRequestType ::= ENUMERATED { preRequest, mainRequest, doorCloseRequest, cancelRequest, emergencyRequest, ... }	✗	Not used	
nodeLink	Description of a link with another lane.	nodeLink NodeLink OPTIONAL NodeLink ::= SEQUENCE SIZE (1..5) OF Node Node ::= SEQUENCE { id INTEGER, lane LaneID OPTIONAL, connectionID laneConnectionID OPTIONAL, intersectionID IntersectionID OPTIONAL,	S	It may be used to represent a link with another node from another lane. In such case, every node included in NodeLink should be given with their unique id, the id of the lane from which they are issued, and may include a connection id	by MAPPF

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
		... }		for any connection set by another lane.	
node	The signalGroupID located at this described position.	SignalGroupID ::= INTEGER (0..255)	✓	To use this data element, the signalGroupID must be unique within the whole MapData, and not only within each intersection.	by MAPPF
L_{id}	Identifier of the node that is unique within its lane.	Id INTEGER	✓	A unique identifier should be given.	by MAPPF
L_{lane}	The unique ID number assigned to this lane object.	Lane LaneID OPTIONAL	✓	The value 0 shall be used when the lane ID is not available or not known the value 255 is reserved for future use Identifier of lane from which node has been issued should be given.	by MAPPF
L_{connectionId}	The LaneConnectionID data entry is used to state a connection index for a lane to lane connection.	connectionID LaneConnectionID OPTIONAL LaneConnectionID ::= INTEGER (0..255)	S	It can be used to relate this connection between the lane (defined in the MAP) and any dynamic clearance data sent in the SPAT.	by MAPPF
L_{intersectionId}	A globally unique value set for an intersection.	intersectionID IntersectionID OPTIONAL	S	Optionally add intersection reference id, especially if multiple intersections are used in a single MAP message..	by MAPPF

Figure on LaneID and ApproachID (egressApproach or ingressApproach)



2.3.2.2.4.2. SPATEM

For SPAT, all information are-is given by SPATPF system of each road operator which is synchronised with pilot system of traffic light. Some information are-is static (no evolution on real time) and some are-is dynamic (can change in real time).

The relationships of the tables of SPATEM are depicted in the figure below:

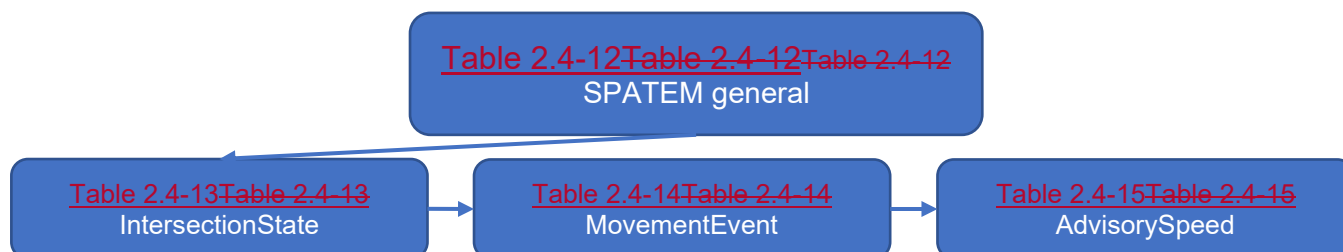


Figure 2 : SPATEM tables

<u>ID</u>	<u>2.4.1.2 M Master SPATEMessageProfile</u>
<u>Component(s)</u>	<u>Traffic light controller, R-ITS-S, V-ITS-S</u>
<u>Requirement</u>	<u>The SPATEM transmitted by the infrastructure shall respect what is expected in the following table.</u>
<u>Acceptance</u>	
<u>Additional information</u>	

Table 2.4-12 : SPATEM Master choices

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
Header					
protocol Version	"Version of the ITS message and/or communication protocol."	INTEGER{ currentVersion(1) } (0..255)	✓	Current version is 2.	is 2
messageID	"Type of the ITS message."	INTEGER{ denm(1),cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7) } (0..255),	✓	spat(4)	is 4
stationID	"The identifier of the ITS-S that generates the ITS message in question." This is the ID of the station broadcasting the message.	INTEGER(0..4294967295)	✓	ID of the R-ITSS or C-ITSS (I2V)	by R-ITSS or C-ITSS
SPAT					
<i>timestamp</i>	The MinuteOfTheYear data element expresses the	MinuteOfTheYear OPTIONAL	✗	Not used because minute of year is not precised enough.	

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
	number of elapsed minutes of the current year in the time system being used (typically UTC time).			moy+timestamp in intersection DF is preferred.	
<i>name</i>	For debug use only.	DescriptiveName OPTIONAL DescriptiveName ::= IA5String (SIZE(1..63))	S	Most often not used. If any, it would be the name of the generic name of the SPAT. Seems not so needed. Note that a name can be included in each intersections in the SPAT (preferred).	By SPATPF
<i>intersections</i>	Sets of SPAT data (one per intersection).	IntersectionStateList OPTIONAL IntersectionStateList ::= SEQUENCE (SIZE(1..32)) OF IntersectionState	U	See Table 2.4-13 Table 2.4-13 Table 2.4-13 Table 2.4-13 on IntersectionState.	By SPATPF
<i>regional</i>	The element is used for additional "regional information", as defined in ISO/PDTS 19091.	SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-MapData}} OPTIONAL	X	Not used (not needed)	

Table 2.4-13 : SPATEM IntersectionState elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
IntersectionState					
<i>name</i>	For debug use only	DescriptiveName OPTIONAL DescriptiveName ::= IA5String (SIZE(1..63))	S	Optional. Only for debug. Not useful for the UC. It is better to give a name to each intersection in this DE than to give a name at previous level (SPAT).	by SPATPF (static)
Id (IntersectionReferenceID)	A globally unique value set, consisting of a regionID and intersection ID assignment. Must be the same as in the MAPEM.	IntersectionReferenceID IntersectionReferenceID ::= SEQUENCE { region RoadRegulatorID OPTIONAL, id IntersectionID}	V	See two next lines id (type intersectionID) : for each road operator, one unique id by intersection.	▼▼▼
Region (RoadRegulatorID)	RoadRegulatorIDs are managed and assigned nationally, and each road regulator assigns IDs to intersections.	RoadRegulatorID ::= INTEGER (0..65535)	V	Proposal of similarity to serviceProvider in IVI (example : 10 033 for DIRA, 3300 for Bordeaux-Métropole, etc. ; See IVI/serviceProviderId for more details.	by SPATPF
Id (IntersectionID)	The region-id combination shall be unique within a radius of dRangeIdUnique around each intersection.	IntersectionID ::= INTEGER (0..65535)	V	The values 0 to 255 are allocated for testing purposes. The uniqueness within a radius is to ensure backwards compatibility with ITS-G5 deployments. For long range deployment the additional field countryCode can be used.	by SPATPF
revision		MsgCount	V	The revision number must be increased by 1 each time the MapData of this intersection changes. The revision numbers of SPAT and MAP must be the same as an indication that the right MAP version is used. If a station receives a message with several intersectionGeometry and if one of the revision numbers is higher than in the previous message, it should consider it as an update. If the state (SPAT message) of the intersection changes, the revision number should not be increased.	by SPATPF (static)

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
status	<p>General status of the controller(s)</p> <p>► manualControlsEnabled (0): timing reported is per programmed values, etc. but person at cabinet can manually request that certain intervals are terminated early (e.g. green).</p> <p>► stopTimelsActivated (1): and all counting/timing has stopped.</p> <p>► failureFlash (2): above to be used for any detected hardware failures, e.g. conflict monitor as well as for police flash.</p> <p>► fixedTimeOperation (5): schedule of signals is based on time only (i.e. the state can be calculated)</p> <p>► trafficDependentOperation (6): operation is based on different levels of traffic parameters (requests, duration of gaps or more complex parameters)</p> <p>► standbyOperation (7): controller: partially switched off or partially amber flashing</p> <p>► failureMode (8): controller has a problem or failure in operation</p> <p>► off (9): controller is switched off</p> <p>Related to MAP and SPAT bindings :</p> <p>► recentMAPmessageUpdate (10): Map revision with content changes</p> <p>► recentChangeInMAPassignedLanesIDsUsed (11): change in MAP's assigned lanes used (lane changes).</p> <p>Changes in the active lane list description :</p> <p>► noValidMAPisAvailableAtThisTime (12): MAP (and various lanes indexes) not available</p> <p>► noValidSPATisAvailableAtThisTime (13): SPAT system is not working at this time</p>	<p>IntersectionStatusObject ::= BIT STRING {</p> <p>manualControlsEnabled (0),</p> <p>stopTimelsActivated (1),</p> <p>failureFlash (2),</p> <p>preemptIsActive (3),</p> <p>signalPriorityIsActive (4),</p> <p>fixedTimeOperation (5),</p> <p>trafficDependentOperation (6),</p> <p>standbyOperation (7),</p> <p>failureMode (8),</p> <p>off (9),</p> <p>recentMAPmessageUpdate (10),</p> <p>recentChangeInMAPassignedLanesIDsUsed (11),</p> <p>noValidMAPisAvailableAtThisTime (12),</p> <p>noValidSPATisAvailableAtThisTime (13)</p> <p>Bits 14,15 reserved at this time and shall be zero</p> <p>} (SIZE(16))</p>	✓	<p>Provided as much as possible, but no real use in current use cases. May be set to a static "0000000000000000" when too difficult to provide properly.</p> <p>Bit 10 to 13 should lead to malfunction of the system if they are set to "1" (if MAP or SPAT is not valid data cannot be properly processed. "recent" is not very clear. Anyway, revision number of SPAT and MAP shall be the same)</p> <p>Bit 3 is a clue that timing can change suddenly (because the traffic light can be preempted).</p> <p>Bit 5 is a clue that timing should not change suddenly (because the traffic light is on fixed time operations)</p> <p>...</p> <p>C2CC: RS_ARSM 69 (amended): For the data element 'status' (of type IntersectionStatusObject) only the status bits "manualControlsEnabled" (0), "fixedTimeOperation" (5), "trafficDependentOperation" (6), "standbyOperation" (7), "failureMode" (8) or "off" (9) shall be used. All other bits shall always be set to zero.</p> <p>Note: Vehicles will mostly rely on MovementPhaseState without consideration of the IntersectionStatusObject.</p> <p>C2CC: RS_ARSM 70: Exactly one of the status bits referred to in RS_ARSM 69 shall be set to 1.</p>	by SPATPF

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
moy	Minute of current UTC year used only with messages to be archived.	MinuteOfTheYear OPTIONAL	U	With next DE used to horodate the SPAT message (when two are received by vehicle).	by SPAT PF (dynamic)
timeStamp	The mSec point in the current UTC minute that this message was constructed.	DSecond OPTIONAL DSecond ::= INTEGER (0..65535) -- units of milliseconds	U	With previous DE used to horodate the SPAT message (when two are received by vehicle).	by SPAT PF (dynamic)
enabledLanes	A list of lanes where the RevocableLane bit has been set which are now active and therefore part of the current intersection.	EnabledLaneList OPTIONAL EnabledLaneList ::= SEQUENCE (SIZE(1..16)) OF LaneID	S	Mandatory if the revocableLane bit is used in any of the lane descriptions, otherwise not used.	
states	Each Movement is given in turn and contains its signal phase state, mapping to the lanes it applies to, and point in time it will end, and it may contain both active and future states.	MovementList ::= SEQUENCE (SIZE(1..255)) OF MovementState MovementState ::= SEQUENCE { movementName DescriptiveName OPTIONAL, signalGroup SignalGroupID, state-time-speed MovementEventList, maneuverAssistList ManeuverAssistList OPTIONAL, regional SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-MovementState}} OPTIONAL, ...}	V	See next five lines	▼▼▼
L_{movementName}	Uniquely defines movement by name human readable name for intersection to be used only in debug mode.	DescriptiveName OPTIONAL DescriptiveName ::= IA5String (SIZE(1..63))	S	Optional but may be useful for debug purposes.	by SPATPF (static)
L_{signalGroup}	The group id is used to map to lists of lanes (and their descriptions) which this MovementState data applies. 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.	SignalGroupID ::= INTEGER (0..255)	V	One ID by phase of the intersection. Important because each lane piloted by a traffic light refers to a signalGroup. This DE is critical as it enables the link with the lanes described in the associated MAP message.	by SPATPF (static)

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
L_{state-time-speed}	Consisting of sets of movement data with: - a) SignalPhaseState - b) TimeChangeDetails, and - c) AdvisorySpeeds (optional) - Note one or more of the movement events may be for a future time and that this allows conveying multiple predictive phase and movement timing for various uses for the current signal group.	MovementEventList ::= SEQUENCE (SIZE(1..16)) OF MovementEvent MovementEvent ::= SEQUENCE {eventState MovementPhaseState, timing TimeChangeDetails OPTIONAL, speeds AdvisorySpeedList OPTIONAL, regional SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-MovementEvent}} OPTIONAL, ... } }	V	See Table 2.4-14Table 2.4-14Table 2.4-14 on MovementEvent. One phase shall be provided by the system.	
L_{maneuverAssistList}	This information may also be placed in the IntersectionState when common information applies to different lanes in the same way.	ManeuverAssistList OPTIONAL ManeuverAssistList ::= SEQUENCE (SIZE(1..16)) OF ConnectionManeuverAssist ConnectionManeuverAssist ::= SEQUENCE { connectionID LaneConnectionID, queueLength ZoneLength OPTIONAL, availableStorageLength ZoneLength OPTIONAL, waitOnStop WaitOnStopline OPTIONAL, pedBicycleDetect PedestrianBicycleDetect OPTIONAL, regional SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-ConnectionManeuverAssist}} OPTIONAL, ... } }	S	Optional, but kept only to provide queueLength (with a connectionID which is mandatory) if information can be provided by the system (loop, radar ...). Indeed, information displayed on board can be different if there is a queue at the traffic light (no chance to reach the advisory speed limit, for example).	By SPATPF (dynamic)
L_{regional}		SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-MovementState}} OPTIONAL	X	Not used, not needed.	
maneuverAssistList	Assist data	ManeuverAssistList OPTIONAL	X	Not used, not needed.	

2.4.1.2_M_Master technical specifications for I2V use cases


standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
<i>regional</i>	Used to describe the prioritization process for different lanes of the intersection.	<p>SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-IntersectionState}} OPTIONAL</p> <p><u>Reg-IntersectionState REG-EXT-ID-AND-TYPE ::= {</u> <u>{IntersectionState-addGrpC IDENTIFIED BY addGrpC},</u> <u>...</u> <u>}</u></p> <p><u>IntersectionState-addGrpC ::= SEQUENCE {</u> <u> activePriorizations</u> <u> PrioritizationResponseList</u> <u>OPTIONAL,</u> <u> ...</u> <u>}</u></p> <p><u>PrioritizationResponseList ::= SEQUENCE SIZE(1..10) OF</u> <u>PrioritizationResponse</u></p> <p><u>PrioritizationResponse ::= SEQUENCE {</u> <u> stationID DSRC.StationID,</u> <u> priorState</u> <u> PrioritizationResponseStatus,</u> <u> signalGroup SignalGroupID,</u> <u> ...</u> <u>}</u></p>		<p>Not used, not needed.Used to provide a Country code of the region (RoadRegulatorID) of the IntersectionReferenceID:</p> <p>countryCode is a bitstring according to ISO 3166-1: 2-letter country code with International Telegraph Alphabet No. 2 encoding. Example : for France, the bitstring stands for "FR" (Bitstring Code: F (10110) and R (01010) 1011001010 according to ISO 14816.</p>	<p>by SPATPF (static)</p> <p>FR:</p> <p>1011001010</p>

Table 2.4-14 : SPATEM MovementEvent elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
MovementEvent					
eventState	Consisting of Phase state (the basic 10 states) Directional, protected, or permissive state.	MovementPhaseState ::= 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) } Reds : 2 and 3 Greens : 4-5-6 Yellow/Ambers : 7-8-9	V	In detail, in FR possible values are : (0) unavailable (unknown or error) (3) stop-And-Remain (3) for static red (stop), (4) pre-Movement for some specific cases (example : Traffic Light Green + Barrier Down) (5) permissive-Movement-Allowed for a green with conflict (example : turn left with caution), (6) protected-Movement-Allowed for a green without conflict (example : go straight or turn left with no conflict), (8) protected-clearance for a static orange (prepare to stop). (9) caution-Conflicting-Traffic for a flashing yellow (intersection control is off) (7) permissive-clearance is not a possible value in FR	by SPATPF (dynamic)
timing	Timing Data in UTC time stamps for event includes start and min/max end times of phase confidence and estimated next occurrence.	TimeChangeDetails OPTIONAL TimeChangeDetails ::= SEQUENCE { startTime TimeMark OPTIONAL, minEndTime TimeMark, maxEndTime TimeMark OPTIONAL, likelyTime TimeMark OPTIONAL, confidence TimeIntervalConfidence OPTIONAL, nextTime TimeMark OPTIONAL }	U	See next six lines. About TimeMark : - Tenths of a second in the current or next hour - In units of 1/10th second from UTC time (different from other types of messages, which use timestampITS) - 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 >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	▼▼▼
L_startTime	Moment when this phase first started.	TimeMark ::= INTEGER (0..36001) OPTIONAL	S	Depends on the use case.	By SPATPF (dynamic)

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
L_{minEndTime}	Expected shortest end time.	TimeMark ::= INTEGER (0..36001)	V	<p>For an on site controller with fixed periods, minEndTime is equal to likelyTime and confidence is 15 (100%). Indeed, in that case, there is no preemption and no adaptive system to the traffic.</p> <p>For adaptive system to the traffic, minEndTime is the time of next change if a priority system is activated at current time (e.g. ask for priority).</p>	By SPATPF (dynamic)
L_{maxEndTime}	Expected longest end time.	TimeMark ::= INTEGER (0..36001) OPTIONAL	S	<p>Shall be set to the latest time possible at which the phase state could change (i.e. as an indication of the safety range based on what can at the very most can happen).</p> <p>In case maxEndTime is infinite (e.g. for traffic lights that only change in case of pedestrian requests), the value shall be set to pTimeMarkOutOfRange.</p>	By SPATPF (dynamic)
L_{likelyTime}	Best predicted value based on other data.	TimeMark ::= INTEGER (0..36001) OPTIONAL	S	LikelyTime is the time of next change if no priority system is activated at current time.	By SPATPF (dynamic)

2.4.1.2_M_Master technical specifications for I2V use cases



standard TS19091			Master_I2V choices																																				
Field	Description / Meaning	Type of data	Status	Content	Value set																																		
L _{confidence}	Applies to likelyTime only.	TimeIntervalConfidence ::= INTEGER (0..15) OPTIONAL	S	<p>Confidence shall be interpreted as the 95% probability that the real phase change occurs within ± time-interval of the indicated likelyTime.</p> <p>Note: This means that the 95% probability for likelyTime – Time-interval <= phase change time <= likelyTime + Time-interval shall be indicated.</p> <p>In addition to the standard, the values are encoded as time-interval classes (in seconds) with proposed values listed in the table below. This table replaces the table in the standard. Time-interval values are intentionally arranged in such a way to align with the probabilities-scale in the standard :</p> <table><tr><th>Value</th><th>Time-interval</th></tr><tr><td>0</td><td>15</td></tr><tr><td>1</td><td>13,5</td></tr><tr><td>2</td><td>12</td></tr><tr><td>3</td><td>10,5</td></tr><tr><td>4</td><td>9</td></tr><tr><td>5</td><td>7,5</td></tr><tr><td>6</td><td>6,5</td></tr><tr><td>7</td><td>5,5</td></tr><tr><td>8</td><td>4,5</td></tr><tr><td>9</td><td>3,5</td></tr><tr><td>10</td><td>2,5</td></tr><tr><td>11</td><td>2</td></tr><tr><td>12</td><td>1,5</td></tr><tr><td>13</td><td>1</td></tr><tr><td>14</td><td>0,5</td></tr><tr><td>15</td><td>0</td></tr></table> <p>If no prediction is available, the confidence of 'likelyTime' shall be disseminated with the value "0".</p>	Value	Time-interval	0	15	1	13,5	2	12	3	10,5	4	9	5	7,5	6	6,5	7	5,5	8	4,5	9	3,5	10	2,5	11	2	12	1,5	13	1	14	0,5	15	0	By SPATPF (dynamic)
Value	Time-interval																																						
0	15																																						
1	13,5																																						
2	12																																						
3	10,5																																						
4	9																																						
5	7,5																																						
6	6,5																																						
7	5,5																																						
8	4,5																																						
9	3,5																																						
10	2,5																																						
11	2																																						
12	1,5																																						
13	1																																						
14	0,5																																						
15	0																																						
L _{nextTime}	Rough estimate of time when this phase may next occur again used to support various ECO driving power management needs.	TimeMark ::= INTEGER (0..36001) OPTIONAL	X	Not used, not needed.																																			

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
<i>speeds</i>	Various speed advisories for use by general and specific types of vehicles supporting green-wave and other flow needs.	AdvisorySpeedList OPTIONAL AdvisorySpeedList ::= SEQUENCE (SIZE(1..16)) OF AdvisorySpeed	S	Depends on the use case, to provide an advisorySpeedType for greenwave for example (speed to pass several next intersection, not to get a green at current intersection). See Table 2.4-15Table 2.4-15Table 2.4-15 on speedsAdvisoryList	
<i>regional</i>	Used to provide for example that the current phase is due to bus or tram preemption.	SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-MovementEvent}} OPTIONAL	X	Not used, not needed.	

Table 2.4-15 : SPATEM AdvisorySpeed elements

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
advisorySpeed					
type	Defines which specific types of vehicles are concerned.	AdvisorySpeedType ::= ENUMERATED { none (0), greenwave (1), ecoDrive (2), transit (3), ... }	V	Possible values are : greenwave (1) = speed for a sequence of coordinated intersections (repeated at each intersection). ecoDrive (2) = speed for current intersection. transit (3) = restricted to specific vehicle type.	by SPATPF
<i>speed</i>	Value of the advising speed, expressed in mph into units of m/s.	SpeedAdvice ::= INTEGER (0..500) in 0,1 m/s	U	Should be used if AdvisorySpeedList is given. Be careful of unit in standard (units of 0.1 m/s).	by SPATPF
<i>confidence</i>	Level of confidence of the speed.	SpeedConfidence ::= ENUMERATED { unavailable (0), -- Not Equipped or unavailable prec100ms (1), -- 100 meters / sec prec10ms (2), -- 10 meters / sec prec5ms (3), -- 5 meters / sec prec1ms (4), -- 1 meters / sec prec0-1ms (5), -- 0.1 meters / sec prec0-05ms (6), -- 0.05 meters / sec prec0-01ms (7) -- 0.01 meters / sec }	X	Not used, not needed.	
<i>distance</i>	Distance is specified upstream from the stop bar along the ingressing lane.	ZoneLength ::= INTEGER (0..10000)	X	Not used, not needed.	

2.4.1.2_M_Master technical specifications for I2V use cases

standard TS19091			Master_I2V choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
<i>class</i>	The Restriction Class of users this applies to.	RestrictionClassID ::= INTEGER (0..255)		Not used, not needed.	
<i>regional</i>	Regional extension.	SEQUENCE (SIZE(1..4)) OF RegionalExtension {{Reg-AdvisorySpeed}} OPTIONAL,		Not used, not needed.	

2.4.2.5. POI (extended)

POI UC uses descriptions out of standard, but inspired by ETSI TS 101 556-1 V1.1.1 “Electric Vehicle Charging Spot Notification Specification”. This standard is pointed by ETSI 102 894-2 V1.2.1 “common data dictionary”, chapter A.114 on DF_ItsPduHeader, for integer associated to messageID : “poi(3): Point of Interest message as specified in ETSI TS 101 556-1”.

The standard is respected until the POIType, where value 1 is still used for EVCS (Electrical Vehicle Charging Station) as described in the standard, but other values are defined out of standard to address the new use cases.

DF/DE conserved from current standard-:

```
POIType ::= INTEGER(0..65535)
```

```
ItsPOIHeader ::= SEQUENCE {
    poiType          POIType,
    timeStamp        TimestampIts,
    relayCapable     BOOLEAN}
```

Beginning of the structure conserved from the current standard :

```
EvcsnPdu ::= SEQUENCE {
    header ItsPduHeader,
    evcsn  EVChargingSpotNotificationPOIMessage }
```

```
EVChargingSpotNotificationPOIMessage ::= SEQUENCE {
    poiHeader ItsPOIHeader, -- Specific POI Message Header
```

As following :

```
xxxPdu ::= SEQUENCE {
    header ItsPduHeader,
    xxx    xxxMessage }
```

```
xxxMessage ::= SEQUENCE {
    poiHeader ItsPOIHeader,
```

At this point the POIType has just been given (ItsPOIHeader contains POIType). This is this POIType that gives the structure to follow to decode the message as following :

Table 2.5-1 : POIType list

Value	Type	Additional description	Use case an structure to use for decoding
0	Unknown	An unknown type	
		Electric vehicle Charging spot	Standard / EVCSNPdu structure
11	Slots	Port slots	J3 MCTO UC / shall use SlotReferenceStatusPdu structure
12	Docks	Port Docks	J2 MCTO UC / shall use DockTimeslotPdu structure
4013	TrainStation		
4100	CommuterRailStation	Commuter rail station, such as a metro station	
4170	BusStation		
4482	FerryTerminal		
4581	Airport		
5540	PetrolStation	A petrol / gas station	(no UC yet / may use BasicPoiPdu structure)
5800	Restaurant		(no UC yet / may use BasicPoiPdu structure)
7011	HotelMotel	A hotel or motel	(no UC yet / may use BasicPoiPdu structure)
7520	ParkingLot	A parking lot (free park)	F1 UC / shall use BasicPoiPdu structure
7521	ParkingGarage	A parking garage (not free)	F1 UC / shall use BasicPoiPdu structure
7522	ParkAndRide	A Park & Ride facility	F1 UC / shall use BasicPoiPdu structure

8060	Hospitals		(no UC yet / may use BasicPoiPdu structure)
9221	PoliceStation		
20023	CargoCentre		
20026	Campground	(whithout caravanning)	(no UC yet / may use BasicPoiPdu structure)
20027	CaravanSite		(no UC yet / may use BasicPoiPdu structure)
20028	CoachandLorryParking	Bus and Truck Parking	F1 UC / shall use BasicPoiPdu structure
20033	Stadium	Stadium (nationaly known)	
20061	ConcertHall		(no UC yet / may use BasicPoiPdu structure)
20114	ToiletPublicAmenities	Toilet/Public Amenities	

Common DF and DE for all type of poi (not specific to the structure targeted then by the poiType) :

ID	2.4.1.2_M_Master_POIMessageProfile
Component(s)	Broadcast: R-ITS-S, Nfr-ITS-S Receive: V-ITS-S
Requirement	The POI transmitted by the infrastructure shall respect what is expected in the following table.
Acceptance	
Additional information	

Table 2.5-2 : POI General elements

standard ETSI TS 101 556-1 modified			Master choices I2V		
Field	Description / Meaning	Type of data	Status	Content	Value set
header		ItsPduHeader		Contained in xxxPdu BasicPoiPdu ::= SEQUENCE { header ItsPduHeader, xxx xxxPoiMessage }	
protocol Version	"Version of the ITS message and/or communication protocol."	INTEGER (0..255)	✓	Current version is 2.	is 2
messageID	"Type of the ITS message."	INTEGER{ denm(1),cam(2), poi(3), spat(4), map(5), ivi(6), ev-rsr(7) } (0..255),	✓	is poi(3)	is 3
stationID	"The identifier of the ITS-S that generates the ITS message in question." This is the ID of the station broadcasting the message.	INTEGER(0..4294967295)	✓	ID of the R-ITS-S or Nfr-ITS-S (I2V)	by R-ITS-S or Nfr-ITS-S
xxx		xxxMessage ::= SEQUENCE { poiHeader ItsPOIHeader, ...by UC...}			
poiHeader		ItsPOIHeader ::= SEQUENCE {poiType POIType, timeStamp TimestampPlts, relayCapable BOOLEAN}	✓	Same than in TS 101 556-1. See three next lines.	▼▼▼
poiType	Type of POI regarding a table of correspondence with the type of POI	INTEGER(0..65535)	✓	See previous table.	by PF

timestamp	The MinuteOfTheYear data element expresses the number of elapsed minutes of the current year in the time system being used (typically UTC time).	Timestamps ::= INTEGER {utcStartOf2004(0), oneMilliSecAfterUTCStartOf2004(1)} (0..4398046511103)	V	Mandatory to have a versioning of POI information broadcasted by the station.	by PF
relayCapable	Indicates whether the originating ITS station is able to relay further reservation messages	BOOLEAN	V	Set to "false", not needed (specific for EVCS)	is "false"
<i>Common DE</i>				<i>Common DE for several POIType (F1, MCTO, ...)</i>	
<i>OpeningPeriod</i>		OpeningPeriod ::= SEQUENCE { opening TimeOfDay, closing TimeOfDay }	S	Used when time periods of opening hours needs to be provided.	
<i>TimeOfDay</i>		TimeOfDay ::= INTEGER { midnight(0), oneMinuteAfterMidnight(1) } (0..1440)	S	Format of the time of day.	

... Specific DE and DF based on the poiType are then described in the UC documents (e.g 2412H-F1 or 2412bish)

Other elements for transmission purpose :

Table 2.5-3 : POI Transmission elements

standard ETSI TS 101 556-1 modified			Master choices		
Field	Description / Meaning	Type of data	Status	Content	Value set
repetitionDuration		ms	V	As long as there is information to broadcast	
repetitionInterval		ms	V	500ms	is 500ms
Destination area	"As specified in ETSI EN 302 931." "itsGnMaxGeoAreaSize ; 10 ; Maximum size of the geographical area for a GBC and GAC packet [km2]. If the geographical area size exceeds the maximum value, the GeoNetworking packet shall not be sent (source) and not be forwarded (forwarder)"	GeoAreaPosLatitude [1/10 microdegree] GeoAreaPosLongitude [1/10 microdegree] Distance a [m] Distance b [m] Angle [°]	V	<u>Contrarily to other types of messages, the destination area can be defined with a maximum distance of 65km, which allows a disc area of maximum 22 698 km². Less than or equal to 80km² as defined through C-Roads PF (see also annex II table 1 of the draft of DA)</u> For I2V, this max value is retained.	(area of 80km²)
Maximum Hop Limit	"The Maximum Hop Limit specifies the number of hops a packet is allowed to have in the network, i.e. how often the packet is allowed to be forwarded." "itsGnDefaultHopLimit : 10 : Default hop limit indicating the maximum number of hops a packet travels"	itsGnDefaultHopLimit Integer8 (0..255)	V	For the moment, no complication seems linked to the choice of a high value. So that 10 hop is chosen.	is 10
Traffic class	"GN traffic class of the DENM as defined in ETSI EN 302 636-4-1 if GeoNetworking/BTP is used."	itsGnTrafficClass Integer32 (0..255) SCF : 1 bit Channel Offload : 1 bit TC ID : 6-bit unsigned integer	V	SCF bit is 0. Channel offload bit is 0 (see RS_RSP_042 based on RS_BSP_262 (C-Roads PF Roadside profile)) TC ID value is "4"	is 4

~~2.5.~~ 2.6. **ETA**

The whole profile is detailed in 2.4.1.2bis_H (MCTO UC). Except SSPs which are described in this document.

2.6-2.7. SSEM

The whole profile for the message is detailed in the 2.4.1.1_M-G2 document. (Requirement 2.4.1.1_M_G2-TrafficSignalPriority-SSEMPProfile)

Other elements for transmission purpose:

ID	2.4.1.2_M_Master_SSEMPProfile
Component(s)	Emission: R-ITS-S, Nfr Diffusion: R-ITS-S Reception: Vpt-ITS-S, Vru-ITS-S, Vro-ITS-S
Requirement	The SSEM transmitted by the infrastructure shall respect what is expected in the following table.
Acceptance	
Additional information	

Table 2.7-1 : SSEM Transmission elements

Field	Description / Meaning	Type of data	Master choices		
			Status	Content	Value set
repetitionDuration		ms	✓	During 5s seconds to ensure the reception by the requestor-vehicle.	is 5 000ms
repetitionInterval		ms	✓	500ms	is 500ms
Destination area	<p>"As specified in ETSI EN 302 931."</p> <p>"itsGnMaxGeoAreaSize ; 10 ; Maximum size of the geographical area for a GBC and GAC packet [km2]. If the geographical area size exceeds the maximum value, the GeoNetworking packet shall not be sent (source) and not be forwarded (forwarder)"</p>	<p>GeoAreaPosLatitude [1/10 microdegree]</p> <p>GeoAreaPosLongitude [1/10 microdegree]</p> <p>Distance a [m]</p> <p>Distance b [m]</p> <p>Angle [°]</p>	✓	Defined as a circle of 1km radius around the RSU dedicated to the intersection	(area of 3,14km²)
Maximum Hop Limit	<p>"The Maximum Hop Limit specifies the number of hops a packet is allowed to have in the network, i.e. how often the packet is allowed to be forwarded."</p> <p>"itsGnDefaultHopLimit : 10 : Default hop limit indicating the maximum number of hops a packet travels"</p>	itsGnDefaultHopLimit Integer8 (0..255)	✓	Direct communication between the RSU and the requestor-vehicle. No hop.	is 1
Traffic class	"GN traffic class as defined in ETSI EN 302 636-4-1 if GeoNetworking/BTP is used."	<p>itsGnTrafficClass Integer32 (0..255)</p> <p>SCF : 1 bit</p> <p>Channel Offload : 1 bit</p> <p>TC ID : 6-bit unsigned integer</p>	✓	<p>SCF bit is 0.</p> <p>Channel offload bit is 0 (see RS_RSP_042 based on RS_BSP_262 (C-Roads PF Roadside profile))</p> <p>TC ID value is "4"</p>	is 4

3. SCOOP₁ use-cases-: technical specifications

This chapter specifies the profile of DENM messages of SCOOP₁ I2V uses-cases. The list of SCOOP₁ use-cases can be found in 2.4.1.1_M_Master_V2X or just be deduced from the following part.

At first, all the following use-cases have to be compliant with the Master choices in I2V context (previous chapter). Only then, specific details related to each use-case are given in this part.

3.1. eventType - relevanceTrafficDirection - validityDuration (I2V)

In the following tables-:

- causeCode, subCauseCode and relevanceTrafficDirection refers to the values that **shall** be set in the DENM message for the use-case
- validityDuration refers to the values that **may** be set in the DENM message for the use-case, when the end value is not set in the TMS. Other default values **can** be set accordingly to experience of the road operator.

Table 3.1-1 : DENM Values for some use cases

Use-case	causeCode	subCauseCode	relevanceTrafficDirection	validityDuration if not set in TMS	Comments
D1 - Temporary slippery road	6: adverse weather condition - adhesion	0: unavailable 1 : heavy frost on road 2 : fuel on road 3 : mud on road 4 : snow on road 6 : black ice 7 : oil on road 8 : looseChippings 9 : instantBlackIce 10 : roadsSalted	upstreamTraffic	1 800s	V2X only uses 6/0
D2a - Animal on the road	11: hazardous animal – animal on the road	0: unavailable 1: wild animal 2 : herd of animal 3: small animal 4 : large animal	upstreamTraffic	1 800s*	V2X only uses 11/0
D2b - Person on the road	12: human presence on the road	0: unavailable	upstreamTraffic	1 800s	
D3 - Obstacle on the road	10: hazardous – obstacle on the road	0: unavailable	upstreamTraffic	1 800s	
D4a - Warning stationary vehicle	94: stationary vehicle	0: unavailable	upstreamTraffic	1 800s	Road operator may use breakdown or stop, the one or the other, because they not always known the reason of a vehicle stop.
D4b - Warning vehicle breakdown	94: stationary vehicle	2: vehicle breakdown	upstreamTraffic	1 800s	
D5 - Warning accident zone	2: accident	0: unavailable 1 : multi vehicle accident 2 : heavy accident 3 : accident involving lorry 4 : accident involving bus 5 : accident involving hazardous materials 7 : unsecured Accident	upstreamTraffic	3 600s - 7 200s	V2X uses 2/0 for declaration and 94/3 when ego vehicle is concerned. TMS is never the ego vehicle, so 94/3 is not used on I2V.

Use-case	causeCode	subCauseCode	relevanceTrafficDirection	validityDuration if not set in TMS	Comments
D6 - Warning reduced visibility	18: Adverse weather condition - visibility	0: unavailable 1 : fog 2 : smoke 3 : heavySnowfall 4 : heavy Rain 5 : heavy Hail	upstreamTraffic	1 800s	V2X only uses 18/0
D8 - Unsecured blockage of a road (road with blocked traffic)	5: impassibility	0: unavailable	upstreamTraffic	3 600s	
D11 - Warning end of queue	27: Dangerous end of queue	0: unavailable	upstreamTraffic	1 800s	Not used by road operators for now as they would need to follow the position of the end of the queue in real time and it needs expensive deployments. May be used if the detection systems can follow the end of queue in real time with a high precision. Use case E7 – Traffic jam ahead can be used instead.
E6 - Warning exceptional weather conditions	17 : Adverse weather condition – extreme weather condition	0: unavailable 1 : strong winds 4 : thunderstorm	upstreamTraffic	1 800s	V2X only uses 19/0 (adverse condition weather - precipitation) as I2V uses 17/x (adverse condition weather - extreme weather condition)

Use-case	causeCode	subCauseCode	relevanceTrafficDirection	validityDuration if not set in TMS	Comments
B1c - Alert planned roadworks - mobile	3: Roadwork	3: Slow moving Road Maintenance	upstreamTraffic	3 600s	In I2V, the use-case is linear. In V2X the use-case is punctual (ego position of the Vro)

Note that all events on highways are upstreamTraffic in I2V, because the PFro always splits the DATEX events from TMS in two upstream events when they concern both directions. When the event is not on a separated roadway and punctual, it may be set to allTrafficDirections.

3.2. informationQuality - validityDuration (I2V)

informationQuality :

- DATEX situationRecord.probabilityOfOccurrence “Certain”** in the TMS **shall** be traduced as an **informationQuality of 6** in DENM messages : it **should** correspond to a verification made by a verification system (e. g. detection by loops or radar, accumulation of CAMs) with a 99.9% safety guaranty or manual verification (i. e. by using CCTV or being on site) by road operator agent or other reliable source (e. g. police)
- DATEX situationRecord.probabilityOfOccurrence “Probable”** in the TMS **shall** be traduced as an **informationQuality of 4** in DENM messages : it **may** correspond to multiple sources of automated data in larger quantity per minute alert the event or notification by not verifiable reliable humans. It **can** also correspond to a planned roadworks which is in a period of validity but has not be validated by the TMS operator.

- **DATEX situationRecord.probabilityOfOccurrence “Riskof”** in the TMS **shall** be translated as an **informationQuality of 2** in DENM messages : it **may** correspond to one source of automated data e. g. CAM or a traffic sensor alerting the event or notification by a not verifiable reliable human.

3.3. Major display prioritisation principles

See 2.4.1.1_M_Master_V2X document : the same priority principles apply in I2V than in V2X.

4. Pfro Datex II interface

(Informative content : see also 2.4.1.4 [M](#) and 2.4.3.2 [M](#))

4.1. Traces and eventHistory building from DATEX II location

This part is imported from the former 2.4.1 document of the project SCOOP.

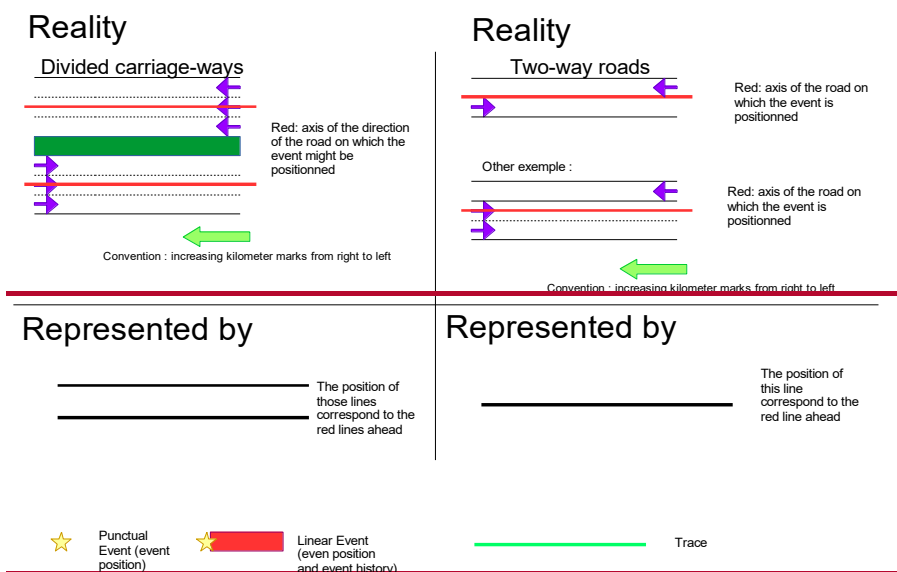
Datex messages that come from the TMS are then transformed within the PFro to perform the necessary operations (see deliverables 2.4.1.4 [M](#) and 2.4.3.2 [M](#) for more details).

The way to code them can be found in deliverable 2.4.1.4 [M](#) (chapter "Point locations and linear locations at a glance")
Here how they are coded depending if they are punctual or linear:

<p>In the case of point locations (e.g. there is no eventHistory in DENM message) :</p> <p>If there is no trace Use <GroupOfLocations> of type "point" • pointByCoordinates (= "eventPosition")</p> <p>If there is 1 trace: Use <GroupOfLocations> of type "point" Use <PointAlongLinearElement> (= "Trace") : • 1 StartPointOfLinearElement • n intermediatePointOfLinearElement • 1 endPointOfLinearElement • pointByCoordinates (= "eventPosition")</p> <p>If there are 2 traces or more: Use <GroupOfLocations> of type "NonOrderedLocationByList" containing "Point" : point 1 ==> Trace 1 • pointAlongLinearElement (= trace) • 1 StartPointOfLinearElement • n intermediatePointOfLinearElement • 1 endPointOfLinearElement • pointByCoordinates (= eventPosition) point 2 ==> Trace 2 • pointAlongLinearElement (= the trace) • 1 StartPointOfLinearElement • n intermediatePointOfLinearElement • 1 endPointOfLinearElement • Optionally: pointByCoordinates (= eventPosition) point 3 ==> Trace 3 • pointAlongLinearElement (= the trace) • 1 StartPointOfLinearElement • n intermediatePointOfLinearElement • 1 endPointOfLinearElement • Optionally: pointByCoordinates (= eventPosition) Etc.</p>	<p>In the case of linear locations (EventHistory present in DENM message) :</p> <p>If there is 1 trace or more <GroupOfLocations> of type "NonOrderedLocationGroupByList" containing "Linear" • linearWithinLinearElement : index = 1 (EventHistory) • "PointCoordinates" with the relation "locationForDisplay" (= eventPosition) • 1 StartPointOfLinearElement • n intermediatePointOfLinearElement • 1 endPointOfLinearElement • linearWithinLinearElement : index = 2 (Trace 1) • "PointCoordinates" with the relation "locationForDisplay" (= eventPosition) • 1 StartPointOfLinearElement • n intermediatePointOfLinearElement • 1 endPointOfLinearElement • linearWithinLinearElement : index = 3 (Trace 2) • "PointCoordinates" with the relation "locationForDisplay" (= eventPosition) • 1 StartPointOfLinearElement • n intermediatePointOfLinearElement • 1 endPointOfLinearElement • etc.</p>
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The following schematics illustrate the previous sentences and show the way the infrastructure builds the traces.

Here is the representation of the roads (legend for schematics below):

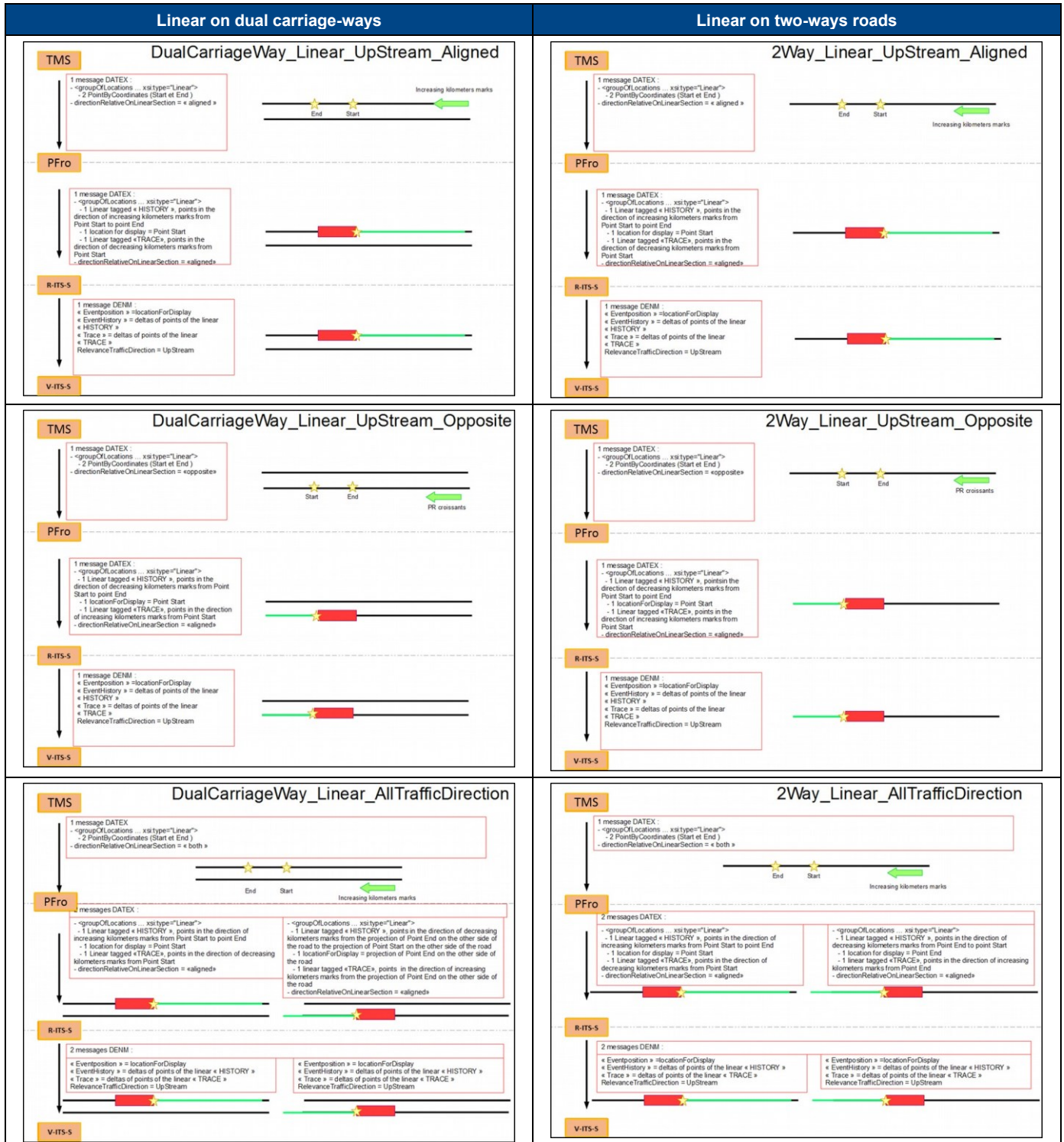


The entire chain from the TMS to the V-ITS-S is represented below, depending on the type of event, type of road and direction of event:

4.1.1. Punctual events



4.1.2. Linear events



4.2. Typology of use-cases (linear or punctual)

This table reflects the type of event expected from the TMS to define the following uses-cases.

- Upstream_Aligned means that the event is set in the TMS in the direction of growing road landmarks.
- Upstream_Opposite means that the event is set in the TMS in the direction of descending road landmarks.
- AllTrafficDirection means that the event is set in the TMS in both-directions.

SCOOP₁ I2V use-cases:

	B1c	D1	D2	D3	D4	D5	D6	D8	D11	E6
PUNCTUAL										
2Way_Punctual_UpStream_Aligned				X	X	X			X	
2Way_Punctual_UpStream_Opposite										
2Way_Punctual_AllTrafficDirection		X	X			X				
DualCarriageWay_Punctual_UpStream_Aligned				X	X	X			X	
DualCarriageWay_Punctual_UpStream_Opposite										
DualCarriageWay_Punctual_AllTrafficDirection		X	X			X				
LINEAR										
2Way_Linear_UpStream_Aligned	X			X		X		X		
2Way_Linear_UpStream_Opposite										
2Way_Linear_AllTrafficDirection		X	X			X	X			X
DualCarriageWay_Linear_UpStream_Aligned	X			X		X		X		
DualCarriageWay_Linear_UpStream_Opposite										
DualCarriageWay_Linear_AllTrafficDirection		X	X			X	X			X

SCOOP₂-InterCor-C-Roads I2V use-cases:

	B1a	B1b	C2	C3	D7	E7	F1	G1	H2	H4	H6	I3	K
PUNCTUAL							X					X	
2Way_Punctual_UpStream_Aligned													
2Way_Punctual_UpStream_Opposite													
2Way_Punctual_AllTrafficDirection													
DualCarriageWay_Punctual_UpStream_Aligned	(X)	(X)											
DualCarriageWay_Punctual_UpStream_Opposite													
DualCarriageWay_Punctual_AllTrafficDirection													
LINEAR								X					X
2Way_Linear_UpStream_Aligned			X	X		X			X	X			
2Way_Linear_UpStream_Opposite													
2Way_Linear_AllTrafficDirection													
DualCarriageWay_Linear_UpStream_Aligned	X	X	X	X	X	X			X	X	X		
DualCarriageWay_Linear_UpStream_Opposite													
DualCarriageWay_Linear_AllTrafficDirection													

G1, I3 and K: no datex are associated with these information.

F1: this UC does not concern the road events, even if exchange of information in DATEX is handled.

5. Validation SSP (service specific permission)

Note that a Vro has the RSU permissions when acting as a mobile R-ITS-S (to broadcast I2V use-cases).

5.1. CAM (and CAM-I)

ITSPduHeader/MessageID : 2

ITS-AID value: 36 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI EN 302 637-2 V1.4.1 2019-01)

Octet 0 (SSP version control) => set to 1

Octet 1-2 (service specific parameter) => set as following :

Octet Position	Bit Position	Permission Items	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	CenDsrcTollingZone/ ProtectedCommunicationZonesRSU	0	0	0	0	0	1
1	1	publicTransport / publicTransportContainer	0	0	1	0	1	0
1	2	specialTransport / specialTransportContainer	0	0	1	0	0	0
1	3	dangerousGoods / dangerousGoodsContainer	0	0	1	0	0	0
1	4	roadwork / roadWorksContainerBasic	0	0	0	1	0	0
1	5	rescue / rescueContainer	0	0	0	1	0	0
1	6	emergency / emergencyContainer	0	0	0	1	0	0
1	7	safetyCar / safetyCarContainer	0	0	0	1	0	0
2	0	closedLanes / RoadworksContainerBasic	0	0	0	1	0	0
2	1	requestForRightOfWay / EmergencyContainer: EmergencyPriority	0	0	0	1	0	0
2	2	requestForFreeCrossingAtATrafficLight / EmergencyContainer: EmergencyPriority	0	0	0	1	0	0
2	3	noPassing / SafetyCarContainer: TrafficRule	0	0	0	1	0	0
2	4	noPassingForTrucks / SafetyCarContainer: TrafficRule	0	0	0	1	0	0
2	5	speedLimit / SafetyCarContainer	0	0	0	1	0	0
2	6	CAM : reserved for future use CAM-I : ServiceAdvertisementContainer	0	0	0	0	0	1
2	7	CAM : reserved for future use CAM-I : PositionEnhancementContainer + ServiceEnvironment&Container	0	0	0	0	0	1

Octet 3 - 30 (reserved for future usage)

Hexadecimal SSP Value 3 firs octets	0x01 0000	0x01 0000	0x01 7000	0x01 0FFC	0x01 4000	0x01 8003
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5.2. DENM

ITSPduHeader/MessageID : 1

ITS-AID value: 37 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI EN 302 637-3 V1.3.1 2019-04)

Octet 0 (SSP version control) => set to 1

Octet 1-3 (service specific parameter) => set as following :

Octet Position	Bit Position	CauseCodeType / Container	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	trafficCondition(1) or railwayLevelCrossing (100)	0	0	0	10	0	1
1	1	accident(2)	1	0	1	1	1	1
1	2	roadworks(3)	0	0	0	1	0	1
1	3	adverseWeatherCondition-Adhesion(6) or aquaplaning (7)	1	0	1	1	1	1
1	4	hazardousLocation-SurfaceCondition(9)	1	0	1	1	1	1
1	5	hazardousLocation-ObstacleOnTheRoad(10) or impassibility (5)	1	0	1	1	1	1
1	6	hazardousLocation-AnimalOnTheRoad(11)	1	0	1	1	1	1
1	7	humanPresenceOnTheRoad(12)	1	0	1	1	1	1
2	0	wrongWayDriving(14)	0	0	0	10	0	1
2	1	rescueAndRecoveryWorkInProgress(15)	0	0	0	1	0	0
2	2	adverseWeatherCondition-ExtremeWeatherCondition(17)	0	0	0	10	0	1
2	3	adverseWeatherCondition-Visibility(18)	1	0	1	1	1	1
2	4	adverseWeatherCondition-Precipitation(19)	1	0	1	1	1	0
2	5	slowVehicle(26)	0	0	1	1	0	1
2	6	dangerousEndOfQueue(27)	0	0	1	1	0	1
2	7	vehicleBreakdown(91)	0	0	0	0	0	0
3	0	postCrash(92)	0	0	0	0	0	0
3	1	humanProblem(93)	0	0	0	0	0	0
3	2	stationaryVehicle(94)	1	0	1	1	1	1
3	3	emergencyVehicleApproaching(95)	0	0	0	1	0	0
3	4	hazardousLocation-DangerousCurve(96)	0	0	0	0	0	0
3	5	collisionRisk(97)	0	0	0	0	0	0
3	6	signalViolation(98)	0	0	0	0	0	0
3	7	dangerousSituation(99)	0	0	1	1	1	0

Octet 4 - 30 (reserved for future usage)

Hexadecimal SSP Value 4 first octets	0x01 5F1820	0x01 000000	0x01 5F1E21	0x01 7F5E31FFFE31	0x01 5F1821	0x01 FFB620
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5.3. IVIM

ITSPduHeader/MessageID : 6

ITS-AID value: 139 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 1

Octet 1 - 3 (service provide ID) => set as « Identification of the Service Provider for which the R-ITS-S is allowed to send out IVIM and to which the Service-specific parameter apply, using the DE Provider from CEN ISO/TS 19321 » => serviceProviderID of the R-ITS-S which encodes the IVIM (see IVIM Master table).

Octet 4 - 5 (service specific parameter) => set as following :

Octet Position	Bit Position	IVI data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
4	0	Vienna Convention Code for road sign	0	0	0	0	0	0
4	1	ISO/TS14823 traffic sign pictogram (danger warning)	0	0	0	1	0	1
4	2	ISO/TS14823 traffic sign pictogram (regulatory)	0	0	0	1	0	1
4	3	ISO/TS14823 traffic sign pictogram (informative)	0	0	0	1	0	1
4	4	ISO/TS14823 traffic sign pictogram (public facilities)	0	0	0	1	0	1
4	5	ISO/TS14823 traffic sign pictogram (ambient condition)	0	0	0	1	0	1
4	6	ISO/TS14823 traffic sign pictogram (road condition)	0	0	0	1	0	1
4	7	ITIS codes	0	0	0	0	0	0
5	0	Lane status	0	0	0	1	0	1
5	1	Road configuration container	0	0	0	1	0	1
5	2	Text container	0	0	0	1	0	1
5	3	Layout container	0	0	0	0	0	0
5	4	IVI status negation	0	0	0	0	0	0
5	5	Automated vehicle container	0	0	0	0	0	0
5	6	Map location container	0	0	0	0	0	0
5	7	Road surface container	0	0	0	0	0	0

Hexadecimal SSP Value 6 octets with xxxxxx instantiated by serviceProviderId of each road operator	0x01 xxxxxx 0000	0x01 xxxxxx 0000	0x01 xxxxxx 0000	0x01 xxxxxx 7EE0	0x01 xxxxxx 0000	0x01 xxxxxx 7EE0
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5.4. MAPEM (RLT)

ITSPduHeader/MessageID : 5

ITS-AID value: 138 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following :

Octet Position	Bit Position	RLT service SSP data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	Intersection geometry list allowed to transmit {MAPEM.map.intersections}	0	0	0	0	0	1
1	1	Road geometry list allowed to transmit {MAPEM.map.roadSegments}	0	0	0	0	0	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x0100	0x0100	0x0100	0x0100	0x01C0
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5.5. SPATEM (TLM)

ITSPduHeader/MessageID : 4

ITS-AID value: 137 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following :

Octet Position	Bit Position	SPATEM data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	Signal Phase and Timing {SPATEM.spat.intersections. IntersectionState.states}	0	0	0	0	0	1
1	1	Public transport prioritization status response {SPATEM.spat.intersections. IntersectionState.regExtValue. IntersectionState-aggGrpC.activePrioritizations}	0	0	0	0	0	1
1	2	Maneuver assisting information {SPATEM.spat.intersections. IntersectionState.maneuverAssistList} and {SPATEM.spat.intersections. IntersectionState.states.MovementState.maneuverAssistList}	0	0	0	0	0	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x0100	0x0100	0x0100	0x0100	0x01E0
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5.6. POI

ITSPduHeader/MessageID : 3

ITS-AID value: 16 491 (test)

SSP (test)

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following :

Octet Position	Bit Position	POI service SSP data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr + MCTO Transporter and Terminal
1	0	POI information list allowed to transmit	0	0	0	0	0	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x0100	0x0100	0x0100	0x0180
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5.7. ETA

ITSPduHeader/MessageID : 14 (out of standard)

ITS-AID value: 16 492 (test)

SSP (test)

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following :

Octet Position	Bit Position	POI service SSP data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr + MCTO transporter
1	0	Allowed to transmit ETA information	0	0	0	0	0	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x0100	0x0100	0x0100	0x0180
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5.8. SREM

ITSPduHeader/MessageID : 9

ITS-AID value: 140 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 2

Octet 1 - 3 (service specific parameter) => set as following:

Octet Position	Bit Position	IVI data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	Signal request {SREM.srm.requests}	0	0	1	1	1 (TBC)	0
1	1	Requestor role (public transport) {SREM.srm.requestor.type.role. publicTransport}	0	0	1 for bus 0 for others	0	1 (TBC)	0
1	2	Requestor role (special transport) {SREM.srm.requestor.type.role. specialTransport}	0	0	0	0	0	0
1	3	Requestor role (dangerousGoods) {SREM.srm.requestor.type.role. dangerousGoods}	0	0	0	0	0	0
1	4	Requestor role (roadWork) {SREM.srm.requestor.type.role. roadWork}	0	0	0	0	0	0
1	5	Requestor role (roadRescue) {SREM.srm.requestor.type.role. roadRescue}	0	0	0	0	0	0
1	6	Requestor role (emergency) {SREM.srm.requestor.type.role. emergency}	0	0	0	1 for Vev 0 for others	0	0
1	7	Requestor role (safetyCar) {SREM.srm.requestor.type.role. safetyCar}	0	0	0	0	0	0
2	0	Requestor role (truck) {SREM.srm.requestor.type.role. truck}	0	0	0	0	0	0
2	1	Requestor role (motorcycle) {SREM.srm.requestor.type.role. motorcycle}	0	0	0	0	0	0
2	2	Requestor role (police) {SREM.srm.requestor.type.role. police}	0	0	0	1 for Vlev 0 for others	0	0
2	3	Requestor role (fire) {SREM.srm.requestor.type.role.fire}	0	0	0	0	0	0
2	4	Requestor role (ambulance) {SREM.srm.requestor.type.role. ambulance}	0	0	0	0	0	0
2	5	Requestor role (dot) {SREM.srm.requestor.type.role.dot}	0	0	0	0	0	0
2	6	Requestor role (transit) {SREM.srm.requestor.type.role. transit}	0	0	0	0	0	0
2	7	Requestor role (slowMoving) {SREM.srm.requestor.type.role. slowMoving}	0	0	0	0	0	0
3	0	Requestor role (cyclist) {SREM.srm.requestor.type.role. cyclist}	0	0	0	0	0	0
3	1	Requestor role (pedestrian) {SREM.srm.requestor.type.role. pedestrian}	0	0	0	0	0	0
3	2	Requestor role (military) {SREM.srm.requestor.type.role. military}	0	0	0	0	0	0

Hexadecimal SSP Value 4 octets	0x02 000000	0x02 000000	0x02 C00000 for bus 0x02 800000 for others	0x02 820000 for Vev 0x02 802000 for Vlev 0x02 800000 for others	0x02 C00000	0x02 000000
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5.9. SSEM

ITSPduHeader/MessageID : 10

ITS-AID value: 637 (ref. TS 102 965 V1.4.1 2018-11)

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 1

Note : 103 301 V1.3.1 2020-02 is respected but in fact only the RSUs should be granted to emit SSEM messages...

5.9. SSEM

ITSPduHeader/MessageID : 10

ITS-AID value: 637 (ref. TS 102 965 V1.4.1 2018-11)

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 1

Note : 103 301 V1.3.1 2020-02 is respected but in fact only the RSUs should be granted to emit SSEM messages...

5.10. CPM

ITSPduHeader/MessageID : 14

ITS-AID value: 639 (ref. TS 102 965 V1.4.1 2018-11)

SSP (test) - No standard dedicated yet

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following :

Octet Position	Bit Position	POI service SSP data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	CPM information allowed to transmit	0	0	1	1	1	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x0180	0x0180	0x0180	0x0180
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5.11. ETM

ITSPduHeader/MessageID : 128

ITS-AID value: 16493

SSP (test) - No standard dedicated yet

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following :

Octet Position	Bit Position	ETM service SSP data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	Allowed to transmit vehicle announcement	0	0	1	1	0	0
1	1	Allowed to transmit vehicle information request	0	0	0	0	0	1
1	2	Allowed to transmit vehicle info response	0	0	1	1	0	0
1	3	Allowed to transmit vehicle payment request	0	0	0	0	0	1
1	4	Allowed to transmit vehicle payment mean	0	0	1	1	0	0
1	5	Allowed to transmit vehicle payment ack	0	0	0	0	0	1
1	6	Allowed to transmit process error	0	0	1	1	0	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x01AA	0x01AA	0x0100	0x0156
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5.12. SAEM

ITSPduHeader/MessageID : 12

ITS-AID value: 540801

SSP (test) - No standard dedicated yet

SSP is empty. This AID should be requested by RSU only.

6. Production SSP (service specific permission)

Note that a Vro has the RSU permissions when acting as a mobile R-ITS-S (to broadcast I2V use-cases).

6.1. CAM (and CAM-I)

ITSPduHeader/MessageID: 2

ITS-AID value: 36 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI EN 302 637-2 V1.4.1 2019-01)

Octet 0 (SSP version control) => set to 1

Octet 1-2 (service specific parameter) => set as following:

Octet Position	Bit Position	Permission Items	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	CenDsrcTollingZone/ ProtectedCommunicationZonesRSU	0	0	0	0	0	1
1	1	publicTransport / publicTransportContainer	0	0	1	0	1	0
1	2	specialTransport / specialTransportContainer	0	0	1	0	0	0
1	3	dangerousGoods / dangerousGoodsContainer	0	0	1	0	0	0
1	4	roadwork / roadWorksContainerBasic	0	0	0	1	0	0
1	5	rescue / rescueContainer	0	0	0	1	0	0
1	6	emergency / emergencyContainer	0	0	0	1	0	0
1	7	safetyCar / safetyCarContainer	0	0	0	1	0	0
2	0	closedLanes / RoadworksContainerBasic	0	0	0	1	0	0
2	1	requestForRightOfWay / EmergencyContainer: EmergencyPriority	0	0	0	1	0	0
2	2	requestForFreeCrossingAtATrafficLight / EmergencyContainer: EmergencyPriority	0	0	0	1	0	0
2	3	noPassing / SafetyCarContainer: TrafficRule	0	0	0	1	0	0
2	4	noPassingForTrucks / SafetyCarContainer: TrafficRule	0	0	0	1	0	0
2	5	speedLimit / SafetyCarContainer	0	0	0	1	0	0
2	6	CAM : reserved for future use CAM-I : ServiceAdvertisementContainer	0	0	0	0	0	0
2	7	CAM : reserved for future use CAM-I : PositionEnhancementContainer + ServiceEnvironment&Container	0	0	0	0	0	0

Octet 3 - 30 (reserved for future usage)

Hexadecimal SSP Value 3 firs octets	0x01 0000	0x01 0000	0x01 7000	0x01 0FFC	0x01 4000	0x01 8000
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6.2. DENM

ITSPduHeader/MessageID : 1

ITS-AID value: 37 (ref. TS 102_965 [V1.4.1 2018-11](#))

SSP (ref. ETSI EN 302 637-3 V1.3.1 2019-04)

Octet 0 (SSP version control) => set to 1

Octet 1-3 (service specific parameter) => set as following:

Octet Position	Bit Position	CauseCodeType / Container	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	trafficCondition(1) or railwayLevelCrossing (100)	0	0	0	10	0	1
1	1	accident(2)	1	0	1	1	1	1
1	2	roadworks(3)	0	0	0	1	0	1
1	3	adverseWeatherCondition-Adhesion(6) or aquaplaning (7)	1	0	1	1	1	1
1	4	hazardousLocation-SurfaceCondition(9)	1	0	1	1	1	1
1	5	hazardousLocation-ObstacleOnTheRoad(10) or impassibility (5)	1	0	1	1	1	1
1	6	hazardousLocation-AnimalOnTheRoad(11)	1	0	1	1	1	1
1	7	humanPresenceOnTheRoad(12)	1	0	1	1	1	1
2	0	wrongWayDriving(14)	0	0	0	10	0	1
2	1	rescueAndRecoveryWorkInProgress(15)	0	0	0	1	0	0
2	2	adverseWeatherCondition-ExtremeWeatherCondition(17)	0	0	0	10	0	1
2	3	adverseWeatherCondition-Visibility(18)	1	0	1	1	1	1
2	4	adverseWeatherCondition-Precipitation(19)	1	0	1	1	1	0
2	5	slowVehicle(26)	0	0	1	1	0	1
2	6	dangerousEndOfQueue(27)	0	0	1	1	0	1
2	7	vehicleBreakdown(91)	0	0	0	0	0	0
3	0	postCrash(92)	0	0	0	0	0	0
3	1	humanProblem(93)	0	0	0	0	0	0
3	2	stationaryVehicle(94)	1	0	1	1	1	1
3	3	emergencyVehicleApproaching(95)	0	0	0	1	0	0
3	4	hazardousLocation-DangerousCurve(96)	0	0	0	0	0	0
3	5	collisionRisk(97)	0	0	0	0	0	0
3	6	signalViolation(98)	0	0	0	0	0	0
3	7	dangerousSituation(99)	0	0	1	1	1	0

Octet 4 - 30 (reserved for future usage)

Hexadecimal SSP Value 4 first octets	0x01 5F1820	0x01 000000	0x01 5F1E21	0x01 7F5E31FFFE31	0x01 5F1821	0x01 FFB620
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6.3. IVIM

ITSPduHeader/MessageID: 6

ITS-AID value: 139 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 1

Octet 1 - 3 (service provide ID) => set as « Identification of the Service Provider for which the R-ITS-S is allowed to send out IVIM and to which the Service-specific parameter apply, using the DE Provider from CEN ISO/TS 19321 » => serviceProviderID of the R-ITS-S which encodes the IVIM (see IVIM Master table).

Octet 4 - 5 (service specific parameter) => set as following:

Octet Position	Bit Position	IVI data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
4	0	Vienna Convention Code for road sign	0	0	0	0	0	0
4	1	ISO/TS14823 traffic sign pictogram (danger warning)	0	0	0	1	0	1
4	2	ISO/TS14823 traffic sign pictogram (regulatory)	0	0	0	1	0	1
4	3	ISO/TS14823 traffic sign pictogram (informative)	0	0	0	1	0	1
4	4	ISO/TS14823 traffic sign pictogram (public facilities)	0	0	0	1	0	1
4	5	ISO/TS14823 traffic sign pictogram (ambient condition)	0	0	0	1	0	1
4	6	ISO/TS14823 traffic sign pictogram (road condition)	0	0	0	1	0	1
4	7	ITIS codes	0	0	0	0	0	0
5	0	Lane status	0	0	0	1	0	1
5	1	Road configuration container	0	0	0	1	0	1
5	2	Text container	0	0	0	1	0	1
5	3	Layout container	0	0	0	0	0	0
5	4	IVI status negation	0	0	0	0	0	0
5	5	Automated vehicle container	0	0	0	0	0	0
5	6	Map location container	0	0	0	0	0	0
5	7	Road surface container	0	0	0	0	0	0

Hexadecimal SSP Value 6 octets with xxxxxx instantiated by serviceProviderId of each road operator	0x01 xxxxxx 0000	0x01 xxxxxx 0000	0x01 xxxxxx 0000	0x01 xxxxxx 7EE0	0x01 xxxxxx 0000	0x01 xxxxxx 7EE0
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6.4. MAPEM (RLT)

ITSPduHeader/MessageID: 5

ITS-AID value: 138 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following:

Octet Position	Bit Position	RLT service SSP data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	Intersection geometry list allowed to transmit {MAPEM.map.intersections}	0	0	0	0	0	1
1	1	Road geometry list allowed to transmit {MAPEM.map.roadSegments}	0	0	0	0	0	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x0100	0x0100	0x0100	0x0100	0x01C0
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6.5. SPATEM (TLM)

ITSPduHeader/MessageID: 4

ITS-AID value: 137 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following:

Octet Position	Bit Position	SPATEM data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	Signal Phase and Timing {SPATEM.spat.intersections. IntersectionState.states}	0	0	0	0	0	1
1	1	Public transport prioritization status response {SPATEM.spat.intersections. IntersectionState.regExtValue. IntersectionState-aggGrpC.activePrioritizations}	0	0	0	0	0	1
1	2	Maneuver assisting information {SPATEM.spat.intersections. IntersectionState.maneuverAssistList} and {SPATEM.spat.intersections. IntersectionState.states.MovementState.maneuverAssistList}	0	0	0	0	0	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x0100	0x0100	0x0100	0x0100	0x01E0
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6.6. POI

ITSPduHeader/MessageID: 3

ITS-AID value: 16 491 (test)

SSP (test)

Octet 0 (SSP version control) => set to 1

Octet 1 (service specific parameter) => set as following:

Octet Position	Bit Position	POI service SSP data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr + MCTO Transporter and Terminal
1	0	POI information list allowed to transmit	0	0	0	0	0	1

Hexadecimal SSP Value 2 octets	0x0100	0x0100	0x0100	0x0100	0x0100	0x0180
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6.7. SREM

ITSPduHeader/MessageID: 9

ITS-AID value: 140 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02)

Octet 0 (SSP version control) => set to 2

Octet 1 - 3 (service specific parameter) => set as following:

Octet Position	Bit Position	IVI data Item	(1) ped.	(2) cycl. (3) moped (4) motorcy.	(5) Vru (6) bus (7) LTruck (8) HGV	(9) trailer (10) Vro / Ev	(11) tram	(15) RSU Nfr
1	0	Signal request {SREM.srm.requests}	0	0	1	1	1 (TBC)	0
1	1	Requestor role (public transport) {SREM.srm.requestor.type.role. publicTransport}	0	0	1 for bus 0 for others	0	1 (TBC)	0
1	2	Requestor role (special transport) {SREM.srm.requestor.type.role. specialTransport}	0	0	0	0	0	0
1	3	Requestor role (dangerousGoods) {SREM.srm.requestor.type.role. dangerousGoods}	0	0	0	0	0	0
1	4	Requestor role (roadWork) {SREM.srm.requestor.type.role. roadWork}	0	0	0	0	0	0
1	5	Requestor role (roadRescue) {SREM.srm.requestor.type.role. roadRescue}	0	0	0	0	0	0
1	6	Requestor role (emergency) {SREM.srm.requestor.type.role. emergency}	0	0	0	1 for Vev 0 for others	0	0
1	7	Requestor role (safetyCar) {SREM.srm.requestor.type.role. safetyCar}	0	0	0	0	0	0
2	0	Requestor role (truck) {SREM.srm.requestor.type.role. truck}	0	0	0	0	0	0
2	1	Requestor role (motorcycle) {SREM.srm.requestor.type.role. motorcycle}	0	0	0	0	0	0
2	2	Requestor role (police) {SREM.srm.requestor.type.role. police}	0	0	0	1 for Vlev	0	0

						0 for others		
2	3	Requestor role (fire) {SREM.srm.requestor.type.role.fire}	0	0	0	0	0	0
2	4	Requestor role (ambulance) {SREM.srm.requestor.type.role.ambulance}	0	0	0	0	0	0
2	5	Requestor role (dot) {SREM.srm.requestor.type.role.dot}	0	0	0	0	0	0
2	6	Requestor role (transit) {SREM.srm.requestor.type.role.transit}	0	0	0	0	0	0
2	7	Requestor role (slowMoving) {SREM.srm.requestor.type.role.slowMoving}	0	0	0	0	0	0
3	0	Requestor role (cyclist) {SREM.srm.requestor.type.role.cyclist}	0	0	0	0	0	0
3	1	Requestor role (pedestrian) {SREM.srm.requestor.type.role.pedestrian}	0	0	0	0	0	0
3	2	Requestor role (military) {SREM.srm.requestor.type.role.military}	0	0	0	0	0	0

Hexadecimal SSP Value 4 octets	0x02 000000	0x02 000000	0x02 C00000 for bus 0x02 800000 for others	0x02 820000 for Vev 0x02 802000 for Vlev 0x02 800000 for others	0x02 C00000	0x02 000000
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6.8. SSEM

ITSPduHeader/MessageID: 10

ITS-AID value: 637 (ref. TS 102 965 [V1.4.1 2018-11](#))

SSP (ref. ETSI TS 103 301 V1.3.1 2020-02))

Octet 0 (SSP version control) => set to 1

Note : 103 301 V1.3.1 2020-02 is respected but in fact only the RSUs should be granted to emit SSEM messages...