



French C-ITS Deployment Coordination committee

# Specification of DATEX II v2.3 messages in conjunction with C-ITS messages

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## 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 behavior 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 terme certificate authority)

ZZZ > is the numeration of the requirement

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

10&

## Acronyms & abbreviations

ASN.1	Abstract Syntax Notation One
CAM	Cooperative Awareness Message
C-ITS	Cooperative Intelligent Transport Systems
DENM	Decentralized Environmental Notification Message
GPS	Global Positioning System
ITS	Intelligent Transport Systems
ITS-G5	ITS-G5 is a European standard for ad-hoc short-range communication of vehicles among each other (V2V) and with Road ITS Stations (V2I). ITS-G5 refers to the approved amendment of the IEEE 802.11 (standard IEEE 802.11p). This technology (possibly others) uses the 5.9 GHz frequency band to support safety- and non-safety ITS applications. In this document ITS-G5 stands for IEEE802.11p/ETSI ITS-G5.
IVI	Infrastructure to Vehicle Information
IVIM	Infrastructure to Vehicle Information Message
Nfr-ITS-S	French National Central ITS-S
PFro	Road operator platform
R-ITS-S	Roadside ITS Station (RSU or ITS-S R in the French Terminology)
RWW	Roadworks Warning
TC	Traffic class
TCC	Traffic Control Centre
TMS	Traffic Management System
V-ITS-S	Vehicle ITS-S
Vro-ITS-S	Road Operator Vehicle ITS-S
Vru-ITS-S	User Vehicle ITS-S

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# 1 Introduction

## 1.1 Purpose of the document

This document specifies the DATEX II message(s) for each use case defined in SCOP, C-ROADS, and INTERCOR.

This document consists in:

- One principal document 2.4.1.4\_H,
- Several annexes which illustrate the messages and their construction:
  - Annex 1: DATEX II <-> DENM translation for R-ITS-S, Vro-ITS-S and Nfr-ITS-S
  - Annex 2: Classes to be used by TMS for the DATEX II <-> DENM translation
  - Annex 3: DATEX II <-> IVI Translation for eVMS, for R-ITS-S, Vro-ITS-S and Nfr-ITS-S
  - Annex 5: DATEX II <-> POI translation for R-ITS-S, Vro-ITS-S and Nfr-ITS-S
  - Annex 6: Schema XSD between Platform and R-ITS-S, Vro-ITS-S and Nfr-ITS-S
  - Annex 7: DATEX II <-> IVI translation for Dynamic speed limit
  - Annex 8: DATEX II <-> IVI translation for Lane Management
- Several examples of DATEX II messages.

All the annexes are applicable.

*Note : Annex 4 has been deleted.*

## 1.2 Inputs of the document

The referenced documents are the following:

- [1] CEN Technical Specifications 16157-1 to 6, defining the language DATEX II v2.3.
- [2] DATEX II Documentation (on the site [www.datex2.eu](http://www.datex2.eu), such as user's guide, Software developer's Guide, Walkthrough the model ...)
- [3] Safety related message sets - Selection of DATEX II Codes, TPEG2-TEC-Causes and TMC-Events for EC high level Categories
- [4] The French Guide "les échanges de données pour l'exploitation de la route – Utilisation de Datex II – Partie 1: publication d'une situation de trafic "(Data exchange for road use – DATEX II Use - Part 1: publication of a traffic situation) - November 2015, drawn up by the DATEX II France Working Group
- [5] 2.4.1\_M – Functional and technical hybrid architecture – Common specification
- [6] 2.4.1\_Common set of functional and technical specifications
- [7] 2.4.1.2 - Specifications of DENM fields
- [8] 2.4.1\_M\_bis - List of standards
- [9] 2.4.1.1\_M\_Master\_V2X and associated use cases specifications
- [10] 2.4.1.2\_M\_Master\_I2V and associated use cases specifications
- [11] Guidance Document for Member States on technical implementation of Delegated Regulation 885/2013 in relation to the European Access Point for Truck Parking Data - Annex I: DATEX II minimum profile for EU core components for static data related to Secured Truck Parking Areas - v1.0 - March 2016 ([https://ec.europa.eu/transport/themes/its/road/action\\_plan/intelligent-truck-parking\\_en](https://ec.europa.eu/transport/themes/its/road/action_plan/intelligent-truck-parking_en))
- [12] 2.4.2.1\_H - R-ITS-S Specifications

- [13] 2.4.2.2\_H – Master (Vro- specifications)
- [14] 2.4.2.4\_H - Nfr-ITS-S specifications
- [15] 2.4.3.2\_H - Detailed functional specifications of SCOOP platform
- [16] 2.4.3.1\_H-TMS

## 1.3 DATEX II principles

(Extracts from the guide drawn up by the DATEX II France group)

DATEX II is a data exchange specification for traffic and movements. It standardises the interface between the traffic management centres, road information centres and with the service operators. It has become the reference for the applications developed and implemented in Europe over the past 10 years. It includes two definition levels:

- the first level is independent of any implementation. It defines concept modelling based on UML (Unified Modelling Language), which is an international standard;
- the second level concerns the implementations based on the model of the first level. Several implementations are possible, but only the one based on XML (“eXtended Markup Language”) has been defined at present. Others may be defined in the future, especially those based on ASN.1 and the corresponding coding standard, ISO/ICE 8825-2 “Information Technologies -- ASN.1 coding rules: Specification for packed coding rules (PER) -- Part 2”.

A DATEX II message is composed of two parts:

- the first, called **<exchange>**, contains the data used to characterise the actual exchange.
- the second defines the useful content exchanged. The exchange is based on the publication mechanism that groups data with similar characteristics. The generic name is **<payloadPublication>**.

The content of a DATEX II message can be exchange via seven major data publication families, modelled distinctly:

- Publication of situations (events sustained and operating actions);
- Publication of measured data (counts and meteorological data);
- Publication of calculated data (transit time – traffic states);
- Publication of traffic states (on a major road or network);
- Publication of data related to the content displayed on variable message panels;
- Publication of status data on parking sites (real-time data for a site or group of sites); and
- Publication of data on vehicles in the parking sites.

In addition to these basic publications, four other utilitarian publications are available (i.e., in support of the previous ones and defining the static characteristics or those that change little:

- Publication of measurement site tables (for the traffic measured data);
- Publication of predefined locations (useful for traffic status in particular);
- Publication of characteristic tables for variable message panels; and
- Publication of site and group characteristics of parking sites.

A simplified version of the structure of a DATEX II message for the publication of situations

is provided below:

```
<d2LogicalModel [name of the versions used]>
  <exchange>
    [exchange parameters: addressing...]
  </exchange>
  <payloadPublication>[publication parameters: name of the publisher,
start/end date of publication...]
    <situation>[parameters describing situation 1: type,
location, direction ... Ex: traffic jams]
    </situation>
    <situation>[parameters describing situation 2: type,
location, direction ... E.g.:X vehicles in Y minutes]
    </situation>
    [n situations described one-by-one]
  </payloadPublication>
</d2LogicalModel>
```

A simplified version of the structure of a DATEX II message for the publication of VMS is provided below:

```
<d2LogicalModel [name of the versions used]>
  <exchange>
    [exchange parameters: addressing...]
  </exchange>
  <payloadPublication>[publication parameters: name of the publisher,
start/end date of publication...]
    <vmsUnit>[parameters describing VMS Message: text,
pictogram]
    </vmsUnit >
    <vmsUnit>[parameters describing VMS Message: text,
pictogram]
    </vmsUnit >
    [n VmsUnit described one-by-one]
  </payloadPublication>
</d2LogicalModel>
```

The other DATEX II publications fit overall into the same scheme. Different types of publication shall not be mixed in the same content.

ID	2414_H-EXCHANGE_PROTOCOLE-001
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S

Requirement	<p>The DATEX II protocol can provide three exchange modes:</p> <ul style="list-style-type: none"> <li>“operatingMode1”: “Publisher Push on Occurrence”: which the supplier can use to send data directly as soon as the content changes (“on occurrence”);</li> <li>operatingMode2: “Publisher Push Periodic”: which the supplier can use periodically to send data directly;</li> <li>operatingMode3: “Client Pull”, which corresponds to a client’s request / supplier’s reply exchange type.</li> </ul>
Acceptance criteria	
Additional information	<p>In the first two modes, the logic is to push information to the consumer (“push”); in the third case, the consumer initiates the exchange (“pull”).</p> <p>Synchronisation requests are in operating mode 3.</p>

ID	2414_H-EXCHANGE_PROTOCOLE-002
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	Synchronisation requests shall be in operating mode 3.
Acceptance criteria	
Additional information	

## 1.4 Vocabulary and language

To make it reading easier, the rest of the document uses the following language simplifications:

- DATEX II refers to DATEX II V2.3 as defined in the Technical Specifications, CEN TS 16157-1 to 6
- CAM refers to the standard EN 302 637-2
- DENM refers to the standard EN 302 637-3
- IVI refers to the standard ISO TS 19321
- POI refers to the standard ETSI TS 101 556-1

(See the Deliverable [2.4.1\_M\_bis] for the versions)

We will designate under the term of “sender” the one that constructs the DATEX II message and sends it to a “recipient”. We also distinguish the content creator (“payload” in DATEX II) from the one who does the exchange (“supplier” in DATEX II). For example, in an “uplink” case from Roadside Unit (R-ITS-S) to platform, the R-ITS-S is a sender, the platform can be a recipient and then a sender and the TMS is a recipient. The R-ITS-S is the message

creator and the platform performs the exchange.

In this document, two terms are to be distinguished:

- Class, which is a set of vehicles meeting conditions for a road operator;
- Class, which is a common description of a set of objects for DATEX II (we will then speak of DATEX II class and use the **<class>** notation).

For reasons of simplification, the term “traffic management system” (TMS) is used to designate all or part of the information system that the road operator will use to transmit the DATEX II messages (it can be TMS or OSS (Operation Support System) or a management terminal, etc.).

Furthermore, in DATEX II version 2.3 there is a single namespace for all the XML tags. The **<D2LogicalModel>** tag using the XML parameter named “xmlns” shall explicitly defined this namespace, in the French C-ITS Projects. However, for improving legibility in the body of this document, the names of the XML tags including namespace of the DATEX II classes are not used. The “xml” files in the appendix are complete and are the reference for the development of use cases.

To be clearer:

- Developers shall complete tag name with namespace: **<D2LogicalModel:payloadPublication>**.
- The examples in this document are only simplified tag name without namespace as used below: **<payloadPublication>**.

Formatting conventions are used to distinguish the different elements:

- xml code: **<?xml version="1.0" >**
- DATEX II class declaration in xml code (with namespace in bold and underlined) :  
  

```
<D2LogicalModel:d2LogicalModel modelBaseVersion="2" xmlns:D2LogicalModel=
"http://DATEX2.eu/schema/2/2_0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation=" http://DATEX2.eu/schema/2/2_0 DatexIISchema_2_2_3.xsd">
```

- DATEX II class declaration in xml code (without namespace):

```
<d2LogicalModel modelBaseVersion="2" xmlns="http://DATEX2.eu/schema/2/2_0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="
http://DATEX2.eu/schema/2/2_0 DatexIISchema_2_2_3.xsd">
```

- xml code that will be specified in a different paragraph:

[EXCHANGE PARAMETERS see chapter 2.2]  
VALUE BASED ON USE CASE

The class name is in black, the parameters that accompany the class name are in green and the attributes that are defined from a closed enumeration list are in orange whereas the others are in blue. The elements in red are clarified in another place.

*NOTE: in the context of the French C-ITS Projects, several attributes or classes of a DATEX II message that could be completed by a TMS are not presented because, in general, there is no equivalent in DENM. However, it should be noted that the operator could send messages to several recipients at the same time. The operator could therefore set some attributes or classes of the DATEX II message that are not recommended in this document.*

## 1.5 Functional elements

Those elements are extracts from the French C-ITS Projects documentation. The authentic information is in the deliverables.

### 1.5.1 Overview of DATEX II messages flow

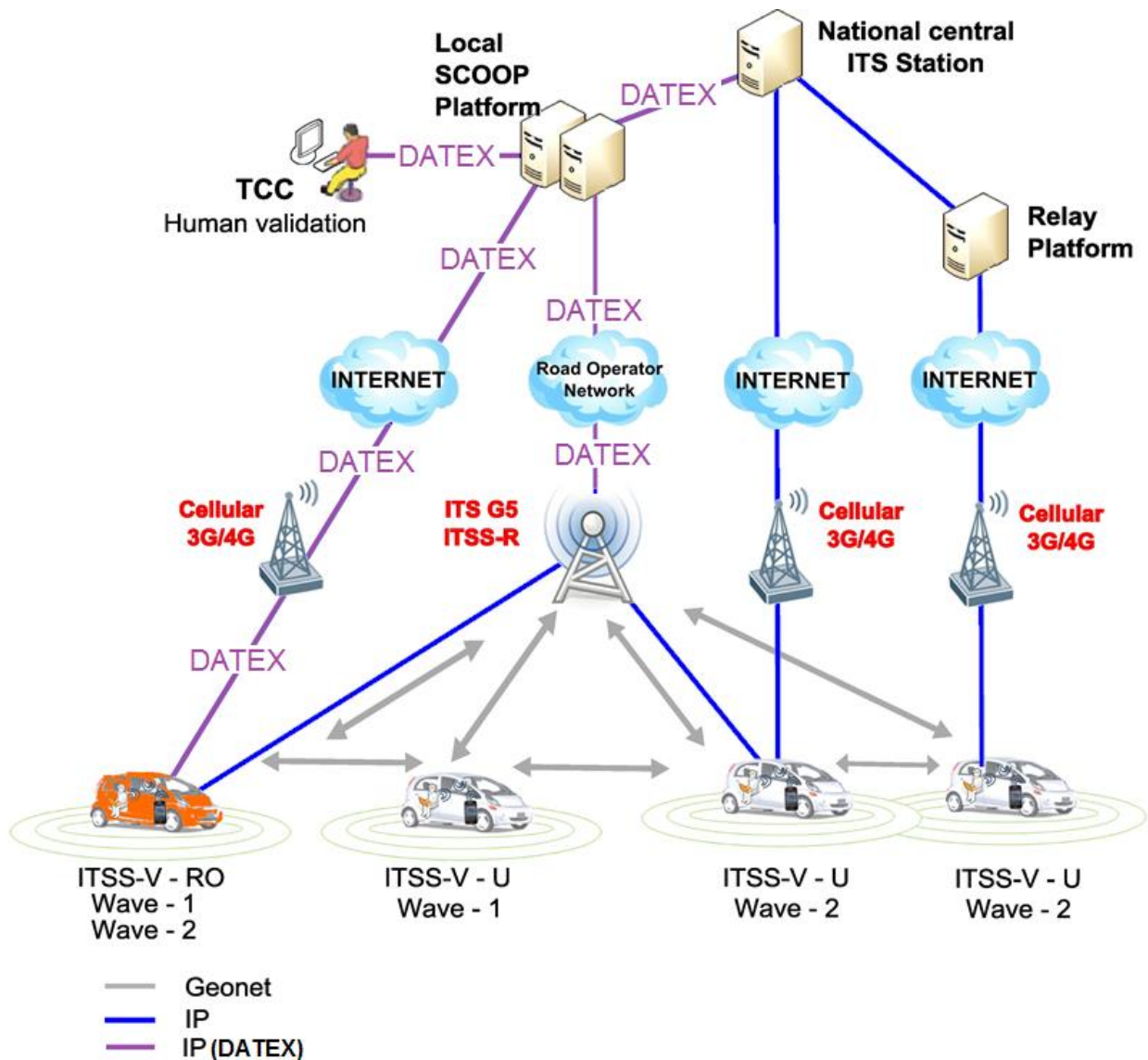


figure 1. *Who can send and receive DATEX II Messages?*

This figure shows between which elements can flow DATEX II messages.



## 1.5.2 Overview of the use cases treated by this document

There are seven types of messages exchanged between the different C-ITS elements, using different DATEX II publications:

DATEX II message "type"	Use Case name or high level description	Details
Measured Data	A1 traffic data (position, speed, direction)	<a href="#">§ 4.3</a>
Configuration of measurement points	Configuration of measurement points in the R-ITS-S	<a href="#">§ 4.2</a>
Situation	B1: warning - scheduled roadwork (stationary and mobile)	<a href="#">§ 5</a>
	B2: Warning - work on lanes	<a href="#">§ 5</a>
	B3: warning - priority winter road maintenance vehicles	<a href="#">§ 5</a>
	A2 and A3: event data produced by the vehicle	<a href="#">§ 5</a>
	C2: Dynamic Speed Limit	<a href="#">§ 8</a>
	D1: warning - temporarily slippery road	<a href="#">§ 5</a>
	D2: Warning - animal or person on the road	<a href="#">§ 5</a>
	D3: Warning - obstacle on the road	<a href="#">§ 5</a>
	D4: warning - stationary vehicles, breakdown	<a href="#">§ 5</a>
	D5: warning - unprotected accident area	<a href="#">§ 5</a>
	D6: Warning - low visibility	<a href="#">§ 5</a>
	D7: warning - wrong way driver	<a href="#">§ 5</a>
	D8: Warning – unsecured blockage of a road	<a href="#">§ 5</a>
	D10: warning - emergency braking	<a href="#">§ 5</a>
	D11: warning - end of queue	<a href="#">§ 5</a>
	E6: Warning - exceptional weather conditions	<a href="#">§ 5</a>
	E7: traffic jam ahead	<a href="#">§ 5</a>
	H2 - dynamic traffic ban to specific vehicle (I2V)	<a href="#">§ 9</a>
	H4 - dynamic lane management - reserved lane (I2V)	<a href="#">§ 9</a>
	H6 - HGV overtaking ban (I2V)	<a href="#">§ 9</a>
Vms message	C3: e-VMS: messages in the whole system	<a href="#">§ 6.2.2</a>
Vms table	C3: e-VMS: location of the VMS from TMS to the platform	<a href="#">§ 6.2.3</a>
Measured Data for a vehicle	Position of the road operators' vehicles	<a href="#">§ 10.1</a>
Sos Activation	SOS activation notification on road operator's vehicles	<a href="#">§ 10.2</a>
Parking Publication	F1 – POI Parking	<a href="#">§ 7</a>

Table 1 : Use Cases treated in this document



## 2 Construction of any DATEX II message

This paragraph details the construction of each part of a DATEX II message according to the use case.

### 2.1 Message beginning and end

At the beginning of any xml message, the versions of XML and the DATEX II model used are specified.

The end of the message terminates with an end tag.

```
<?xml version="1.0" coding="UTF-8"?>
<!--Potential comments -->
<d2LogicalModel modelBaseVersion="2" xmlns="http://DATEX2.eu/schema/2/2_0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://DATEX2.eu/schema/2/2_0 DatexIISchema_2_2_3.xsd">
...
[EXCHANGE PARAMETERS see chapter 2.2]
...
[MESSAGE CONTENT see the rest of the document]
...
</d2LogicalModel>
```

*NOTE 1: The prologue "<?xml version='1.0' coding='UTF-8'?>" is used only once, at the first file line. As French C-ITS projects always used the DATEX II messages with the SOAP protocol, the prologue is not repeated in the SOAP <body> part of the file.*

*NOTE 2: The name "DatexIISchema-2-2-3.xsd" is the local file name used. This name shall comply the rules of the operating system and file system; it may vary among the different deployed systems.*

## 2.2 Exchange parameters

The first DATEX II class appearing in the message is the **<exchange>** class, which defines the useful parameters to receive the message.

Here is an example of an **<exchange>** class:

```
<exchange>
  <supplierIdentification>
    <country>fr</country>
    <nationalIdentifier>PROJECT_ENTITY_SOURCE </nationalIdentifier>
  </supplierIdentification>
  <subscription>
    <deliveryInterval>VALUE BASED ON THE USE CASE</deliveryInterval>
    <operatingMode>VALUE BASED ON THE USE CASE</operatingMode>
    <subscriptionStartTime>2015-07-17T16:00:00+02:00</subscriptionStartTime>
    <subscriptionState>VALUE BASED ON THE USE CASE</subscriptionState>
    <updateMethod>VALUE BASED ON THE USE CASE</updateMethod>
    <target>
      <address>VALUE BASED ON THE USE CASE</address>
      <protocol>SOAP</protocol>
    </target>
  </subscription>
</exchange>
```

For more information on filling in the blue parameters in this class, refer to chapter "2.2. Definition of a publication envelop" in the situations guide [4].

The black parameters depend on the use case. Therefore, the chapters hereafter address them.

### 2.2.1 Attribute **<nationalIdentifier>**

For the **<nationalIdentifier>**, the guide [4] specifies the following limitation: “*no accents, no spaces, only ASCII characters, and only CAPITAL letters and digits.*”

ID	2414_H-NATIONALIDENTIFIER-001
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, NFR-ITS-S
Requirement	<p>In the context of the C-ITS projects, the following convention shall set: PROJECT_ENTITY_SOURCE where the parts are filled in as follows:</p> <ul style="list-style-type: none"> <li>PROJECT = SCOP, CROADS or INTERCOR or InDiD for each project, or CITS, for road operators in different projects</li> <li>ENTITY = Name in capitals of the organisation for the motorway companies, DExxx for the counties (= <i>Départements</i>) where xxx is their INSEE number, DIRxxx, for DIRs, ...</li> <li>SOURCE = UBR12345 (or UBR_12345 or 12345UBR, depending on the road operators' naming...) for an R-ITS-S, PF for a platform, SAGT or TGBretagne or name of the TMS for a TCC ...</li> </ul>
Acceptance criteria	
Additional information	<i>Example: SCOP_DIRIF_UBR12345</i>

*NOTE: The guide [4] reckons that this code should be allocated by the country, for a question of unity of the identifier. Since the ministry in charge of this point still has not issued a policy, this convention was proposed in agreement with them. This convention may change in the future. In consequence, the entire <nationalIdentifier> shall be configurable.*

*NOTE: The SCOP Platform or the TMS could check the value "SOURCE" or <nationalIdentifier> in its database. The road operators shall check the consistency between the different databases, especially on the value of "SOURCE". See deliverable 2.4.3.2.*

## 2.2.2 Attribute <protocol>

This attribute precised the protocol used.

The detailed platform specifications set the value. See deliverable 2.4.3.2\_H.

*NOTE: According to deliverables, French C-ITS projects shall always use the DATEX II messages with the SOAP protocol.*

## 2.2.3 Attribute <keepAlive>

The **<keepAlive>** attribute is an indicator of a "filler" message. It indicates that the exchange is made to keep the circuit active.

ID	2414_H-KEEPALIVE-001
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, NFR-ITS-S
Requirement	The keeAlive shall be used when no message has been supplied since a certain configurable time.
Acceptance criteria	
Additional information	In this type of message there is not <PayloadPublication>

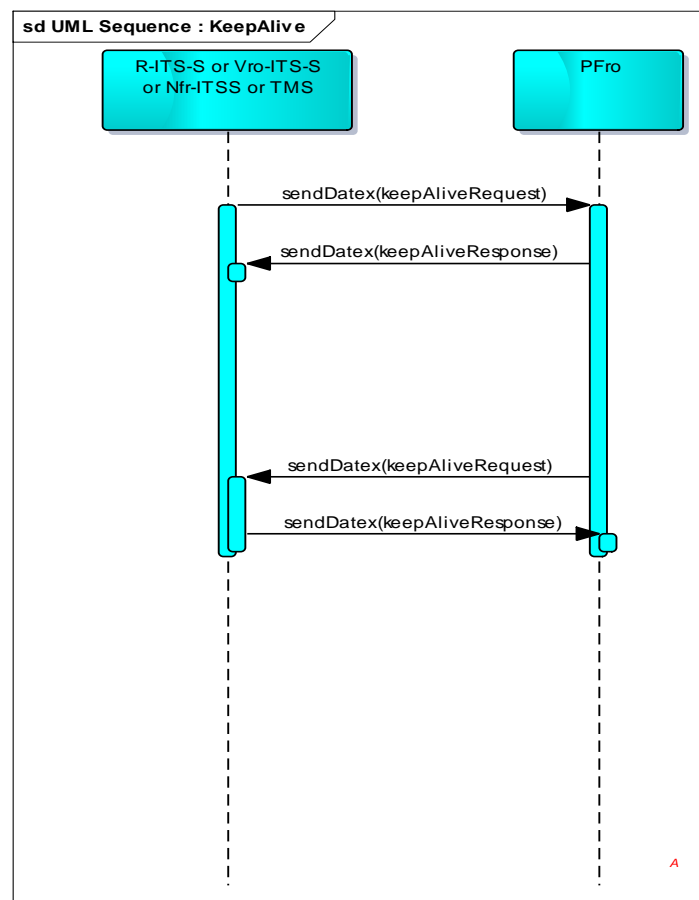


figure 2. *Keep Alive Messages*

The **<response>** attribute indicates that this message is a response to a “Request” message. It is used in particular in the case of implementing a TMP (Traffic Management Plan). (In this type of message there is not <PayloadPublication>).

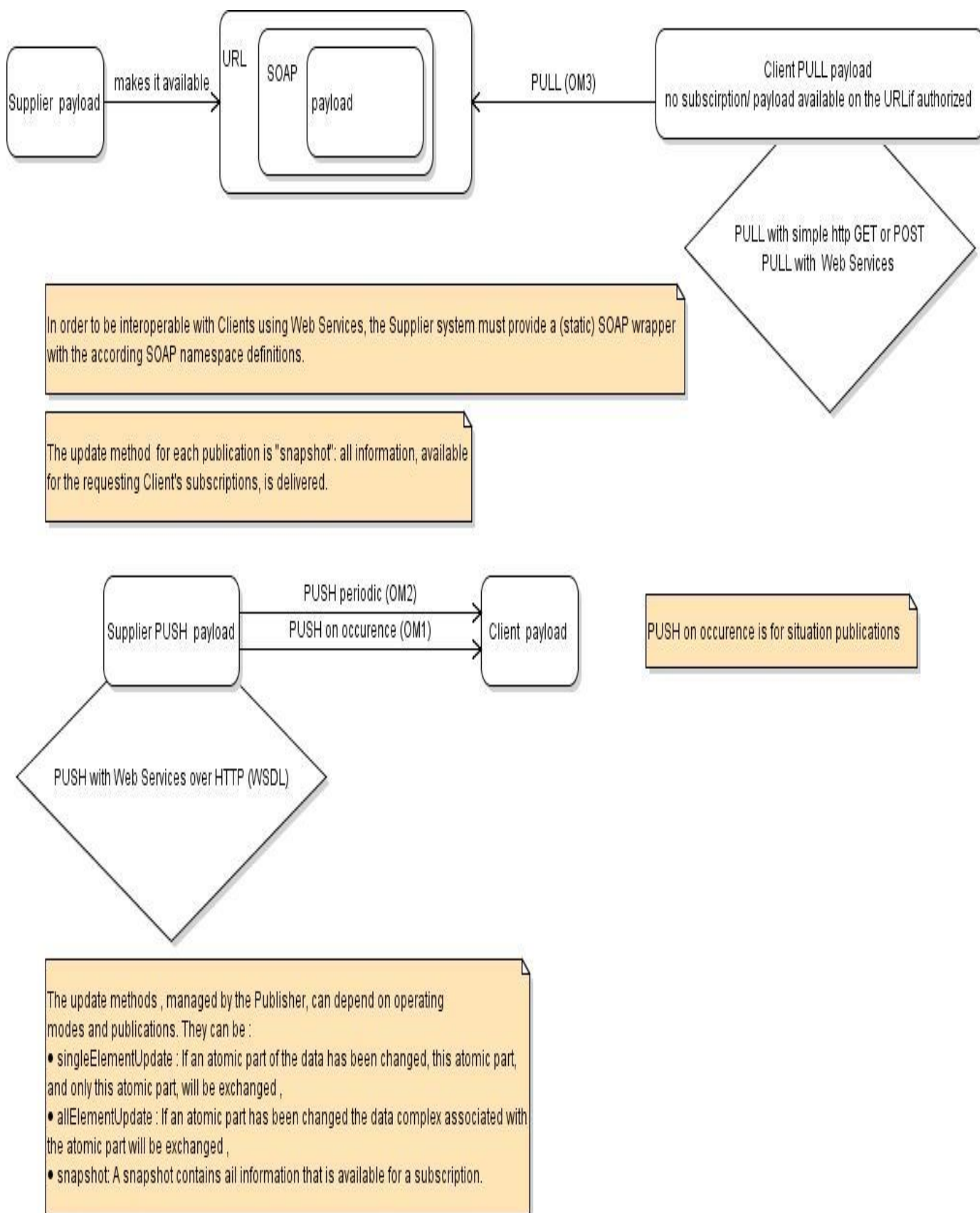
ID	2414_H-KEEPALIVE-002 (2)
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	<p>The reponse possible values shall be as follows:</p> <ul style="list-style-type: none"> <li>• <u>acknowledge</u>: An acknowledgement that the supplier has received and complied with the client's request</li> <li>• <del>catalogueRequestDenied: A notification that the supplier has denied the client's request for a catalogue</del></li> <li>• <del>filterRequestDenied: A notification that the supplier has denied the client's request for a filter.</del></li> <li>• <u>requestDenied</u>: A notification that the supplier has denied the client's request for a data.</li> <li>• <del>subscriptionRequestDenied: A notification that the supplier has denied the client's request for a subscription.</del></li> </ul>
Acceptance criteria	
Additional information	

## 2.2.4 Version number

All version numbers begin at one according to the guide issued by the service of the Ministry in charge of Transport.

## 2.2.5 Attribute <operatingMode> in <Subscription> class

ID	2414_H-OPERATING-MODE-001
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	<p>We will use the following 3 enumerations:</p> <ul style="list-style-type: none"> <li>• OperatingMode1</li> <li>• OperatingMode2</li> <li>• OperatingMode3</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>• operatingMode1 is the "Publisher Push on Occurrence" operating mode. This mode is used for situation publications, VMS publications or POI publications. It isn't used for static data (tables).</li> <li>• operatingMode2 is the "Publisher Push Periodic" operating mode.</li> <li>• operatingMode3 is the "Client Pull" operating mode. This mode is used for any payload.</li> </ul>



## 2.2.6 Attribute <updateMethod> in <Subscription> class

In some cases, R-ITS-S or the PFro, or the TMS needs to synchronise all information with the other stations.

ID	2414_H-UPDATE-001
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	<p>The classes "Exchange" and "Subscription" shall be implemented to access the attribute "updateMethod" which can have three values:</p> <ul style="list-style-type: none"> <li>• Snapshot</li> <li>• singleElementUpdate</li> <li>• allElementUpdate</li> </ul> <p>updateMethod definition: The type of updates of situations requested by the client.</p>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>• Snapshot: The client has requested that all situations and their elements which are valid at the time of request be sent together, i.e. a snapshot in time of all valid situations.</li> <li>• singleElementUpdate: The client has currently requested that only the individual elements of a situation that have changed are sent when updated.</li> <li>• allElementUpdate: The client has currently requested that all situation elements are sent when one or more component elements are updated.</li> </ul>

The classes "Exchange" and "Subscription" shall be implemented to access the attribute "updateMethod" which can have three values:

- "snapshot" is used for snapshots, which means for a photo containing all publications without any link with their previous status
- "singleElementUpdate" is used when only the updated Publication is transmitted on occurrence
- "allElementUpdate" is used when all the elements of a Publication are transmitted on occurrence, even if only one situation record is updated. To be transmitted, the publication shall at least have one updated element.

It is very important for the system that receives the information contained in the XML file, to know the category of update method used.

If the updateMethod is allElementUpdate, that means that all previous elements of the same type of publication received from the same supplier shall be deleted and replaced by the new one. If a SituationRecord is no longer in the new XML File, it means that the event has ended during the time between the two publications and after the mapping, and all these events shall be deleted from the database.

For singleElementUpdate, and also allElementUpdate, the supplier must implement the management class to transmit to the client the end of an event, or that one event is cancelled and so no longer alive.

ID	2414_H-SNAPSHOT-002
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	In the French C-ITS projects, only snapshot in pull mode will be done. Snapshot in a push mode shall not be done.
Acceptance criteria	
Additional information	<p>The snapshot shall gather:</p> <ul style="list-style-type: none"> <li>from R-ITS-S, for V-ITS-S, for Nfr-ITS-S to the platform, all the data about DENM in one message and CAM in another</li> <li>from the platform to the TMS, all the data about DENM in one message and CAM in another</li> <li>from platform to the R-ITS-S, for V-ITS-S, for Nfr-ITS-S all the data from the TMS, in as many messages as there are types of publication (situation, VMS...)</li> <li>from TMS to the platform all the data from the TMS, in as many messages as there are types of publication (situation, VMS...)</li> </ul>

ID	2414_H-SNAPSHOT-001
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	<p>When a system receives a snapshot message:</p> <ul style="list-style-type: none"> <li>it shall compare the data in the message, to the data in its LDM or database.</li> <li>This system shall add new messages.</li> <li>This system shall update messages already presents, if needed.</li> </ul>
Acceptance criteria	
Additional information	In addition, it is possible that some messages (DATEX II or DENM or others) will be generated consequently to the snapshot reception, according to the system specifications



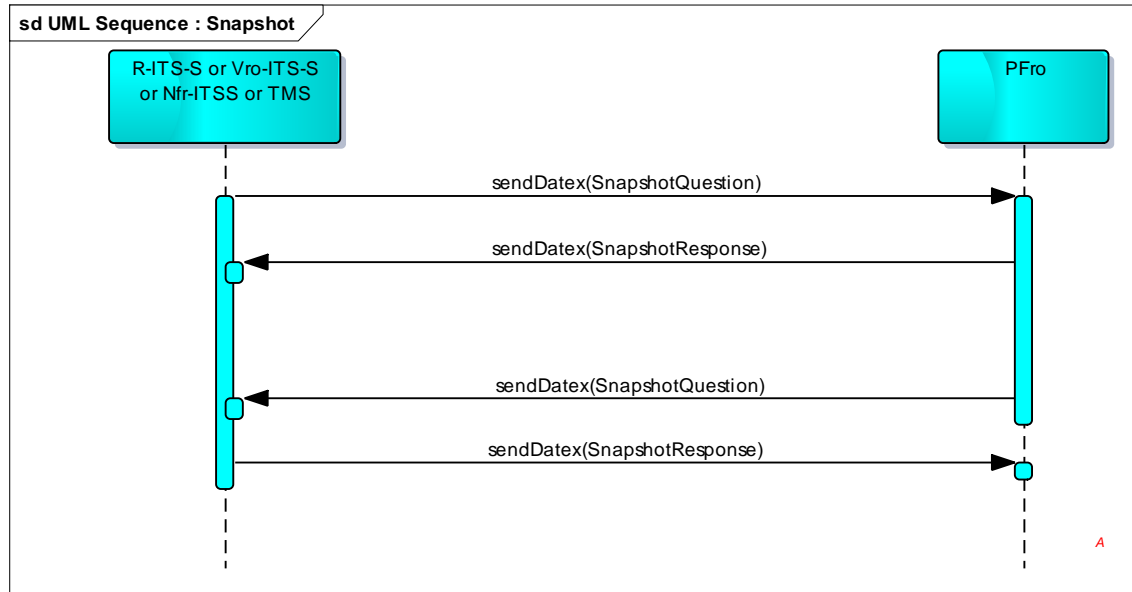


figure 3. *Snapshot between the platform and any other component*

## 2.3 Message content

The message content depends substantially on the use case.

Here are the elements in common:

```
<payloadPublication xsi:type="VALUE BASED ON THE USE CASE" lang="fre">
  <publicationTime>2015-07-20T08:34:14+02:00</publicationTime>
  <publicationCreator>
    <country>fr</country>
    <nationalIdentifier>SCOOP_DIRIF_UBR_12345</nationalIdentifier>
  </publicationCreator>
```

```
[VALUE BASED ON USE CASE]
</payloadPublication>
```

*NOTE: the <nationalIdentifier> is present in the <PayloadPublication> part, to identify the content ("payload"), creator, and in the <Exchange> part to identify who does the exchange ("supplier"). Admittedly, it is often the same entity. In an uplink case, for example, when the platform sends to the TMS a message created by an R-ITS-S, then the creator remains the R-ITS-S and the supplier the platform. Thus, there are also differences of dates.*

### Time management

Precise values have to be given to the different potential attributes like "date":

- Message publication time,
- Measurement time (beginning or end – convention to be established) – For all zone measurements or the event date,
- Calculation time (individual for each value calculated),
- Calculation period (individual for each value calculated)

### 2.3.1 Case of end or cancellation message

The "cancel" and "end" attributes of the **<lifeCycleManagement>** class are used to know whether the situation has ended or been cancelled or neither.

ID	2414_H-LIFECYCLEMANAGEMENT-001
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	An actor shall not terminate a message that is not his own.
Acceptance criteria	
Additional information	In consequence, in uplink usecases, only the "CANCEL" attribute of the class will be specified.

For example, the DATEX II translation of a cancelled DENM will contain:

```

...<management>
  <lifeCycleManagement>
    <cancel>TRUE< cancel>
  </lifeCycleManagement>
</management>

```

ID	2414_H-LIFECYCLEMANAGEMENT-002(2)
Component(s)	TMS, PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	In downlink cases, TMS can send message setting "Cancel" or "End" attribute to the value "TRUE". In the two cases, the R-ITS-S shall understand it as a cancellation of the linked DENM., even if overallendtime is overpassed when received by R-ITS-S.
Acceptance criteria	
Additional information	<p>The &lt;Management&gt; class is used when the SituationPublication is sent by the supplier to the client in Operating Mode 1, "Publisher Push on occurrence".</p> <p><b>TMS shall end each SituationRecord to be compliant to the Datex II standard.</b></p> <p><b>Exception: for the C-ITS-S needs, if the first SituationRecord is terminated, all the SituationRecord are terminated.</b></p>

### 3 Location of events

The range of location systems recognised by DATEX II is broad.

The appendices show the possibilities in the technical specification.

This chapter only presents the specificities of location for the French C-ITS projets, for the exchanges between the platform and the R-ITS-S, or Vro-ITS-S, or Nfr-ITS-S. Sometimes, some indications are given for the exchanges between TMS and plateform.

It should be noted that the location systems used by DATEX II v2.3 do not generate the altitude ("altitude" in DENM) nor the intervals of confidence on the position ("PositionConfidenceEllipse" in DENM). There are a few attributes (based on the enumerations) that can be used to manage the position in relation to the road.

The descriptions for the C-Its messages are made in the documents: 2.4.1, 2.4.1.2\_M,, and 2.4.1.1\_M

## 3.1 Particularities for R-ITS-S – PFro exchanges

This chapter concerns also Nfr-ITS-S and mobile function of Vro-ITS-S.

ID	2414_H-LOCATION-001
Component(s)	PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	As the R-ITS-S may not have maps or specific database, the location using coordinates shall be the one used.
Acceptance criteria	
Additional information	The “Referent” as PR or PLO, can be used, complementary to the coordinates.

ID	2414_H-LOCATION-002
Component(s)	PFro, Vro-ITS-S, R-ITS-S, Nfr-ITS-S
Requirement	The Alert-C and TPEGLoc descriptions shall not be used for exchanges between the PFro and the R-ITS-S.
Acceptance criteria	
Additional information	

## 3.2 Particularities for TMS – PFro exchanges

ID	2414_H-LOCATION-003 (2)
Component(s)	PFro, TMS
Requirement	As the platform have mapping functionalities, the messages between TMS and platform shall use TPEG or “Referent” as “PR” or “PLO”.
Acceptance criteria	
Additional information	The TMS can add other description (Alert-C ...) complementary to one of the two mandatory, but the platform does not use this description.

ID	2414_H-LOCATION-004
Component(s)	PFro, TMS
Requirement	The French Guide “les échanges de données pour l’exploitation de la route – Utilisation de Datex II – Partie 1: publication d’une situation de trafic” and « Echanges numeriques d’information routiere Modele d’echange pour les interfaces Datex II V2.3 des SAGT des DIR et des SAE des SCA → avec Tipi” shall be applied if no indication is present.
Acceptance criteria	
Additional information	

NOTE: For the different possibilities of geocoding in the platform, see 2.4.3.2\_H.

## 3.3 Differences between C-ITS locations and DATEX II locations

The **units** used are different:

- tenth of a micro-degree for DENM, or IVI
- decimal degree for DATEX II

The **geodetic systems** used can be considered as equivalent for these applications:

- WGS84 for DENM
- ETRS89 for DATEX II, better adapted for positioning in Europe

ID	2414_H-LOCATION-005
Component(s)	PFro, TMS
Requirement	The system based on Lambert93 shall not be used for the C-ITS projects
Acceptance criteria	
Additional information	

The different geographic locations, which are part of a **trace/detection zone** or an **event history/relevance zone**, are defined differently:

- in the C-ITS messages, the difference with the previous location (“deltas”) is sent,
- DATEX II defines point locations by geodetic coordinates (latitude and longitude)

separately.

The conversion rules (operated by RSUs) are defined below, depending on the use case.

**The “roadType” information** in the “LocationContainer” (DENM) will not be used in generating the DATEX II location because there is no equivalent in standardised DATEX II.

## 3.4 Bearing

ID	2414_H-Bearing-downward-001
Component(s)	PFro
Requirement	Downward case : For a punctual event (without trace (detectionZone) nor eventHistory (relevanceZone)), the bearing shall be computed by PFro
Acceptance criteria	
Additional information	

ID	2414_H-Bearing-upward-001
Component(s)	R-ITS-S, Nfr-ITS-S
Requirement	Upward case: For a punctual event (without trace (detectionZone) nor eventHistory (relevanceZone)), the bearing will be given by the R-ITS-S or Nfr-ITS-S.
Acceptance criteria	
Additional information	

ID	2414_H-Bearing-downward-002
Component(s)	R-ITS-S, Nfr-ITS-S
Requirement	Downward case : For a punctual event with one trace (detectionZone) or eventHistory (relevanceZone), the bearing reference direction (HeadingValue) will be computed by the R-ITS-S or Nfr-ITS-S
Acceptance criteria	
Additional information	

ID	2414_H-Bearing-upward-002
Component(s)	PFro
Requirement	Upward case : For a punctual event with one trace (detectionZone) or eventHistory (relevanceZone), the bearing reference direction shall be computed by PFro
Acceptance criteria	
Additional information	

ID	2414_H-Bearing-downward-003
Component(s)	R-ITS-S, Nfr-ITS-S
Requirement	Downward case : For a punctual event with 2 traces (detectionZone) or eventHistory (relevanceZone) and more, see 2414_H-LOCATION-2+-TRACE-003(2)
Acceptance criteria	
Additional information	

ID	2414_H-Bearing-upward-003
Component(s)	PFro
Requirement	Upward case : For a punctual event with 2 traces (detectionZone) or eventHistory (relevanceZone) and more , see 2414_H-LOCATION-2+-TRACE-004
Acceptance criteria	
Additional information	

ID	2414_H-Bearing-downward-004
Component(s)	PFro, R-ITS-S, Nfr-ITS-S

Requirement	Downward case : For a linear event, the bearing reference direction (HeadingValue) will be computed by the R-ITS-S or Nfr-ITS-S
Acceptance criteria	
Additional information	

ID	2414_H-Bearing-upward-004
Component(s)	PFro, TMS, R-ITS-S, Nfr-ITS-S
Requirement	Upward case : For a Linear event, the bearing reference direction shall be computed by PFro
Acceptance criteria	
Additional information	

ID	2414_H-Bearing-001(2)
Component(s)	PFro, R-ITS-S, Nfr-ITS-S
Requirement	The algorithm for calculating the bearing will be as follows : The theoretical value of heading is : $headingvalue = \alpha \tan^{-1} \frac{longitude\ LFD - longitude\ SP}{latitude\ LFD - latitude\ SP} + \beta \frac{\pi}{180}$ and headingValue= bearing x 10
Acceptance criteria	
Additional information	LFD : locationfordisplay SP : startPointOfLinearElement of the first Trace/detectionZone $\alpha$ and $\beta$ depending on the relative position of the two points, and the part of the globe considered. If one uses SP from History/relevanceZone, then SP and LFP are swapped in the above equation .(LFD-SP becomes SP-LFD)

Special attention should be given to the units.

NOTE: One interpretation of the theoretical value is suggested here, operationnal only in France:

- If  $latitude\ LFD = latitude\ SP$  and  $longitude\ LFD > longitude\ SP$  then  $headingvalue = 90^\circ$ ;



- If  $latitude\ LFD = latitude\ SP$  and  $longitude\ LFD < longitude\ SP$  then  $headingvalue = 270^\circ$  ;
- If  $latitude\ LFD > latitude\ SP$  and  $longitude\ LFD = longitude\ SP$  then  $headingvalue = 0^\circ$  ;
- If  $latitude\ LFD < latitude\ SP$  and  $longitude\ LFD = longitude\ SP$  then  $headingvalue = 180^\circ$  ;
- If  $latitude\ LFD > latitude\ SP$  and  $longitude\ LFD > longitude\ SP$  then  $headingvalue = (\tan^{-1}(\frac{longitude\ LFD - longitude\ SP}{latitude\ LFD - latitude\ SP})) * \frac{180}{\pi}$  ;
- If  $latitude\ LFD > latitude\ SP$  and  $longitude\ LFD < longitude\ SP$  then  $headingvalue = (270 + \tan^{-1}(\frac{longitude\ LFD - longitude\ SP}{latitude\ LFD - latitude\ SP})) * \frac{180}{\pi}$  ;
- If  $latitude\ LFD < latitude\ SP$  and  $longitude\ LFD > longitude\ SP$  then  $headingvalue = (90 + \tan^{-1}(\frac{longitude\ LFD - longitude\ SP}{latitude\ LFD - latitude\ SP})) * \frac{180}{\pi}$  ;
- If  $latitude\ LFD < latitude\ SP$  and  $longitude\ LFD < longitude\ SP$  then  $headingvalue = (180 + \tan^{-1}(\frac{longitude\ LFD - longitude\ SP}{latitude\ LFD - latitude\ SP})) * \frac{180}{\pi}$  ;

NOTE: a 10-degrees approximation is tolerate, so calculation without “tan<sup>-1</sup>” can be found, using for example the appropriate Taylor series for approximation:

$$\tan^{-1} x = x + \sum_{n=1}^{\infty} (-1)^n \frac{x^{2n+1}}{2n+1}$$

## 3.5 Case of point-located event, without Traces nor DetectionZone

### 3.5.1 Perimeter

This case concerns for example, a DENM send by a V-ITS-S at the startup of the vehicle, or all the point-located events between the TMS and the platform, or a Parking publication from the TMS.

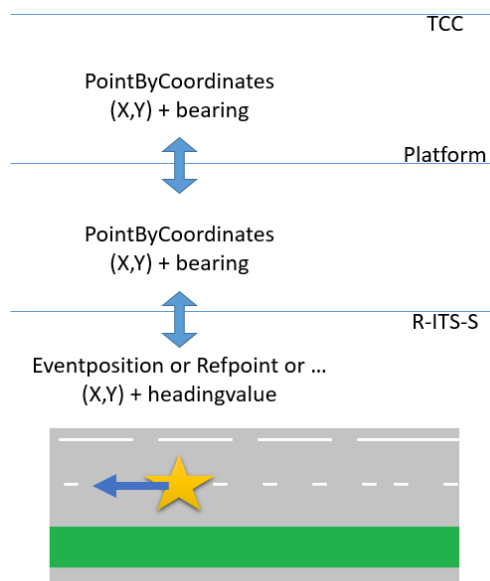


figure 4. *point-located event, without Traces*

## 3.5.2 Coding

ID	2414_H-LOCATION-0-TRACE_001
Component(s)	PFro, TMS
Requirement	In this case (between the platform and the R-ITS-S), the location of the situation element shall contain a "PointByCoordinates" type object with the determination of the "bearing" attribute representing the direction of traffic impacted by the situation element.
Acceptance criteria	
Additional information	In the case = Case of point-located event, without Traces nor DetectionZone

The following table provides a correspondence between the DATEX II attributes and the DENM data elements ("eventPosition" element).

DATEX II location		DENM location	
Class::attribute	Information	Data Frame. Data Element	Information
PointByCoordinates:: bearing	In whole degrees (integer number) (optional but made mandatory for the French C-ITS Projects)	eventPositionHeading. HeadingValue	Integer in tenths of degree

DATEX II location		DENM location	
Class::attribute	Information	Data Frame. Data Element	Information
---		eventPositionHeading. HeadingConfidence	Value = 127 (i.e., unavailable)
PointCoordinates::latitude	In decimal degrees	eventPosition.latitude	In tenths of micro-degree
PointCoordinates::longitude	In decimal degrees	eventPosition.longitude	In tenths of micro-degree
---		eventPosition.position ConfidenceEllipse	All three integer values (4095, 4095, 3601) indicating the information is unavailable.
---		eventPosition.altitude. altitudeValue	800001 (i.e. unavailable, because altitude is not present in a DATEX II v2.3 message)
---		eventPosition.altitude. altitudeConfidence	15 (i.e. unavailable)
(PointWithRoadType)	(DATEX II extension)	roadType	Filled in by rule based on the operator's map database (see chapter 3.9.2 Definition of the "roadType" DENM data element)
(1)		relevanceTrafficDirection	Enumeration (definition by use case – see deliverable 2.4.1.2_M)
(1) There is no correspondence of concepts between DATEX II and DENM. The coding rule is defined in the deliverable 2.4.1_M and the coding table is defined in the deliverable 2.4.1.2_M (depending on the use cases).			

Table 2 : Location parameters for a point located event

The "groupOfLocations" corresponds exactly, and only, to the location of the event. It is a "Point", and gather a "latitude", a "longitude" and a "bearing".

The latitude and longitude correspond to the latitude and longitude in:

- DENM, to the dataelement EventPosition in the container Management,
- IVI, to the referencePosition in the Geographic Location Container,
- POI-Parking, to the refPoint in the Location Container.

The "bearing" attribute of the DATEX II class **<PointByCoordinates>** corresponds to:

- the "eventPositionHeading" information in the "LocationContainer" in DENM,
- the "referencePositionHeading" in IVI,
- nothing in the POI-Parking.

Caution: the units are not the same but the zero corresponds to North of the reference ellipsoid.

In all scenarios, the determined point will mark the beginning of the event from the point of view of the driver, but the length of the event will be unknown.

### 3.5.3 Example

Hence the corresponding XML coding (values are false):

```
...  
<groupOfLocations xsi:type="Point">  
  <pointByCoordinates>  
    <bearing>108</bearing>  
    <pointCoordinates>  
      <latitude>50.12345</latitude>  
      <longitude>2.12345</longitude>  
    </pointCoordinates>  
  </pointByCoordinates>  
</groupOfLocations>  
...
```

## 3.6 Case of point-located event, with 1 Trace or 1 DetectionZone

### 3.6.1 Perimeter

This case concerns for example:

- a DENM send by a V-ITS-S, with one trace,
- a situation publication sent by the PFro, with only one path leading to the event.

This case only concerns exchanges between PFro and R-ITS-S, Vro-ITS-S, and Nfr-ITS-S, the TMS do not transmit traces nor detectionZones.

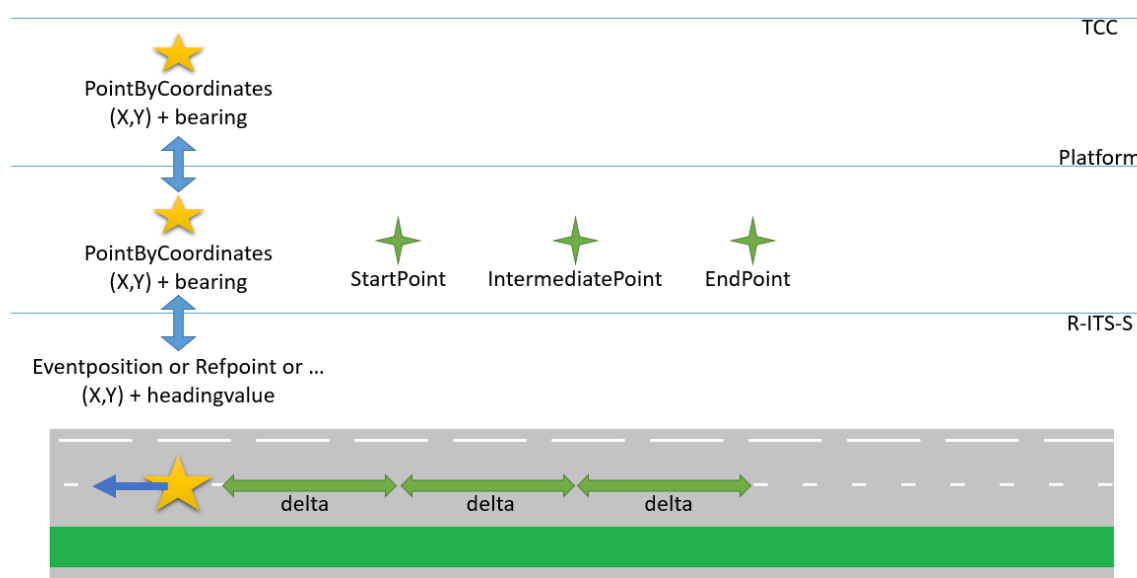


figure 5. *point-located event, with 1 trace*

### 3.6.2 Coding

ID	2414_H-LOCATION-1-TRACE-001
Component(s)	PFro, R-ITS-S, Vro-ITS-S, Nfr-ITS-S

Requirement	<p>In the “groupOfLocations” of type “point”, two classes shall describe the location :</p> <ul style="list-style-type: none"> <li>• <b>&lt;pointByCoordinates&gt; class</b></li> <li>• <b>&lt;PointAlongLinearElement&gt; class</b></li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>• One is a <b>&lt;pointByCoordinates&gt;</b> whose elements are set in the same way as in the case of point-located event, without Traces. This corresponds to the location of the event, and the heading if present.</li> <li>• the other class will be specialised with the DATEX II <b>&lt;PointAlongLinearElement&gt;</b> class. No attribute of this class will be filled in except “directionRelativeAtPoint.”</li> </ul> <p>See Chapter: 3.8.1      <i>LinearReferencingDirectionEnum</i></p>

ID	2414_H-LOCATION-1-TRACE-002
Component(s)	PFro, <del>TMS</del>
Requirement	<p><b>&lt;linearElement&gt;</b> class (from <b>&lt;PointAlongLinearElement&gt;</b>) shall be specialised as <b>&lt;LinearElementByPoints&gt;</b> and shall be instantiated as follows:</p> <ul style="list-style-type: none"> <li>• roadName attribute</li> <li>• startPointOfLinearElement</li> <li>• intermediatePointOfLinearElement</li> <li>• endPointOfLinearElement</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>• no attributes will be filled in other than the "roadName" attribute</li> <li>• the "roadName" attribute will contain "inconnu" information (variable lang = "fre")</li> <li>• it will be described by at least three points considered as reference points (DATEX II <b>&lt;Referent&gt;</b> class): <ul style="list-style-type: none"> <li>○ Each point defined this way will include geographic coordinates (DATEX II <b>&lt;PointCoordinates&gt;</b> class).</li> <li>○ The different instances of the DATEX II <b>&lt;Referent&gt;</b> class will be defined as follows: <ul style="list-style-type: none"> <li>▪ the "referentDescription" and "referentName" attributes will not be filled in,</li> <li>▪ the "referentType" attribute will carry the "roadNode" value,</li> <li>▪ the "referentIdentifier" attribute will contain the geographic order number based on one of the points entering into the definition of the linear element. (startPointOfLinearElement has no identifier.)</li> </ul> </li> </ul> </li> </ul>

- The difference between the coordinates of two consecutive Points in the "LinearElement" corresponds to a pathPoint in the first (and only) pathHistory of the traces, in the LocationContainer in the DENM as follow:

*NOTE: a "pathPoint" is a "DeltaReferencePosition" : "deltaLatitude" and "deltaLongitude" elements.*

*NOTE: the deliverable 2.4.1 set the calculation of the pathpoints.  $PP = CP + \text{delta}$  with  $PP$  = PathPoint new pathpoint of the trace) and  $CP$  = CurrentPoint (or eventposition for the first one)*

*NOTE : The rules for the Trace creation in the downward direction is specified in the Deliverable 2.4.3.2\_H*

ID	2414_H-LOCATION-1-TRACE-003
Component(s)	PFro, <del>TMS</del>
Requirement	<p>The Rule for Trace or detectionZone Encoding or Decoding for R-ITS-S shall be as follows: Considering N pathPoints in the DENM, or N-2 intermediatePointOnLinearElement in the DATEX II message:</p> <ul style="list-style-type: none"> <li>• startPointOfLinearElement = pointByCoordinates + pathPoint(1)</li> <li>• intermediatePointOnLinearElement index="1"= startPointOfLinearElement + pathPoint (2)</li> <li>• intermediatePointOnLinearElement index="i"= intermediatePointOnLinearElement index="i-1" + pathPoint(i+1)</li> <li>• endPointOfLinearElement = intermediatePointOnLinearElement index="N-2" + pathPoint(N)</li> </ul>
Acceptance criteria	
Additional information	<p><i>NOTE: PointA = PointB + DeltaReferencePosition is a simplification, and shall be understood as longitude(PointA) = longitude(PointB) + deltaLongitude (DeltaReferencePosition) AND latitude(PointA) = latitude(PointB) + deltaLatitude(DeltaReferencePosition), AND, if relevant, altitude(PointA) = altitude(PointB) + deltaaltitude(DeltaReferencePosition).</i></p>

ID	2414_H-LOCATION-1-TRACE-004
Component(s)	PFro, R-ITS-S, Vro-ITS-S, Nfr-ITS-S
Requirement	<p>The relative distance (in the form of the DATEX II <b>&lt;DistanceFromLinearElementReferent&gt;</b> class) will be connected to the last point of the linear element and set to 0 (the referent identifier will be recalled on this occasion).</p>
Acceptance criteria	
Additional information	



ID	2414_H-LOCATION-1-TRACE-005
Component(s)	PFro, R-ITS-S, Vro-ITS-S, Nfr-ITS-S
Requirement	<p>The DATEX II <b>&lt;ExternalReferencing&gt;</b> class can be instantiated as follows:</p> <ul style="list-style-type: none"> <li>the externalReferencingSystem shall be set to «TRACE», for a DENM production, to «DETECTIONZONE» for an IVI production.</li> <li>The “externalLocationCode” attribute will contain the number 1.</li> </ul>
Acceptance criteria	
Additional information	

### 3.6.3 Example

Hence the corresponding XML coding (values are false):

```

...
<<groupOfLocations xsi:type="Point">
  <!-- In this case, the point is defined linearly based on the trace of the
transmitting vehicle (via DENM).-->
  <pointByCoordinates>
    <bearing>108</bearing>
    <pointCoordinates>
      <latitude>50.12340</latitude>
      <longitude>2.12340</longitude>
    </pointCoordinates>
  </pointByCoordinates>
  <externalReferencing>
    <externalLocationCode>1</externalLocationCode>
    <externalReferencingSystem>TRACE</externalReferencingSystem>
  </externalReferencing>
  <pointAlongLinearElement>
    <directionRelativeAtPoint>aligned</directionRelativeAtPoint>
    <linearElement xsi:type="LinearElementByPoints">
      <roadName>
        <values>
          <value lang="fre">inconnu</value>
        </values>
      </roadName>
      <startPointOfLinearElement>
        <referentIdentifier>1 </referentIdentifier>
        <referentType>roadNode </referentType>
        <pointCoordinates>
          <latitude>50.12345</latitude>
          <longitude>2.12345</longitude>
        </pointCoordinates>
      </startPointOfLinearElement>
    </linearElement>
  </pointAlongLinearElement>
</groupOfLocations>

```

```

<intermediatePointOnLinearElement index="1">
  <referent>
    <referentIdentifier>2 </referentIdentifier>
    <referentType>roadNode </referentType>
    <pointCoordinates>
      <latitude>50.12354</latitude>
      <longitude>2.12354</longitude>
    </pointCoordinates>
  </referent>
</intermediatePointOnLinearElement>
<intermediatePointOnLinearElement index="2">
  <referent>
    <referentIdentifier>3 </referentIdentifier>
    <referentType>roadNode </referentType>
    <pointCoordinates>
      <latitude>50.12375</latitude>
      <longitude>2.12375</longitude>
    </pointCoordinates>
  </referent>
</intermediatePointOnLinearElement>
<endPointOfLinearElement>
  <referentIdentifier>4 </referentIdentifier>
  <referentType>roadNode </referentType>
  <pointCoordinates>
    <latitude>50.12397</latitude>
    <longitude>2.12397</longitude>
  </pointCoordinates>
</endPointOfLinearElement>
</linearElement>
<distanceAlongLinearElement xsi:type="DistanceFromLinearElementReferent">
  <distanceAlong>0</distanceAlong>
  <fromReferent>
    <referentIdentifier>4</referentIdentifier>
    <referentType>roadNode</referentType>
    <!--No need to repeat the coordinates of referent 4 because they are
already provided above -->
  </fromReferent>
</distanceAlongLinearElement>
</pointAlongLinearElement>
</groupOfLocations>

```

## 3.7 Case of point-located event, with more than 1 trace or detectionZone

### 3.7.1 Perimeter

This case concerns for example:

- a situation publication sent by the platform, with up to seven paths leading to the event.

This case only concerns exchanges between platform and R-ITS-S, Vro-ITS-S, and Nfr-ITS-S, the TMS do not transmit traces.

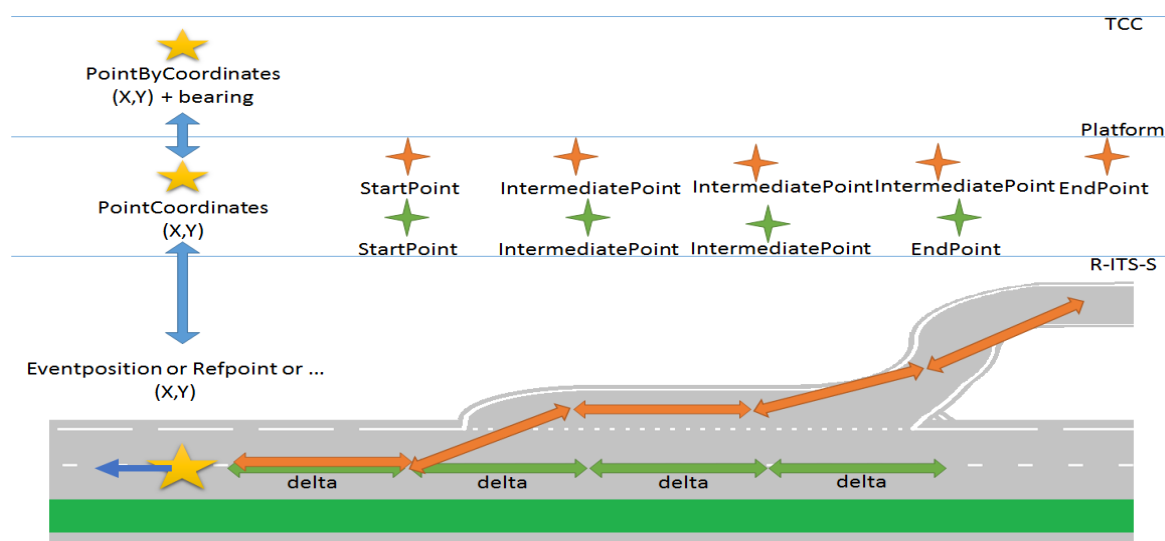


figure 6. *point-located event, with 2 traces*

### 3.7.2 Coding

ID	2414_H-LOCATION-2+-TRACE-001
Component(s)	PFro, <del>TMS</del>
Requirement	<p>The &lt;groupOfLocations&gt; shall be of type "NonOrderedLocationGroupByList" containing different "Points".</p> <ul style="list-style-type: none"> <li>The first pointAlongLinearElement corresponds to the first pathHistory in the traces, it contains also a « locationForDisplay», which corresponds to the eventposition.</li> <li>The second pointAlongLinearElement corresponds to the second pathHistory in the traces,</li> <li>And so on...</li> </ul>
Acceptance criteria	
Additional information	

The coding principles, in particular the “Rule for Trace Encoding”, are the same as the case with one trace.

ID	2414_H-LOCATION-2+-TRACE-002
Component(s)	PFRo, <del>TMS</del>
Requirement	<p>The following elements shall be added:</p> <ul style="list-style-type: none"> <li>the DATEX II <b>&lt;ExternalReferencing&gt;</b> class will be instantiated for each pointAlongLinearElement as follows:           <ul style="list-style-type: none"> <li>The externalReferencingSystem shall be set to "TRACE", for a DENM production, to "DETECTIONZONE" for an IVI production.</li> <li>The “externalLocationCode” attribute can contain any string. Even if DATEX II does not define any rule to fill in this attribute, the following convention shall be adopted, which consists in allocating the value "1" for the first string and then incrementing for the subsequent strings. The pointAlongLinearElement which the externalLocationCode equals 1 contains the locationfordisplay corresponding to the eventposition.               <ul style="list-style-type: none"> <li>the locationfordisplay in the first pointAlongLinearElement: the longitude and latitude corresponds to the same elements in the eventposition of the DENM</li> </ul> </li> </ul> </li> </ul>
Acceptance criteria	
Additional information	

ID	2414_H-LOCATION-2+-TRACE-003(3)
Component(s)	R-ITS-S, NFr
Requirement	<p><b>Particularity for the downward cases</b></p> <p>As there is no bearing attribute in the DATEX II message in this case, the headingvalue, if needed, shall be calculated by the R-ITS-S, based on the locationfordisplay (LFD) and on the startPointOfLinearElement (SP), (or if they are identical, based on the two first different elements present in the first trace) :</p>
Acceptance criteria	
Additional information	headingValue= bearing x 10

ID	2414_H-LOCATION-2+-TRACE-004
Component(s)	<del>R-ITS-S, NFr</del>

Requirement	<b>Particularity for the upward cases</b> The bearing is not requested in the DATEX II message, so the R-ITS-S may not translate the heading, if present in the DENM.
Acceptance criteria	
Additional information	

### 3.7.3 Example

Hence the corresponding XML coding (values are false, and the content that is identical to the previous example has been removed for better reading):

```

...
<groupOfLocations xsi:type="NonOrderedLocationGroupByList">
  <locationContainedInGroup xsi:type="Point">
    <externalReferencing>
      <externalLocationCode>1 </externalLocationCode>
      <externalReferencingSystem>TRACE </externalReferencingSystem>
    </externalReferencing>
    <locationForDisplay>
      <latitude>48.97518</latitude>
      <longitude>2.48609</longitude>
    </locationForDisplay>
    <pointAlongLinearElement>
      <directionRelativeAtPoint>aligned</directionRelativeAtPoint>
      <linearElement xsi:type="LinearElementByPoints">
        <roadName>
          ...
        </roadName>
        <startPointOfLinearElement>
          ...
        </startPointOfLinearElement>
        <intermediatePointOnLinearElement index="1">
          ...
        </intermediatePointOnLinearElement>
        <endPointOfLinearElement>
          ...
        </endPointOfLinearElement>
      </linearElement>
      <distanceAlongLinearElement xsi:type="DistanceFromLinearElementReferent">
        ...
      </distanceAlongLinearElement>
    </pointAlongLinearElement>
  </locationContainedInGroup>
  <locationContainedInGroup xsi:type="Point">
    <externalReferencing>
      <externalLocationCode>2 </externalLocationCode>
      <externalReferencingSystem>TRACE</externalReferencingSystem>

```

```

</externalReferencing>
<pointAlongLinearElement>
  <directionRelativeAtPoint>aligned</directionRelativeAtPoint>
  <linearElement xsi:type="LinearElementByPoints">
    ...
  </linearElement>
  ...
</pointAlongLinearElement>
</locationContainedInGroup>
</groupOfLocations>
...

```

## 3.8 Case of the linearly located events

### 3.8.1 Perimeter

**For the following upwards use cases:**

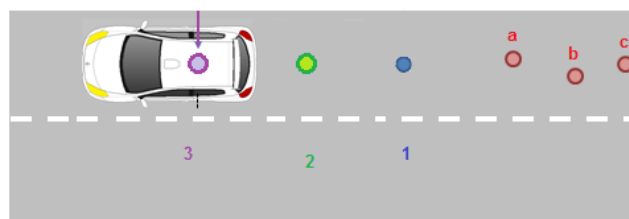
- A2-D1: Temporary slippery road,
- A2-D6: Reduced visibility,
- A2-E6: exceptional weather conditions,

the vehicle-generated DENM may contain the EventHistory data frame that consists of the ordered list (until 23 positions) of the positions along the event.

*NOTE: the definition is set in the deliverable 2.4.1*

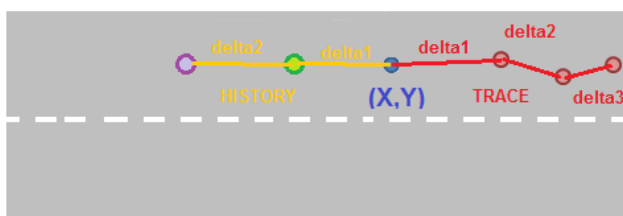
*NOTE: However, the standard is unclear on how to implement the event history for dynamic events (essentially for Vu-ITS-S). Both solutions are still under discussions:*

- 1 – the event position changes at each update and the previous event position become point of the eventhistory. Trace and eventhistory overlap.
- 2 – the event position remains identical at each update and new event history points are added along with each update.



Previous positions of the vehicle :  
in red: the vehicle do not detect the event.  
other colors: the vehicle detects the event at each position.

Illustration of the DENM sent when the vehicle is in the violet position :



event position remains identical at each update



event position changes at each update

figure 7. Coding principles for a linear event from the vehicle

**For all the linear downwards uses cases, this chapter applies:**

- All the Situation publication with a linear location (Roadworks, D1, D6, E6, C2 ...)
- C3, IVI from a VMS publication,
- C2, IVI from a speedmanagement message,
- ...

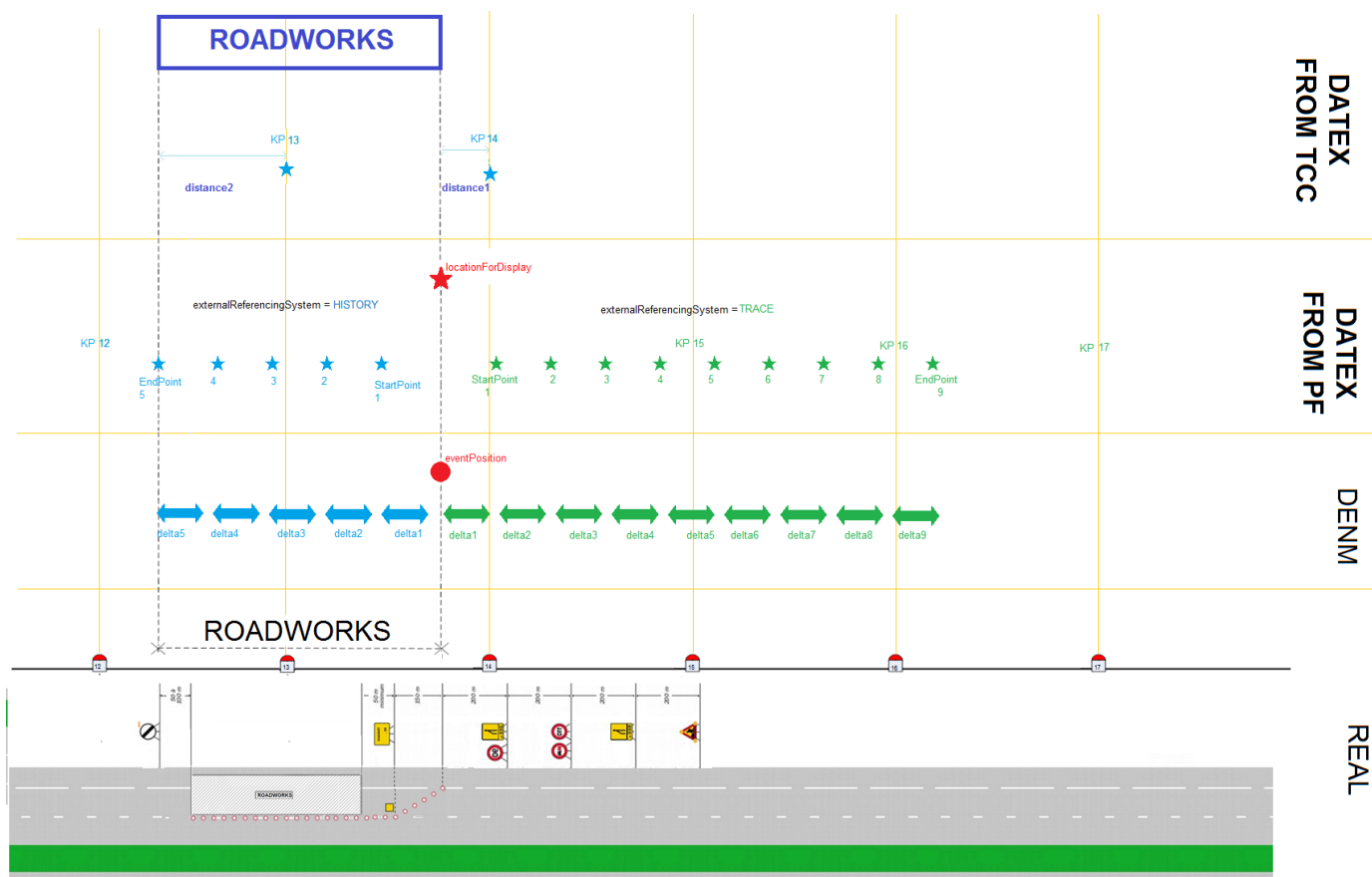


figure 8. Coding principles for a linear event from the TMS

## 3.8.2 Coding

In the C-ITS messages norm, the linear representation of an event is not based on a standardised localisation system that would represent linear type topological objects, whereas DATEX II does it natively and this is certainly the most common localisation mode. In DENM, the “eventHistory” is a succession of “eventPoint” entities - 23 at most. In IVI, the “relevancezone” can contains several group of points.

Extract of the C-ITS dictionnary:

```
EventPoint ::= SEQUENCE {
    eventPosition DeltaReferencePosition,
    eventDeltaTime PathDeltaTime OPTIONAL,
    informationQuality InformationQuality
}
```

On the other hand, DATEX II does not include a linear localisation system equivalent to the **<PointByCoordinates>** of points. The mandatory data elements to generate a DENM have to be determined by using the embedded road geographic database in the platform.

ID	2414_H-LOCATION-008
Component(s)	PFro, <del>TMS</del>
Requirement	In DATEX II, the two locations representing respectively the trace (DENM) or the detection zone (IVI) and the history (DENM) or the relevance zone (IVI) will be grouped into the <groupOfLocations> class. This <groupOfLocations> shall be of type "NonOrderedLocationGroupByList" containing different "Linear"
Acceptance criteria	
Additional information	

ID	2414_H-LOC_EVENTHISTORY_RELEVANCEZONE-001
Component(s)	PFro, <del>TMS</del>
Requirement	The first element shall corresponds to the linear of the event, using the <b>&lt;LinearWithinLinearElement&gt;</b> class instantiated from the positions defined in « eventHistory » (DENM) or relevance zone (IVI) according to the following rules: <ul style="list-style-type: none"> <li>• "directionRelativeOnLinearSection" attribute</li> <li>• <b>&lt;locationForDisplay&gt;</b> class</li> <li>• <b>&lt;ExternalReferencing&gt;</b> class</li> </ul>
Acceptance criteria	
Additional information	

ID	2414_H-LOC_EVENTHISTORY_RELEVANCEZONE-002
Component(s)	PFro, <del>TMS</del>
Requirement	"directionRelativeOnLinearSection" attribute shall be entered. The possible values are : both;opposite;aligned;unknown.
Acceptance criteria	
Additional information	No other attribute of this class is filled See Chapter: 3.9.1 LinearReferencingDirectionEnum



ID	2414_H-LOC_EVENTHISTORY_RELEVANCEZONE-003
Component(s)	PFro, <del>TMS</del>
Requirement	The class <b>&lt;locationForDisplay&gt;</b> shall be present for the location of eventHistory (or relevanceZone), and gives the precise values of "eventPosition"
Acceptance criteria	
Additional information	This class provides the latitude and longitude of "evenPosition"

ID	2414_H- LOC_EVENTHISTORY_RELEVANCEZONE-004
Component(s)	PFro, <del>TMS</del>
Requirement	<p>The DATEX II <b>&lt;ExternalReferencing&gt;</b> class shall be instantiated as follows:</p> <ul style="list-style-type: none"> <li>• The "externalReferencingSystem" attribute</li> <li>• The "externalLocationCode" attribute</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>• The "externalReferencingSystem" attribute will contain the "HISTORY" string for a DENM production, or "RELEVANCEZONE" for an IVI production;</li> <li>• The "externalLocationCode" attribute can contain any string. Even if DATEX II does not define any rule to fill in this attribute, the following convention shall be adopted, which consists in allocating the value "1" for this linear, corresponding to the EventHistory. The linear element that the externalLocationCode equals 1 contains the locationForDisplay corresponding to the eventposition</li> </ul>

- The DATEX II **<linearElement>** class is specialised as **<LinearElementByPoints>** and is instantiated as follows:

ID	2414_H-LOC_EVENTHISTORY_RELEVANCEZONE-005
Component(s)	PFro, <del>TMS</del>
Requirement	<p>The <b>&lt; linearElement &gt;</b> shall be instantiated as follows:</p> <ul style="list-style-type: none"> <li>• roadName</li> <li>• startPointOfLinearElement</li> <li>• intermediatePointOnLinearElement</li> <li>• endPointOfLinearElement</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>• All the attributes are kept void but the "roadName" attribute, which is filled in with the value "inconnu" (variable lang = "fre").</li> <li>• The linear location is described by using at least three points defined as distance markers (DATEX II <b>&lt;Referent&gt;</b> class), <ul style="list-style-type: none"> <li>◦ Every defined point includes geographic coordinates (DATEX II <b>&lt;PointCoordinates&gt;</b> class).</li> </ul> </li> <li>• The different instances of the DATEX II <b>&lt;Referent&gt;</b> class are defined as follows: <ul style="list-style-type: none"> <li>◦ The "referentType" attribute is filled in with the enumeration value: "roadNode";</li> <li>◦ The "referentIdentifier" attribute is filled in with an order number starting at 1 according to the geographic order of the points shaping the road link.</li> </ul> </li> <li>• They are ordered using the driving direction.</li> </ul> <p>The difference between the coordinates of two consecutive Points in the "LinearElement" corresponds to an EventPoint in the eventHistory, in the SituationContainer in the DENM as follow.</p>

#### Rule for History/Relevance zone Encoding:

Considering N EventPoints in the DENM, or N-2 intermediatePointOnLinearElement in the DATEX II message:

- startPointOfLinearElement = pointByCoordinates + EventPoint (1)
- intermediatePointOnLinearElement index="1" = startPointOfLinearElement + EventPoint (2)
- intermediatePointOnLinearElement index="i" = intermediatePointOnLinearElement index="i-1" + EventPoint (i+1)
- endPointOfLinearElement = intermediatePointOnLinearElement index="N-2" + EventPoint (N)

ID	2414_H-LOC_EVENTHISTORY_RELEVANCEZONE-006
Component(s)	PFro, <del>TMS</del> , R-ITS-S
Requirement	If startPointOfLinearElement= endPointOfLinearElement, the linear location shall be interpreted like an area zone.
Acceptance criteria	
Additional information	

- The relative distance (using the DATEX II **<DistanceFromLinearElementReferent>** class) is linked to the last point of the road link and filled in with the value "0". The referent identifier is repeated in this instance.

*NOTE: in consequence of the description above, and as it is described in the specific deliverables, the "fromPoint" and the "toPoint" in a message from the platform, will not be used by the R-ITS-S. The R-ITS-S uses directly the points in "xxPointOfLinearElement", and calculate the deltas for the eventHistory and traces.*

*NOTE: in consequence, there shall be N+1 coordinates in the DATEX II message, including locationfordisplay, start, intermediate and end points, for N deltas in the trace/eventHistory in the DENM, as can be seen on the Figure 8.*

ID	2414_H- LOC_TRACES_DETECTIONZONE-006
Component(s)	PFro, <del>TMS</del>

Requirement	In <code>&lt;ExternalReferencing&gt;</code> class, the next elements “externalLocationCode” and “externalReferencingSystem” shall correspond to the traces or the detection zones of the event, using the <code>&lt;LinearWithinLinearElement&gt;</code> class instantiated from the positions defined in « traces » according to the previous rules.
Acceptance criteria	
Additional information	<p>Some logical differences are raised below:</p> <p>In <code>&lt;ExternalReferencing&gt;</code> class:</p> <ul style="list-style-type: none"> <li>the « externalLocationCode » shall be incremented from the number of History or relevancezone plus one, up to the number of traces, maximum 7, or to the number of detection zone,</li> <li>the externalReferencingSystem shall be set to « TRACE », for a DENM production, to « DETECTIONZONE » for a IVI production.</li> </ul> <p>the « Rule for Trace Encoding » shall be applied to each element.</p>

### 3.8.3 Example

The XML extract shows the coding obtained in the exchange file exiting the platform for a DENM case:

```

...
<groupOfLocations xsi:type="NonOrderedLocationGroupByList">
  <locationContainedInGroup xsi:type="Linear">
    <externalReferencing>
      <externalLocationCode>1 </externalLocationCode>
      <externalReferencingSystem>HISTORY</externalReferencingSystem>
    </externalReferencing>
    <locationForDisplay>
      <latitude>48.97518</latitude>
      <longitude>2.48609</longitude>
    </locationForDisplay>
    <supplementaryPositionalDescription>
      <affectedCarriagewayAndLanes>
        <carriageway>mainCarriageway </carriageway>
        <lane>lanel</lane>
        <lengthAffected>1800</lengthAffected>
      </affectedCarriagewayAndLanes>
    </supplementaryPositionalDescription>
    <linearWithinLinearElement>
      <directionRelativeOnLinearSection>aligned
    </directionRelativeOnLinearSection>
    <linearElement xsi:type="LinearElementByPoints">
      <roadNumber>A1</roadNumber>
      <linearElementReferenceModel>RIU V2 France
    </linearElementReferenceModel>
  </locationContainedInGroup>
</groupOfLocations>

```

```

    <linearElementReferenceModelVersion>2015
  </linearElementReferenceModelVersion>
  <startPointOfLinearElement>
    <referentIdentifier>95PR14G </referentIdentifier>
    <referentType>referenceMarker </referentType>
    <pointCoordinates>
      <latitude>48.97318</latitude>
      <longitude>2.48709</longitude>
    </pointCoordinates>
  </startPointOfLinearElement>
  <intermediatePointOnLinearElement index="1">
    <referent>
      <referentIdentifier>93PR13G </referentIdentifier>
      <referentType>referenceMarker </referentType>
      <pointCoordinates>
        <latitude>48.96695</latitude>
        <longitude>2.47769</longitude>
      </pointCoordinates>
    </referent>
  </intermediatePointOnLinearElement>
  <endPointOfLinearElement>
    <referentIdentifier>93PR12G </referentIdentifier>
    <referentType>referenceMarker </referentType>
    <pointCoordinates>
      <latitude>48.96060</latitude>
      <longitude>2.46806</longitude>
    </pointCoordinates>
  </endPointOfLinearElement>
</linearElement>
<fromPoint xsi:type="DistanceFromLinearElementReferent">
  <distanceAlong>550</distanceAlong>
  <fromReferent>
    <referentIdentifier>95PR14G </referentIdentifier>
    <referentType>referenceMarker </referentType>
  </fromReferent>
</fromPoint>
<toPoint xsi:type="DistanceFromLinearElementReferent">
  <distanceAlong>150</distanceAlong>
  <fromReferent>
    <referentIdentifier>93PR12G </referentIdentifier>
    <referentType>referenceMarker </referentType>
  </fromReferent>
</toPoint>
</linearWithinLinearElement>
</locationContainedInGroup>

<locationContainedInGroup xsi:type="Linear">
  <externalReferencing>
    <externalLocationCode>2 </externalLocationCode>
    <externalReferencingSystem>TRACE</externalReferencingSystem>
  </externalReferencing>
  <linearWithinLinearElement>
    <directionRelativeOnLinearSection>aligned
  </directionRelativeOnLinearSection>
    <linearElement xsi:type="LinearElementByPoints">
      <roadNumber>A1</roadNumber>
      <linearElementReferenceModel>RIU V2 France
    </linearElementReferenceModel>
  </linearElementReferenceModel>

```

```

<linearElementReferenceModelVersion>2015
</linearElementReferenceModelVersion>
  <startPointOfLinearElement>
    <referentIdentifier>95PR16G </referentIdentifier>
    <referentType>referenceMarker </referentType>
    <pointCoordinates>
      <latitude>48.98318</latitude>
      <longitude>2.49709</longitude>
    </pointCoordinates>
  </startPointOfLinearElement>
  <intermediatePointOnLinearElement index="1">
    <referent>
      <referentIdentifier>95PR15G </referentIdentifier>
      <referentType>referenceMarker </referentType>
      <pointCoordinates>
        <latitude>48.96695</latitude>
        <longitude>2.47769</longitude>
      </pointCoordinates>
    </referent>
  </intermediatePointOnLinearElement>
  <endPointOfLinearElement>
    <referentIdentifier>95PR14G </referentIdentifier>
    <referentType>referenceMarker </referentType>
    <pointCoordinates>
      <latitude>48.96060</latitude>
      <longitude>2.46806</longitude>
    </pointCoordinates>
  </endPointOfLinearElement>
</linearElement>
<fromPoint xsi:type="DistanceFromLinearElementReferent">
  <distanceAlong>0</distanceAlong>
  <fromReferent>
    <referentIdentifier>95PR16G </referentIdentifier>
    <referentType>referenceMarker </referentType>
  </fromReferent>
</fromPoint>
<toPoint xsi:type="DistanceFromLinearElementReferent">
  <distanceAlong>0</distanceAlong>
  <fromReferent>
    <referentIdentifier>95PR14G </referentIdentifier>
    <referentType>referenceMarker </referentType>
  </fromReferent>
</toPoint>
</linearWithinLinearElement>
</locationContainedInGroup>
</groupOfLocations>

```

## 3.9 Special points

### 3.9.1 LinearReferencingDirectionEnum

Different attributes are based on LinearReferencingDirectionEnum enumeration:  
 “directionRelativeAtPoint”, “directionRelativeOnLinearSection”

ID	2414_H-LOCATION_POINT-004
Component(s)	PFro, TMS
Requirement	<p>In the case of a divided road, PFro shall duplicate the message for the DENMs generated</p> <ul style="list-style-type: none"> <li>• If the event concerns the 2 directions (e.g. slippery road)</li> <li>• with the same geographic location (“eventPosition”)</li> <li>• but with the “Trace” entities and “HeadingValue” attributes representing the opposite directions of traffic (angle reading increased 180°).</li> </ul>
Acceptance criteria	
Additional information	<p>It should be noted that contrary to the localisation systems used in DATEX II (except for “PointByCoordinates”), it seems not very relevant in the case of a divided road for a DENM to define a traffic element or an operating action as bidirectional (i.e., affecting both directions of traffic).</p> <p>Consequently, the French C-ITS Projects has decided (deliverable 2.4.1) to duplicate the DENMs generated.</p>

ID	2414_H-LOCATION_POINT-001
Component(s)	PFro, TMS
Requirement	<p>Different values shall set in the LinearReferencingDirectionEnum enumeration.</p> <ul style="list-style-type: none"> <li>• “<b>both</b>” is used if the event concerns all the directions (the same as the DENM “alltrafficdirection” value).</li> <li>• “<b>aligned</b>”, if the event is in the same direction that the one defined by the order of the markers used.</li> <li>• “<b>opposite</b>”, if the event is in the opposed direction of the markers.</li> </ul>
Acceptance criteria	
Additional information	

ID	2414_H-LOCATION_POINT-002
Component(s)	PFro, TMS, R-ITS-S
Requirement	If <b>“aligned”</b> , the event shall be in the same direction that the one defined by the order of the markers used.
Acceptance criteria	
Additional information	<b>Particularity for the downward cases</b> <ul style="list-style-type: none"> <li>if the PFro receives it from the TMS, it means “in the PR upwards” with reference to the RIU,</li> <li>if the R-ITS-S receives it from the PFro, it means in the same direction as the markers, so it shall translate it into <b>“upstreamtraffic”</b> in the DENM</li> </ul>

ID	2414_H-LOCATION_POINT-003
Component(s)	PFro, TMS
Requirement	If <b>“opposite”</b> , the event shall be in the opposed direction of the markers.
Acceptance criteria	
Additional information	<b>Particularity for the downward cases</b> <ul style="list-style-type: none"> <li>if the PFro receives it from the TMS, it means “in the PR downwards” with reference to the RIU, it shall translate it into “aligned”, and sent the markers in the other direction than the “PR upward”.</li> <li>the R-ITS-S shall not receive the value “opposite” from the PFro.</li> </ul>

ID	2414_H-LOCATION_POINT-005(2)
Component(s)	PFro, TMS
Requirement	<b>Particularity for the upward cases</b> PFro compute with “aligned” and “bearing” the sense of the event. PFro shall translate to the RIU location for the TMS <ul style="list-style-type: none"> <li>aligned if increasing PR sense</li> <li>opposite if decreasing PR sense</li> </ul>
Acceptance criteria	
Additional information	the R-ITS-S translates the <b>“upstreamTraffic”</b> or <b>“downstreamTraffic”</b> from the DENM into “aligned”, and organize the markers in the <linearElement>, in the same direction as the event.



ID	2414_H-LOCATION_POINT-006
Component(s)	PFro, TMS
Requirement	<b>Particularity for the upward cases</b> PFro compute with “opposite” and “bearing” the sense of the event. PFro shall translate <ul style="list-style-type: none"> <li>aligned if increasing PR sense</li> <li>opposite if decreasing PR sense</li> </ul>
Acceptance criteria	
Additional information	the R-ITS-S translates the “oppositeTraffic” from the DENM into “opposite”, and organize the markers in the <linearElement>, in the opposite direction as the event.

ID	2414_H-LOCATION_POINT-007
Component(s)	PFro, TMS
Requirement	<b>Particularity for the upward cases</b> If PFro receive both, PFro shall translate “both”
Acceptance criteria	
Additional information	the R-ITS-S translates the “alltrafficdirection” from the DENM into “both”.

### 3.9.2 Definition of the “roadType” DENM data element

There is no way in the DATEX II data model to convey usable information to define this piece of data for messages generated by TMS. It is the duty of the platform to fulfil this task. To allow it a DATEX II level B extension is proposed in the “RoadTypeScoopExtension” package:

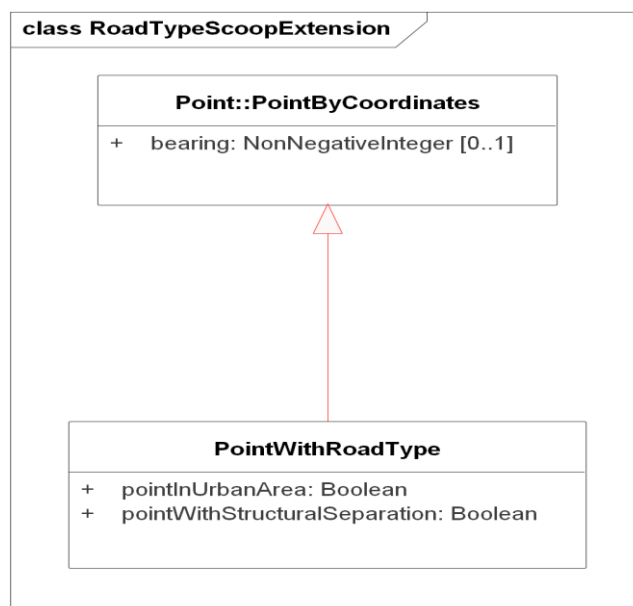


figure 9. *Extension for the “roadType” definition*

ID	2414_H-EXT_ROADTYPE_001
Component(s)	PFro
Requirement	PFro shall create an extension (pointByCoordinatesExtension) with pointWithRoadType
Acceptance criteria	
Additional information	<p>Each Boolean is set to “true” if the corresponding definition is fulfilled according to the platform map content at the given point.</p> <p>Knowing the ASN.1 definition of the “roadType” data element in ETSI TS 102 894-2:</p> <pre> RoadType ::= ENUMERATED {     urban-NoStructuralSeparationToOppositeLanes(0),     urban-WithStructuralSeparationToOppositeLanes(1),     nonUrban-NoStructuralSeparationToOppositeLanes(2),     nonUrban-WithStructuralSeparationToOppositeLanes(3) }                     </pre>

the formula to calculate the “roadType” value is defined as follows:

$$\text{roadType} = (\text{pointWithStructuralSeparation?1:0}) + (\text{pointInUrbanArea?0:2})$$

The XML extract below shows the coding obtained in the exchange file exiting the platform:

```

...
<pointByCoordinates>

```

```

<bearing>210</bearing>
<pointCoordinates>
  <latitude>50.12345</latitude>
  <longitude>1.23456</longitude>
</pointCoordinates>
<pointByCoordinatesExtension>
  <pointWithRoadType>
    <pointInUrbanArea>false</pointInUrbanArea>
    <pointWithStructuralSeparation>true</pointWithStructuralSeparation>
  </pointWithRoadType>
</pointByCoordinatesExtension>
</pointByCoordinates>

```

### 3.9.3 Lane and carriageway positioning

. ID	2414_H-LANE_001 (2)
Component(s)	TMS
Requirement	If data is relevant and if the TMS treat this type of data, the location part shall be completed by the transverse positioning information on the lane
Acceptance criteria	
Additional information	<p>The value in the lane enumeration are not all allowed. The value of the lane shall be of type</p> <ul style="list-style-type: none"> <li>• “laneXX”, with a number beginning by 1 for the lane the most on the right</li> <li>• or « rightlane », « leftlane », and « middlelane », but, in this case, shall precise the number of original lanes (in the impact class).</li> <li>• For the needs of the projects, the number of lanes (in the impact class) becomes mandatory : SituationRecord.Impact.numberOfOperationalLanes or SituationRecord.Impact.originalNumberOfLanes</li> </ul>

ID	2414_H-LANE_002 (2)
Component(s)	TMS
Requirement	For the needs of the projects : “Impact” class shall be filled by TMS with “numberOfOperationalLanes” or “originalNumberOfLanes” attribute.
Acceptance criteria	
Additional information	

*NOTE: TIPI accepts the value rightlane, leftlane, but the PFro do not have the number of lane on the carriageway.*

This type of data can be added by the TMS, but cannot be added by the PFro.

The syntax is as:

```
...
<supplementaryPositionalDescription>
  <affectedCarriagewayAndLanes>
    <carriageway>mainCarriageway</carriageway>
    <lane>lane1</lane>
    <lane>lane2</lane>
    <lengthAffected>1800</lengthAffected>
  </affectedCarriagewayAndLanes>
</supplementaryPositionalDescription>
...
```

*NOTE: that the transverse positioning information is attached to a linear or point location. When it is a question of a group of locations (e.g., in the case of the definition of an "Itinerary" object), the information will be repeated for each element in the group.*

*NOTE: The information will contribute to generate the DENM entity "RoadWorksContainerExtended".*

### 3.9.4 Case of location on slip roads and auxiliary lanes for downward use case, between TMS and Platform

The DENM standard (ETSI EN 302 637-3) does not specify specific values for locations on a slip road or another auxiliary lane unlike DATEX II, where several and practices are possible.

Therefore, for messages issued by infrastructure (cases B and D), if the DATEX II **<SupplementaryPositionalDescription>** and **<AffectedCarriagewayAndLanes>** classes are instantiated and explicitly indicates the given location is e.g. on a slip road, a parallel carriageway or on rest/service area, it may mean the provided location (point or linear element) is not the actual location depending on the used TMS.

ID	2414_H-SLIP_ROAD_001
Component(s)	TMS, PFro
Requirement	On a slip road, a parallel carriageway or on rest/service area : <ul style="list-style-type: none"> <li>the corresponding location shall be the position of the nose (French "musoir"), where the slip road crosses the road.</li> <li>the provided distance corresponds to the distance between the nose and the event.</li> </ul>
Acceptance criteria	
Additional information	

ID	2414_H-SLIP_ROAD_002
Component(s)	TMS, PFro
Requirement	The PFro shall transform such a location into a location usable by R-ITS-S for creating DENM, in coordinates.
Acceptance criteria	
Additional information	See Deliverable 2.4.3.2 for the transformation rules.

Example: The event is on the slip road on 260m.

```

<groupOfLocations xsi:type="Point">
...
    <supplementaryPositionalDescription>
        <affectedCarriagewayAndLanes>
            <carriageway>entrySlipRoad</carriageway>
            <lengthAffected>260</lengthAffected>
        </affectedCarriagewayAndLanes>
    </supplementaryPositionalDescription>
...
    <pointAlongLinearElement>
        <directionRelativeAtPoint>aligned</directionRelativeAtPoint>
        <linearElement>
            <roadNumber>A0001</roadNumber>
            <linearElementReferenceModel>RIU_2012</linearElementReferenceModel>
        </linearElement>
        <distanceAlongLinearElement xsi:type="DistanceFromLinearElementReferent">
            <distanceAlong>618</distanceAlong>
            <fromReferent>
                <referentIdentifier>59PR201D</referentIdentifier>
                <referentType>referenceMarker</referentType>
            </fromReferent>
        </distanceAlongLinearElement>
...
    </pointAlongLinearElement>
...
</groupOfLocations>

```

### 3.9.5 Special case of Speed limit positions for road works (only the use cas Roadworks (B), not dynamic speed limit (C2))

Speed limits attached to a roadwork are defined the DATEX II **<SpeedManagement>** class that instantiates a second or third situation record (only accepted for use cases B).

*NOTE: this chapter does not apply to the C2, dynamic speed limit, whose <SpeedManagement> class instantiates the first situation record.*

This class inherits from the DATEX II **<NetworkManagement>** class, this latter being itself a specialisation of the **<OperatorAction>** as **<RoadWorks>**.

ID	2414_H-RW_SPEED_LIMIT_001
Component(s)	TMS, PFro
Requirement	As for any <situationrecord>, a location reference shall be attached to the <b>&lt;SpeedManagement&gt;</b> class
Acceptance criteria	
Additional information	

From TMS this location is generally defined linearly.

On the other hand, in the DENM "AlacarteContainer" including the "roadWorks" data frame :

- the "speedLimit" data element defines the speed limit value (only in kilometre per hour)
- the "startingPointSpeedLimit" data element defines the speed limit start being applicable. This point is not defined by absolute geographic coordinates but differentially in relation to the "eventPoint" pinpointing the beginning of the considered roadwork.

The method to convert the provided initial linear location consists, in the platform, in extracting it upwards point (it may be the first or the last point of the linear according to the adopted location referencing method). Then to determine its geographic coordinates (if they are not provided) using the map included. The corresponding coordinates can be transferred to R-ITS-S using the DATEX II **<PointByCoordinates>** class.

At the R-ITS-S the DENM data frame is calculate as coordinates differences according to the following rule:

Rule:

$$\Delta Lat_{i+1} = Lat_{i+1} - Lat_i$$

$$\Delta Long_{i+1} = Long_{i+1} - Long_i$$

## 4 Processing of the traffic data

### 4.1 Description of the use case A1: Traffic Data

The Nfr-ITS-S and R-ITS-S receives CAMs. It filters and aggregate the messages and sends the information calculated based on these CAMs to the platform.

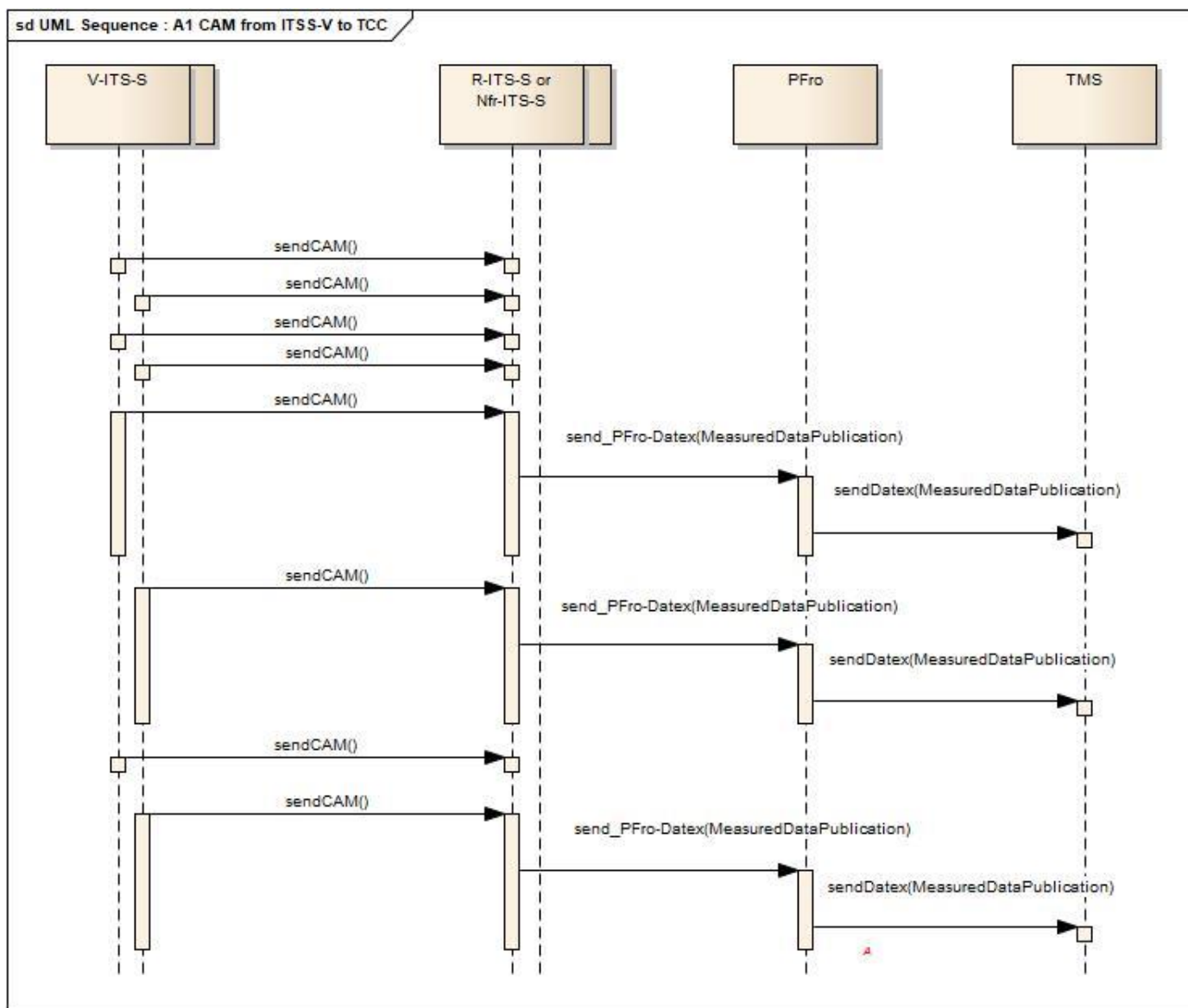


figure 10. UML sequence diagram for the Traffic data collection from V-ITS-S to TMS, uplink flow

Here is an example of the information that could be available in the end to the user.

Type	Beginning of considered period	End of considered period	Considered measurement zone	Considered length class	Average harmonic speed	Average length	Number of vehicles
1	HH:MM:SS DD/MM/YYYY	HH:MM:SS DD/MM/YYYY	All zones	All classes	$V_{avg}$	$L_{avg}$	Number
2	HH:MM:SS DD/MM/YYYY	HH:MM:SS DD/MM/YYYY	Zone x	All classes	$V_{avg}(Zone_x)$	$L_{avg}(Zone_x)$	Number( $Zone_x$ )
3	HH:MM:SS DD/MM/YYYY	HH:MM:SS DD/MM/YYYY	All zones	Class Y	$V_{avg}(Class_y)$	$L_{avg}(Class_y)$	Number( $Class_y$ )
4	HH:MM:SS DD/MM/YYYY	HH:MM:SS DD/MM/YYYY	Zone x	Class Y	$V_{avg}(Zone_x, Class_y)$	$L_{avg}(Zone_x, Class_y)$	Number( $Zone_x, Class_y$ )

Table 3 : Example of information calculated based on CAMs

## 4.2 Construction of the DATEX II message Configuration of measurement points in the R-ITS-S

### 4.2.1 Message principles

ID	2414_H-CAM_001
Component(s)	Nfr-ITS-S, R-ITS-S
Requirement	Nfr-ITS-S and the R-ITS-S shall know the description of the zones and the measurement classes
Acceptance criteria	
Additional information	Consequently, this assumes that there is an exchange mechanism between the TMS, Nfr-ITS-S and the R-ITS-S concerning the definition of these zones and classes.

Here are some paths to explore, if these measurement points shall be configured in DATEX II (see deliverable “platform specifications”).



ID	2414_H-CAM_002
Component(s)	Nfr-ITS-S, R-ITS-S
Requirement	<p>The rules below shall apply :</p> <p>A zone will be named: ZoneX (e.g., Zone01 or Zone135).</p> <ul style="list-style-type: none"> <li>• The geometric definition of a Zone in DATEX II consists of 3 points (in coordinates) and an orientation (<b>&lt;bearing&gt;</b> indicated by a point).</li> <li>• The version number of the zone is incremented if one of the zone characteristics is updated.</li> <li>• The CAM aggregation zones will be exchanged via the <b>&lt;measurementSiteTablePublication&gt;</b>. For the other parameters, this should involve an extension based on the <b>&lt;genericPublication&gt;</b> class (if possible, level B).</li> </ul> <p>A measurement class will be named: ClasseY (e.g., Classe01 or Zone135).</p> <ul style="list-style-type: none"> <li>• The guide [4] recommends using the DATEX II <b>&lt;MeasurementSiteRecord&gt;</b> class, which can be used to describe the static data for the exchange of aggregated traffic data.</li> </ul> <p>The <b>&lt;measurementSiteRecord&gt;</b> class will be completed by the DATEX II <b>&lt;VehicleCharacteristics&gt;</b> class. For example: with the DATEX II <b>&lt;LengthCharacteristic&gt;</b> class (&gt;12 m, =3 m...), to be combined with one or two comparison operators for the case "included between."</p>
Acceptance criteria	
Additional information	

```
<measurementSiteReference id="UBR12345-Zone01-Classe01" targetClass=
"MeasurementSiteRecord" version="1"/>
```

*NOTE: This would make it possible, in the future, to define new groups of vehicles: by height, by number of axles, etc.*

## 4.3 Construction of the DATEX II message Reporting traffic data

### 4.3.1 Exchange parameters

#### 4.3.1.1 Choosing the distribution mode

ID	2414_H_CAM_003
Component(s)	TMS
Requirement	The OM2 mode (OperatingMode2), called Push at a regular interval, shall be used for this use case
Acceptance criteria	
Additional information	The R-ITS-S transmits all the data at a regular interval to the platform.

The publication contains the aggregation of a set of CAMs.

The parameters concerned are:

```

...
<subscription>
  <operatingMode>operatingMode2</operatingMode>
  <updateMethod>allElementUpdate</updateMethod>
...
</subscription>
...

```

#### 4.3.1.2 Data reporting period

ID	2414_H_CAM_004
Component(s)	<del>TMS</del> -PFro
Requirement	In "OM2" mode, the reporting period shall be configured for each R-ITS-S.
Acceptance criteria	
Additional information	Its value is in seconds.

```

...
<subscription>
...
<deliveryInterval>360</deliveryInterval>
...
</subscription>
...

```

## 4.3.2 Message content (<PayloadPublication> and <MeasuredDataPublication>)

### 4.3.2.1 <MeasuredDataPublication> class

ID	2414_H_CAM_005
Component(s)	R-ITS-S; Nfr-ITS-S
Requirement	The message in DATEX II shall contain all the data for all zones for all classes over a given period.
Acceptance criteria	
Additional information	Based on “Table 3 : Example of information calculated based on CAMs”, this signifies that a DATEX II message between an R-ITS-S and the platform will only contain the data defined according to the type 4 in this table.

ID	2414_H_CAM_006 (1)
Component(s)	TMS, R-ITS-S, PFro, Nfr-ITS-S
Requirement	The <b>&lt;payloadPublication&gt;</b> class shall be a <b>&lt;MeasuredDataPublication&gt;</b> type
Acceptance criteria	
Additional information	<p>This class will contain, in addition to the elements already presented in chapter 2.2.5</p> <p>Message content, several elements:</p> <ul style="list-style-type: none"> <li>• a &lt;measurementSiteTableReference&gt; class,</li> <li>• and as many DATEX II &lt;siteMeasurements&gt; classes as pairs (ZoneX, ClasseY). (A &lt;siteMeasurements&gt; class instance corresponds to a line (type 4) as defined in )</li> </ul>

#### 4.3.2.1.1 <MEASUREMENTSITE TABLE REFERENCE> CLASS

The identifier is used to identify the transmitting R-ITS-S. The value proposed for the identifier is the nationalIdentifier. See chapter 2.2.1 Attribute <nationalIdentifier>.

The <targetclass> is used to identify the type of data: <MeasurementSiteTable>.

```
...
<measurementSiteTableReference id="SCOOP_DIRIF_UBR12345 "
targetClass="MeasurementSiteTable" version="1"/>
...
```

##### 4.3.2.1.1.1 Locations of CAM aggregations

As explained in chapter 4.3 Construction of the DATEX II message Reporting traffic data, in the case of reporting aggregated messages from CAMs, the static part describing the aggregation zone (and the class) will be converted by means of the specific DATEX II publication, <MeasurementSiteTablePublication>.

In particular, the CAM aggregation zone will be defined in this publication by the DATEX II class <groupOfLocations>, specialised as <NonOrderedLocationGroupByList>, which will include three points defined by coordinates, corresponding to three summits of the rectangle defining the zone. The first point can also include angular bearing information corresponding to the traffic direction in the zone.

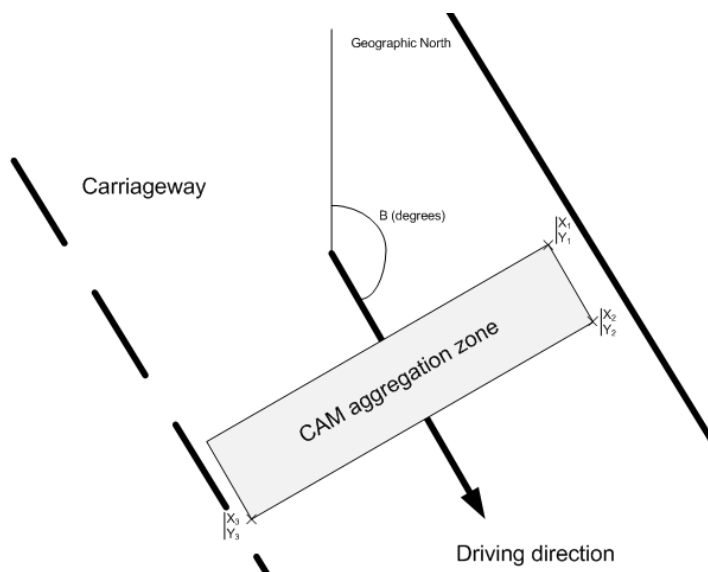


figure 11. *Defining the CAM aggregation area*  
This provides the following file:

```
...
<measurementSiteLocation xsi:type="NonOrderedLocationGroupByList">
  <locationContainedInGroup xsi:type="Point">
    <pointByCoordinates>
      <bearing>108</bearing>
      <pointCoordinates>
        <latitude>50.12345</latitude>
        <longitude>2.12345</longitude>
      </pointCoordinates>
    </locationContainedInGroup>
  </measurementSiteLocation>
```

```

</pointByCoordinates>
</locationContainedInGroup>
<locationContainedInGroup xsi:type="Point">
  <pointByCoordinates>
    <pointCoordinates>
      <latitude>50.12348</latitude>
      <longitude>2.12346</longitude>
    </pointCoordinates>
  </pointByCoordinates>
</locationContainedInGroup>
<locationContainedInGroup xsi:type="Point">
  <pointByCoordinates>
    <pointCoordinates>
      <latitude>50.12347</latitude>
      <longitude>2.12347</longitude>
    </pointCoordinates>
  </pointByCoordinates>
</locationContainedInGroup>
</measurementSiteLocation>

```

...

#### 4.3.2.1.2 DATEX II <SITE MEASUREMENTS> CLASS

First of all, the class type used has to be specified. For this type of information, the guide [4] recommends using the DATEX II **<MeasurementSiteRecord>** class, which can be used to describe the static data for the exchange of aggregated traffic data.

ID	2414_H_CAM_007
Component(s)	TMS, R-ITS-S, PFro, Nfr-ITS-S
Requirement	The <siteMeasurements> Class shall contain two attributes : <ul style="list-style-type: none"> <li>• measurementSiteReference</li> <li>• measurementTimeDefault.</li> </ul>
Acceptance criteria	
Additional information	

ID	2414_H_CAM_009
Component(s)	TMS, R-ITS-S, PFro, Nfr-ITS-S

Requirement	<p>MeasurementSiteReference is a reference to a versioned measurement site record defined in a MeasurementSiteTable.</p> <p>It is the reference to the zone and the traffic class. The identifier identifies the pair (ZoneX, ClasseY) concerned. We propose the following naming rule: Stationxx_ZoneX_ClasseY,</p> <p>If ZoneX isn't present, then it concerns all zones. If ClasseY isn't present, then it concerns all classes. If ZoneX and ClasseY aren't present, then it concerns all zones and all classes.</p>
Acceptance criteria	
Additional information	<p>For example: « UBR12345-Zone01-Classe02» or « NN_Zone02_Classe1254».</p>

```
...
<measurementSiteReference id="UBR12345-Zone01-Classe01"
targetClass="MeasurementSiteRecord" version="1"/>
...
```

The version number of the zone is incremented if one of the zone characteristics is updated.

The identifier identifies the pair (ZoneX, ClasseY) concerned. We propose the following naming rule: Stationxx\_ZoneX\_ClasseY,

For example: « UBR12345-Zone01-Classe02» or « NN\_Zone02\_Classe1254».

*NOTE: there is another option to identify a class: The solution described above is the preferred solution to identify a class, for this type of message exchanges. Indeed, it minimises the volume of data exchanged. The <MeasurementSiteRecord> class can be completed with, for example, the DATEX II <LengthCharacteristic> class (> 12 m, =3 m, etc.). This would also make it possible to define new groups of vehicles: by height, by number of axles, etc. This is what is used in the "Configuration" message.*

- MeasurementTimeDefault is the time associated with the set of measurements.

```
...
<measurementTimeDefault>2015-07-20T08:24:00+01:00</measurementTimeDefault>
...
```

This time is the date and time of these uploaded measures. The time is in a format local time with the time zone, in GMT.

#### 4.3.2.1.3 <MEASUREDVALUE> CLASS

ID	2414_H_CAM_008 (2)
Component(s)	TMS, R-ITS-S, PFro, Nfr-ITS-S
Requirement	This <b>&lt;siteMeasurements&gt;</b> class shall contain as many <b>&lt;measuredValue&gt;</b> classes as values to measure.
Acceptance criteria	
Additional information	<p>In theory, there are <del>three</del> four values:</p> <ul style="list-style-type: none"> <li>• average speed,</li> <li>• average length,</li> <li>• number of vehicles.</li> <li>• <b>Travel Time</b></li> </ul> <p>It should be noted that the <b>&lt;measuredValue&gt;</b> classes should be indexed.</p>

#### 4.3.2.1.3.1 Average speed

We use the **<basicData>** class, **<TrafficSpeed>** type.

```
<measuredValue index="1">
  <measuredValue>
    <basicData xsi:type="TrafficSpeed">
      <averageVehicleSpeed>
        <speed>88</speed>
      </averageVehicleSpeed>
    </basicData>
  </measuredValue>
</measuredValue>
```

#### 4.3.2.1.3.2 Average length

There is no class to report an average length. But Cerema had proposed an extension for classified speeds. An extension can also be created to report the average lengths. This extension can be treated later.

#### 4.3.2.1.3.3 Number of vehicles

The **<BasicData>** class with the **<TrafficFlow>** type is used.

```
<measuredValue index="2">
  <measuredValue>
    <basicData xsi:type="TrafficFlow">
      <measurementOrCalculationPeriod>60</measurementOrCalculationPeriod>
    </basicData>
  </measuredValue>
</measuredValue>
```

```

        <vehicleFlowRate>1200</vehicleFlowRate>
      </vehicleFlow>
    </basicData>
  </measuredValue>
</measuredValue>

```

#### 4.3.2.1.3.4 Additional information

A **<measuredValue>** class can optionally be specified by the type of equipment used to make the measurement.

```

<measurementEquipmentTypeUsed>
  <values>
    <value lang=fr>UBR A86E PR37 </value>
  </values>
</measurementEquipmentTypeUsed>

```

*NOTE: For the record, other information can be reported in DATEX II: data specific to a vehicle, occupancy rate, concentration, inter-vehicle distances, etc.*

#### 4.3.2.1.3.5 Travel Time Data

The **<BasicData>** class with the **<TravelTimeData>** type is used.

```

<measuredValue index="4">
  <measuredValue>
    <basicData xsi:type="TravelTimeData">
      <measurementOrCalculationPeriod>60</measurementOrCalculationPeriod>
      <travelTime numberOfInputValuesUsed=151>
        <duration>19</duration>
      </ travelTime >
    </basicData>
  </measuredValue>
</measuredValue>

```



### 4.3.2.2 Example of a DATEX II message from an R-ITS-S to the PFro.

For example, if the R-ITS-S, named UBR12345, has calculated the following data:

Beginning of period in question	End of period in question	Measurement zone in question	Length class in question	Average harmonic speed	Number of vehicles
2015-07-01T00:00:00	2015-07-01T00:06:00	Zone1	Class1	88	3
2015-07-01T00:00:00	2015-07-01T00:06:00	Zone1	Class2	110	50
2015-07-01T00:00:00	2015-07-01T00:06:00	Zone2	Class1	95	1
2015-07-01T00:00:00	2015-07-01T00:06:00	Zone2	Class2	130	20

Table 4 : Example of data from the UBR12345

Line 1 will be represented by a <siteMeasurements> class completed as follows:

```
<payloadPublication xsi:type="MeasuredDataPublication">
<siteMeasurements>
  <measurementSiteReference id="UBR12345-Zone01-Classe01" targetClass=
    "MeasurementSiteRecord" version="1"/>
  <measurementTimeDefault>2015-07-20T08:24:00+01:00</measurementTimeDefault>
  <measuredValue index="1">
    <measuredValue>
      <measurementEquipmentTypeUsed>
        <values>
          <value>UBR A86E PR37</value>
        </values>
      </measurementEquipmentTypeUsed>
      <basicData xsi:type="TrafficFlow">
        <measurementOrCalculationPeriod>360</measurementOrCalculationPeriod>
        <vehicleFlow>
          <vehicleFlowRate>3</vehicleFlowRate>
        </vehicleFlow>
      </basicData>
    </measuredValue>
  </measuredValue>
  <measuredValue index="2">
    <measuredValue>
      <basicData xsi:type="TrafficSpeed">
        <averageVehicleSpeed>
          <speed>88</speed>
        </averageVehicleSpeed>
      </basicData>
    </measuredValue>
  </measuredValue>
</siteMeasurements>
... *
</payloadPublication>
```

The other lines in table 4 are described identically to the location noted \* in the xml code above.

### 4.3.2.3 Example of DATEX II message from PFro to TMS

There are two possibilities for this message:

1. the platform sends as many messages to the TMS as messages received from the R-ITS-S (The platform modifies the exchange parameters, but it keeps the content unchanged):
  - this solution does not optimise the traffic between the platform and the TMS; and
  - the platform has a very reduced role.
2. the platform aggregates the data from the R-ITS-S into a single publication with a unique **<MeasurementSiteTable>** class. For example:

```
...  
<measurementSiteTableReference id="SCOOP_DIRIF" targetClass="MeasurementSiteTable"  
version="1"/>  
...  
<siteMeasurements>  
<measurementSiteReference id="UBR1-Zone1-Classe1"  
targetClass="MeasurementSiteRecord" version="1"/>  
...  
</siteMeasurements>  
...  
<siteMeasurements>  
<measurementSiteReference id="UBR1-Zone2-Classe1"  
targetClass="MeasurementSiteRecord" version="1"/>  
...  
</siteMeasurements>  
...  
<siteMeasurements>  
<measurementSiteReference id="UBR1-Zone2-Classe1" targetClass=  
"MeasurementSiteRecord" version="1"/>  
...  
</siteMeasurements>  
</payloadPublication>
```

In order to optimise the traffic between the platform and the TMS, solution 2 shall be used.

## 5 Traffic Events and Operator Actions Messages

This chapter is completed by:

- 2.4.1.4\_H Annex 1: translation between Datex II SituationPublication and DENM
- 2.4.1.4\_H Annex 2: situationPublication authorised from the TMS

### 5.1 Description of use-cases

The Roadworks and the events usecases, and the two directions of information flow are grouped in this chapter because they are the same in DATEX II from the point of view of the format of the exchanged message. However, the content changes.

In the "uplink" direction, the R-ITS-S receives DENMs. It analyses the DENMs and reports the DATEX II message to the SCOOP platform, if it is relevant. The platform reports the DATEX II message to the TMS, if it is relevant.

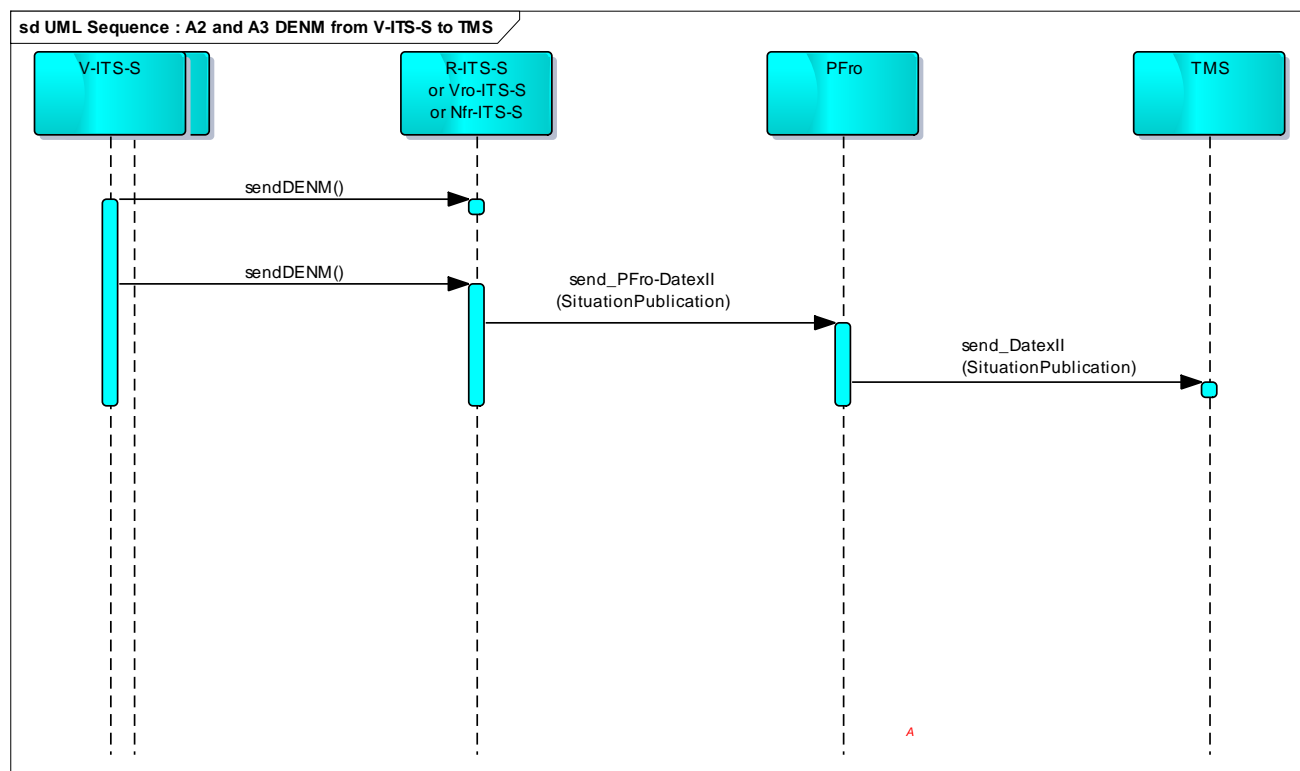


figure 12. UML sequence diagram for the data collection based on DENM from V-ITS-S to TMS, uplink flow

There are also the messages from the Vro-ITS-S, in the uplink direction. The operator vehicle send DATEX II Messages, for example to indicate the roadwork to the TMS. The Vro-ITS-S creates the DATEX II message then sends it to the platform.

The platform sends a DATEX II message to the TMS (eventually the same message, or an aggregation of several DATEX II Messages). See 2.4.3.2\_H about DENM treatment and aggregation.

In the meantime, if the DATEX II message is a message created by the Vro-ITS-S in a

operator mode, the platform shall send it directly to the Nfr-ITS-S. (According to the annex1 of this document, this means that the sourcetype is set to roadAuthorities (for a trailer), or otherOfficialVehicle.

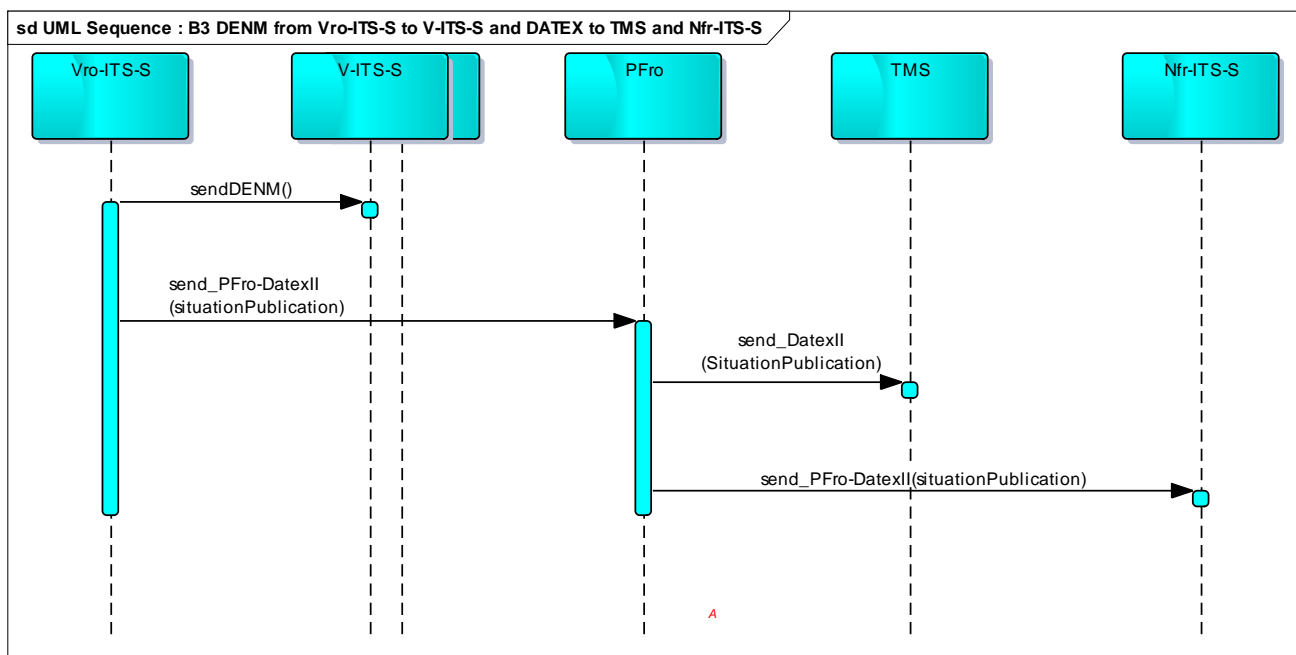


figure 13. *UML sequence diagram for the traffic information based on DENM from Vro-ITS-S to TMS and Nfr-ITS-S, uplink flow*

In the "downlink" direction, the TMS sends the information to the platform, which sends it to the R-ITS-S. The R-ITS-S sends DENMs based on the parameters received.

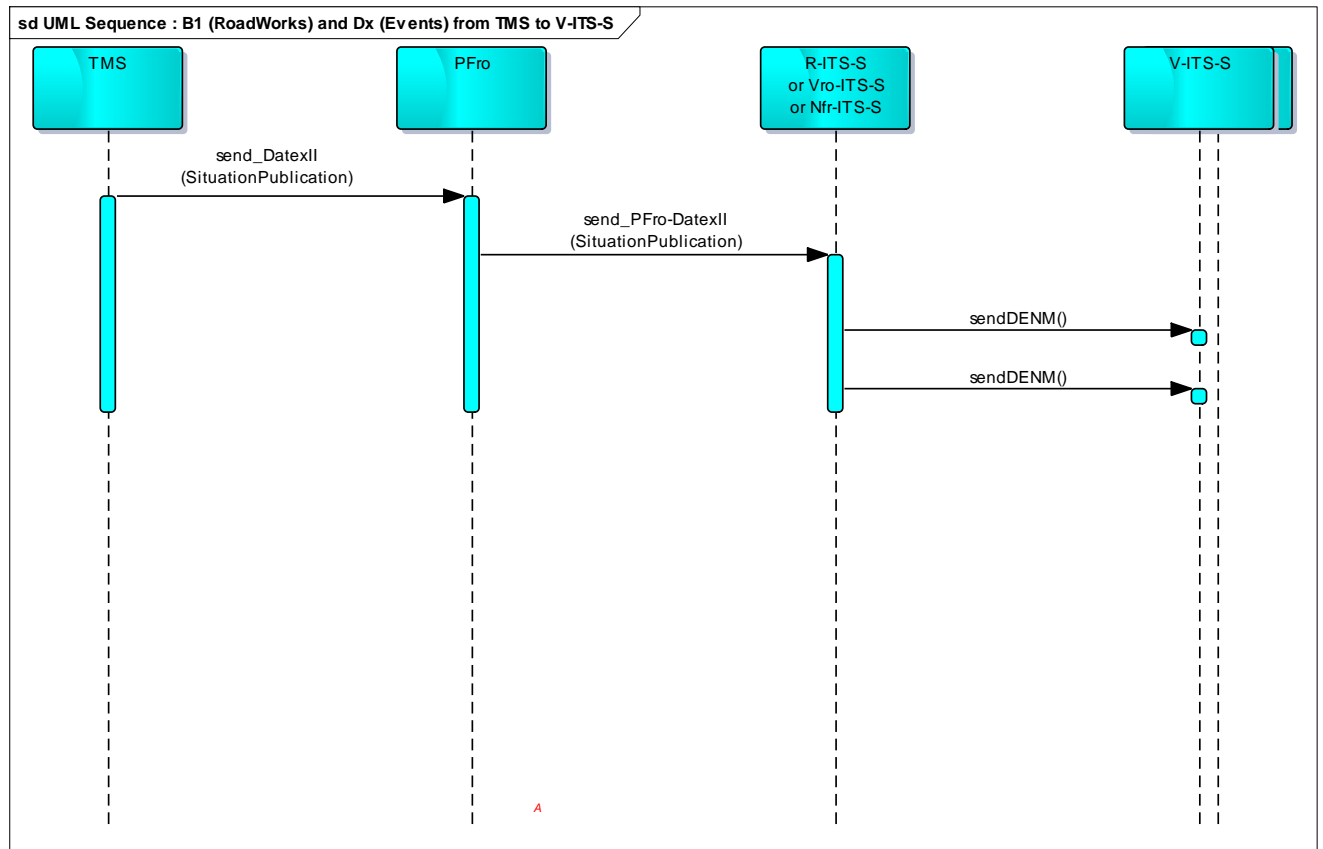


figure 14. UML sequence diagram for the events and roadworks from TMS to V-ITS-S, downlink flow

A great part of the recommendations of this document is from the proposals of the TISA [3].

*NOTE: However, it should be noted that the guide [3] is based on the TPEG2-TEC standard, which was used initially to construct the cause codes of the DENM standard. Subsequently, this standard diverged. Consequently the version of the DENM standard adopted in the French C-ITS Projects presents variances from this document. This will be specified below, where applicable.*

*NOTE: The network management, such as rerouting, speed limit, or other advertisements to the users, is not covered by this chapter, as the meaning is not covered by a DENM, but by another type of C-ITS messages (IVI, POI, MAPS...). The list of types of situationrecord covered by this chapter the list in the table 8, and in the table 11.*

## 5.2 Construction of DATEX II messages of event data

### 5.2.1 Exchange parameters: Choosing the distribution mode

ID	2414_H_SITUATION_001
Component(s)	TMS, R-ITS-S, PFro, Nfr-ITS-S
Requirement	The "Push on occurrence" mode shall be used for this use case. When the data changes, the sender returns a DATEX II message (OM1 mode).
Acceptance criteria	
Additional information	The sender transmits the data as soon as it is relevant (according to the use case) to the recipient (R-ITS-S=>PF for the upwards cases, PFro=>R-ITS-S for the downwards cases).

```
...
<operatingMode>operatingModel</operatingMode>
...
<updateMethod>allElementUpdate</updateMethod>
...
```

### 5.2.2 Message content (<PayloadPublication> and <SituationPublication>)

A message in DATEX II (for the publication) contains at least one situation (= one event or roadworks, named <SituationRecord>), and so, can contain several. The DATEX II class used to describe a situation is **<SituationPublication>**.

We need to specify the **<publicationTime>** attribute of the **<PayloadPublication>** class and the **<situationVersionTime>** attribute of the DATEX II **<Situation>** class. See Table 6 : Dates and times of a situation.

The roadwork declaration is made through the DATEX II class: **<SituationPublication>** (as for the D cases), which can contain one or more <SituationRecord> objects.

The <OperatorAction> class inherits from this **<SituationRecord>** class. And several classes inherit from this <OperatorAction> class, including the following two which can be used in the C-ITS project:

- the **<RoadWorks>** class: description of the type of roadwork, type of operator vehicles involved, etc.

- the **<NetworkManagement>** class: description of the operating actions, including in particular: signalling setting up, lane closures, speed limits, user information, etc.

ID	2414_H_SITUATION_002
Component(s)	TMS, R-ITS-S, PFro, Nfr-ITS-S
Requirement	In the French C-ITS projects, one <b>&lt;Situation&gt;</b> class shall correspond exactly to one C-ITS message.
Acceptance criteria	
Additional information	It means, that all the <b>&lt;situationRecord&gt;</b> class inside this situation class are about the same C-ITS message. It also, means, for example, that if there are four valid <b>&lt;Situation&gt;</b> classes in a DATEX II message, the R-ITS-S should create four C-ITS messages.

The situation which first situationrecord is a <TrafficElement> or a <Roadworks>, shall be translated in an DENM, with respect to the deliverables of reference.

*NOTE: this chapter only refers to the DENM, but some situationrecord can be translated into another C-ITS message, such as IVI for the C2 use case, described in the chapter 8.2 Overview of the DATEX II Model.*

The events can be linked by the DATEX II attribute “Relatedsituation”, which corresponds to the DENM attribute “referenceDenms”. These linked events, can be in the same DATEX II message, or in separate DATEX II messages.

Simplified DATEX	Simplified DENM
<datex> ... <situation ID1> Relatedsituation =ID3  <situationRecord Roadworks> <ID1> <groupOfLocations>... </groupOfLocations> </situationRecord>  <situationRecord speedmanagement> <ID2> <speedLimit> <groupOfLocations>... </groupOfLocations> </speedmanagement > </situationRecord>  <situationRecord lanemanagement> <ID5> <Lane> <groupOfLocations>... </groupOfLocations>	  ActionID: ID1 referenceDenms = ID3  CauseCode = 3  Eventposition / EventHistory /Traces   temporarySpeedLimit        TrafficFlowRule

</situationRecord>  </situation>	
<situation ID3> Relatedsituation =ID1 <situationRecord travaux> <ID4> <groupOfLocations>... </groupOfLocations> </situationRecord>  <situationRecord speedmanagement> <ID5> <speedLimit> <groupOfLocations>... </groupOfLocations> </situationRecord>  <situationRecord lanemanagement> <ID6> <Lane> <groupOfLocations>... </groupOfLocations> </situationRecord>  </situation>	ActionID: ID3 referenceDenms = ID1 CauseCode = 3  Eventposition / EventHistory /Traces  temporarySpeedLimit  TrafficFlowRule
... </datex>	

Table 5 : Extremely simplified example of DATEX II message, and its conversion in DENM

### 5.2.2.1 The DATEX II <HeaderInformation> class

The DATEX II <HeaderInformation> class, which is associated with all the publications defined in DATEX II, is mandatory. Exceptionally, for the publication of situations, this class is attached to each situation and not to the publication level itself.

ID	2414_H-HEADER_SITUATION-001
Component(s)	TMS, R-ITS-S, PFro, Nfr-ITS-S
Requirement	<HeaderInformation> includes four attributes, two of which are mandatory: For the two mandatory attributes: <ul style="list-style-type: none"> <li>The "confidentiality" attribute shall be filled in systematically with the "noRestriction" value;</li> <li>The "informationStatus" attribute shall be filled in systematically with the "real" value.</li> </ul>
Acceptance criteria	
Additional information	It is proposed not to fill in the two optional attributes.



```
<headerInformation>
  <confidentiality>noRestriction</confidentiality>
  <informationStatus>real</informationStatus>
</headerInformation>
```

*NOTE: for the test or validation cases, the "informationStatus" attribute could be filled in with "technicalExercise" or "test".*

## 5.2.2.2 The DATEX II <Situation> class

### 5.2.2.2.1 IDENTIFIER OF THE CLASS

ID	2414_H-SITUATION_CLASS-001
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	For the French C-ITS projects, a situation publication shall only contain one situation that is "versionIdentifiable"
Acceptance criteria	
Additional information	

The creation rules for identifier and version are the following:

ID	2414_H-SITUATION_CLASS-002
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	In case of downlink usecases (use cases Dx): the identifier and version are shall be defined by the platform depending on what is sent by TMS;
Acceptance criteria	
Additional information	For the "versionIdentifiable"

ID	2414_H-SITUATION_CLASS -003
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<p>In case of uplink usecases (use cases A2Dx and A3Dx): the identifier shall be created by concatenating:</p> <ul style="list-style-type: none"> <li>▪ The “actionID” DENM attribute;</li> <li>▪ The R-ITS-S “stationID” (it allows making the identifier unique);</li> <li>▪ The value “0”.</li> </ul>
Acceptance criteria	
Additional information	<p><i>NOTE: Adding the value 0 allows for using the same rule for creating identifiers for situations and situation record and guarantying unicity.</i></p> <p><i>For the versionIdentifiable</i></p>

ID	2414_H-SITUATION_CLASS-004
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	The version attribute is an integer, incremented (starting from 1) and is updated for each DENM update based on the “referenceTime” DENM attribute.
Acceptance criteria	
Additional information	

#### 5.2.2.2.2 TWO OR MORE SITUATIONS LINK

ID	2414_H-SITUATION_CLASS-005
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	If there is a link between two or more situations, then attributes “relatedSituation” shall be fulfilled with the reference to a related situation via its unique identifier.
Acceptance criteria	
Additional information	There are as many attributes in one situation as the situations linked. All the situations linked shall have these attributes fulfilled. In this case, all these situations can be in the same DATEX II publication, or in different messages.

These attributes are to be used to express the “ReferenceDenms” attribute in the roadwork container, specified in the COCSIC deliverable 2.4.1.4\_H: B1a&b.

Note : The ReferenceDenms is a sequence of ActionIDs

### 5.2.2.3 The DATEX II <SituationRecord> class

A situation can contain several DATEX II <SituationRecord> class instances to describe each element of the situation. However, all elements of a situation are connected by a causality link. They cannot be independent elements.

A DATEX II <SituationRecord> class includes several attributes. It is also associated with other classes that complete it:

- Comment (see chapter 5.2.2.3.2.3 The DATEX II <Comment> class )
- Impact (see chapter 5.2.2.3.2.1 The DATEX II <Impact> class )
- Source (see chapter 5.2.2.3.2.2 The DATEX II <Source> class )

Validity (Mandatory) (see chapter 0

- )
- groupOfLocations (see chapter 5.2.2.3.2.6 The DATEX II <groupOfLocations>); (Mandatory)
- Cause (See chapter 5.2.2.3.2.4 The DATEX II <Cause> class)
- And other optional classes, not described in this document.

#### 5.2.2.3.1 THE <SITUATIONRECORD> CLASS ATTRIBUTES

##### 5.2.2.3.1.1 The class identifier

The class identifier is mandatory (“versionedIdentifiable”):

ID	2414_H-SITUATIONRECORD_CLASS-001
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	In case of downlink usecases (use cases D); the identifier shall be defined by platform from what is provided by the traffic information and control system;
Acceptance criteria	
Additional information	

ID	2414_H-SITUATIONRECORD_CLASS-002
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	In case of uplink usecases (use cases A2Dx and A3Dx): the identifier shall be equal to the value of the “situationRecordCreationReference”
Acceptance criteria	
Additional information	see chapter 5.2.2.3.1.2 The “situationRecordCreationReference” attribute

#### 5.2.2.3.1.2 The “situationRecordCreationReference” attribute

ID	2414_H-SITUATIONRECORD_CLASS-003
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	In the French C-ITS Projects, the attribute of the situation record, called <b>&lt;situationRecordCreationReference&gt;</b> becomes mandatory. It shall be filled.
Acceptance criteria	
Additional information	This attribute contains a unique alphanumeric reference (external or GUID) of the first <b>&lt;SituationRecord&gt;</b> class occurrence version when created by the original supplier.

NOTE: it is not mandatory in the standard or in the guide [4].

#### Particularity for the downlink cases

ID	2414_H-SITUATIONRECORD_CLASS-004
Component(s)	PFro, Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	This <b>&lt;situationRecordCreationReference&gt;</b> , in the form of a text chain, may therefore not be provided by the traffic information and control system. In any case, the platform shall create it because it is used for defining the DENM “actionID” data frame (B.7).
Acceptance criteria	
Additional information	

ID	2414_H-SITUATIONRECORD_CLASS-005
Component(s)	PFro
Requirement	<p>The PFro shall create the “situationRecordCreationReference” attribute by concatenating the following information:</p> <ul style="list-style-type: none"> <li>its “stationID” (32-bit integer in hexadecimal format left padded with 0) ,</li> <li>followed by an incremental number (16-bit integer in hexadecimal format left padded with 0),</li> <li>followed by a sequence number in each situation starting from 1 (0 is allocated for the situation itself) (4-bits integer in hexadecimal format left padded with 0).</li> </ul>
Acceptance criteria	
Additional information	

One number in the hexadecimal base corresponds exactly 4 numbers in binary base.  
The SituationRecordCreationReference is on 13 hexadecimal characters.

Example of a “SRCR” from PFro	0	0	0	0	2	7	6	E	0	0	E	7	1
Meaning for an R-ITS-S:	To use to fill the OriginatingStationID								To use to fill the SequenceNumber				This R-ITS-S shall take the situationrecord with the number 1 to find the eventType.
Value in DENM	10094								231				Nothing

figure 15. *example of translation of the SituationRecordCreationReference in the downlink cases.*

There is no need for a separation character between the different concatenated elements due to the fix format.

The R-ITS-S that receives this message recovers the incremental number and the “stationID” from the platform (considered as the “originatingStationID” to fill in the “actionID” attribute of the DENM to transmit.

### Particularity for the uplink cases

ID	2414_H-SITUATIONRECORD_CLASS-006
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<p>In the case of a DATEX II message generated from a DENM, the “actionID” data element of the DENM will be used to generate this reference. The R-ITS-S and Nfr-ITS-S shall construct the DATEX II &lt;situationRecordCreationReference&gt; attribute by concatenating the following information (all the elements in hexadecimal format – as for the downlink cases):</p> <ul style="list-style-type: none"> <li>• “actionID” attribute of the DENM (keeping the “stationID” of generating V-ITS-S makes possible for the platform to verify if the same DENM is uploaded from two different RSUs)<sup>1</sup></li> <li>• followed by the “stationID” of the R-ITS-S</li> <li>• followed by a sequence number in each situation starting from 1<sup>2</sup> (this last point in order to make the identifier unique<sup>3</sup>), 4-bits integer in hexadecimal format left padded with 0.</li> </ul>
Acceptance criteria	
Additional information	

One number in the hexadecimal base corresponds exactly 4 numbers in binary base.  
 The SituationRecordCreationReference is on 13+8 hexadecimal characters :

Example of a “SRCR” from R-ITS-S	0	0	D	5	E	1	5	6	0	0	E	7	0	0	0	0	0	0	A	1
Meaning	To fill with the actionID												R-ITS-S StationID						The PFro shall take the situationrecord with the number 1 to find the eventType.	
Value in DENM	14016854								231				10						Nothing	

figure 16. *example of translation of the SituationRecordCreationReference in the uplink cases.*

<sup>1</sup> Note 1: This implies that the <situationRecordCreationReference> can be different from the “stationID” in the “actionID” (Forward by vehicles before the treatment by R-ITS-S).

<sup>2</sup> Note 2: as quite all the situations only include one situation record the corresponding sequence number is 1.

<sup>3</sup> Note 3: The uniqueness of the reference must be provided since it also serves as an ID for the situation record.

### 5.2.2.3.1.3 Time attributes

NOTE: there are two possible formats in DATEX II: either local (2015-09-29 T 10:20:00 +2:00 which represents the difference with GMT) or universal i.e. GMT ("2015-09-29 T 10:20:00 Z").

ID	2414_H-TIME-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	The universal time i.e. GMT shall be used in the French C-ITS projects, for DATEX II messages.
Acceptance criteria	
Additional information	

NOTE: Timestamps in DENM messages are in TAI (International Atomic Time), so R-ITS-S shall do a conversion. See SCOOP Deliverables "R-ITS-S specifications" for more information.

ID	2414_H-SITUATIONRECORD_CLASS-007
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<p>The following attributes shall be filled.</p> <p>The creation timestamp of a record is mandatory: <b>&lt;situationRecordCreationTime&gt;</b>.</p> <p>The version timestamp of the situation record is mandatory: <b>&lt;situationRecordVersion&gt;</b>.</p> <p>The version timestamp of the situation record by the first supplier is optional, shall be present in C-ITS Projects: <b>&lt;situationRecordFirstSupplierVersionTime&gt;</b>.</p> <p>The observation timestamp of the situation element is mandatory: <b>&lt;situationRecordObservationTime&gt;</b>.</p>
Acceptance criteria	
Additional information	

### Particularity for each use case

The table lists the values according to the use cases. It also presents in the interest of coherence, the situation version time (**<situationVersionTime>** of the DATEX II **<situation>** class - optional) and the publication time (**<publicationTime>** of the DATEX II **<PayloadPublication>** class - mandatory).

Class::attribute	M a n d .	R-ITS-S=>PF message	TMS=>PF and PFro=>R-ITS-S message
PayloadPublication::publicationTime	Y	Message creation time by the R-ITS-S	Message creation time by the platform. Not used to generate the DENM.
Situation:: situationVersionTime	N	Not used	Not used
SituationRecord:: situationRecordCreationTime	Y	Creation time of the first version of the message when the first DENM considered as the source of the situation record is processed by R-ITS-S.	Fill in (because mandatory) but not used by the R-ITS-S to create DENM.
SituationRecord:: situationRecordFirstSupplierVersionTime	Y	Creation time of the current version of the message by processing the first DENM considered as an update of the situation record; this is the time contained in the "referenceTime" data element of the DENM.	Not used by the R-ITS-S.
SituationRecord:: situationRecordObservationTime	Y	Time contained in the "detectionTime" data element of DENM where the current version of the situation record came from.	<ul style="list-style-type: none"> <li>Time used by the R-ITS-S to construct the "detectionTime" data element of DENM</li> <li>Time used by the R-ITS-S to construct the "validityduration" data element of DENM</li> </ul>
SituationRecord:: situationRecordVersionTime	Y	This is the time of the current version of the situation record via the current relay (for an R-ITS-S, it is the same piece of data as that contained in <situationRecordFirstSupplierVersionTime>)	Not used by the R-ITS-S.
validity.overallStartTime	Y	Time contained in the "detectionTime" data element of DENM where the current version of the situation record came from.	Not used by the R-ITS-S.
validity. overallEndTime	Y	Time obtained by the following calculation: detectionTime + validityduration	Time used by the R-ITS-S to construct the "validityduration" data element of DENM

Table 6 : Dates and times of a situation for DENM use cases



### 5.2.2.3.1.4 “probabilityOfOccurrence” attribute

ID	2414_H-SITUATIONRECORD_CLASS-008
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<probabilityOfOccurrence> attribute shall be filled : This is an evaluation of the probability of occurrence of the situation element signalled. It is mandatory.
Acceptance criteria	
Additional information	The possible values in DATEX II are “certain”, “probable” and “riskOf”.

In the French C-ITS Projects, a DENM can be transmitted with 3 quality levels (“InformationQuality” attribute of a DENM). The correspondence is presented in table 7:

probabilityOfOccurrence	Level of Quality
riskOf	Q1 = risk
Probable	Q2 = Probable
Certain	Q3 = Certain

Table 7 : Correspondence between “Level of Quality” and “probabilityOfOccurrence”

ID	2414_H-SITUATIONRECORD_CLASS-016
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<b>Particularity for the downlink linear cases</b> In each element of the eventHistory, an “InformationQuality” is requested. The R-ITS-S shall use the same “probabilityOfOccurrence” to fill in this attribute for all the points.
Acceptance criteria	
Additional information	

ID	2414_H-SITUATIONRECORD_CLASS-017
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<b>Particularity for the uplink linear cases</b> In the uplink linear cases, the InformationQuality related to the points of the eventHistory shall be not used by the R-ITS-S.
Acceptance criteria	
Additional information	Only the principal “InformationQuality” is filled in.

*NOTE: deliverable “2.4.1.” does not specify the default value, but requires that the DENM data element is filled in.*

*NOTE: deliverable “2.4.1.” lists for each use case the values of the InformationQuality data element corresponding to the Level of Quality used here.*

#### 5.2.2.3.1.5 The <OperatorAction> class attributes (roadworks only)

This DATEX II class is used to describe the operating actions (i.e., any action that an operator can decide to prevent or correct dangerous or deteriorated traffic conditions, including roadwork). The attributes of this class are not used in the context of the C-ITS project because they are not mandatory and they do not have an equivalent in DENM.

*NOTE: for the record the attributes are actionOrigin (internal/external), actionPlanIdentifier (PGT identifier) and operatorActionStatus (status).*

#### 5.2.2.3.1.6 The other attributes

ID	2414_H-SITUATIONRECORD_CLASS-009
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<confidentialityOverride> and <severity> attributes shall not be filled.
Acceptance criteria	
Additional information	<confidentialityOverride> and <severity> are not retained in the context of the French C-ITS Projects. They are not mandatory in DATEX II and do not have an equivalent in DENM.

### 5.2.2.3.2 THE CLASSES LINKED TO THE <SITUATIONRECORD> CLASS

#### 5.2.2.3.2.1 The DATEX II <Impact> class

The DATEX II <impact> class is used to provide an evaluation of the impact of an event or operating action (defined by the situation element) on the driving conditions. It can be expressed both in terms of lane capacity and in terms of time lost on the travel time.

ID	2414_H-SITUATIONRECORD_CLASS-010
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S

Requirement	<impact> class can be fulfilled.
Acceptance criteria	
Additional information	<p>The DATEX II <b>&lt;impact&gt;</b> class serves to qualify and quantify the lane and road restrictions. Concerning divided roads, two situation elements, one per direction, shall be created. The two attributes, “capacityRemaining” and “numberOfOperationalLanes” or “originalNumberOfLanes”, should preferably be used when they are known. When this is not possible, use the “trafficConstrictionType” attribute.</p> <ul style="list-style-type: none"> <li>• capacityRemaining: Capacity remaining: Percentage compared to the normal traffic capacity, in the direction concerned.</li> <li>• numberOfOperationalLanes or originalNumberOfLanes: in the direction concerned</li> <li>• trafficConstrictionType: Type of traffic restriction: Based on an enumeration whose possible values are: “carriagewayBlocked”, “carriagewayPartiallyObstructed”, “lanesBlocked”, “lanesPartiallyObstructed”, “roadBlocked”, “roadPartiallyObstructed”.</li> </ul>

*NOTE: The semantic difference in DATEX II between “blocked” and “partially obstructed” is important.*

### Particularity for messages created from a DENM (except A3-D8)

In the French C-ITS use cases corresponding to data from vehicles (A2 or A3, except A3D8), it will be impossible to fill the DATEX II **<impact>** class from a DENM.

### Particularity for A3-D8 and D8 use cases: “unsecured blockage of a road”

In the A3-D8 cases, the impact class makes it possible to qualify the blockage of the road because there is no predefined corresponding event (i.e., no class inherited from **<SituationRecord>** to describe a blockage. Indeed, in DATEX II, a blockage is considered as the impact of an event.

Use case	Class::attribute	Instruction and comment
A3-D8	Impact::trafficConstrictionType	<p>Fill in with the “lanesBlocked” value.</p> <p><i>NOTE: according to the capacities of the V-ITS-S, the DENM could be more complete. The R-ITS-S should verify the completeness of all data elements to verify whether it can fill in this attribute with the “carriagewayBlocked” value (case of a divided road) or “roadBlocked” value (case of a bidirectional road or case of a divided road).</i></p>

Use case	Class::attribute	Instruction and comment
D8	Impact::capacityRemaining	Fill in with the percentage (in the form of a whole number), the capacity that remains open to traffic. The opening of an emergency lane to traffic enters into account.
	Impact::NumberOfOperationalLanes	The number of usable lanes in the specified direction which remain fully operational (this may include the hard shoulder if it is being used as an operational lane).
	Impact::originalNumberOfLanes	The normal number of usable lanes in the specified direction that the carriageway has before reduction due to roadworks or traffic events.
	Impact::trafficConstrictionType	Only fill in when it is impossible to fill in the preceding attributes (especially for bidirectional roads). Use the “roadBlocked” value when the blockage is total and “lanesBlocked” value otherwise.

Table 8 : Attributes for UC “D8” & “A3-D8”

NOTE: For the French C-ITS Projects, it is proposed to not use the DATEX II **<Delays>** class (linked to the **<Impact>** class), with which one can describe the delay created either by an estimated duration (“delayTimeValue”), or by duration attributes (“DelayBandEnum”) or finally by a more subjective qualification (“DelaysTypeEnum”).

#### 5.2.2.3.2.2 The DATEX II **<Source>** class

The DATEX II **<Source>** class is used to provide information on the source of traffic information (e.g., reliable (yes/no), sourceType (camera, authority, cell phone, etc.)).

ID	2414_H-SITUATIONRECORD_CLASS-011
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<source> class can be fulfilled.
Acceptance criteria	
Additional information	<p>We recommend filling in the following attributes:</p> <ul style="list-style-type: none"> <li>“sourceName”: Name of the organisation that produced the information / Corresponds to “supplierIdentification” when the creator is the supplier (in the case where the publication is relayed, the name of the source of the original publication shall be kept).</li> <li>“sourceIdentification”: Coded information of the organisation or active equipment that produced the information concerning the version in question of the “sourceIdentification”.</li> </ul>

#### Particularity for messages created by TMS or PFro

The Platform uses the information received from the TMS.

*NOTE: there are no general rules for the TMS, since there is no equivalent in a DENM, the R-ITS-S will not use its content in preparing the messages.*

### Particularity for messages created from a DENM

In the case of an upload from the vehicles (use case A2 and A3), this class could be used to distinguish the modes. The “sourceType” attribute can be filled in with the “vehicleProbeMeasurement” value for the A2Dx cases and “registeredMotoristObserver” value for the A3Dx cases.

So the R-ITS-S uses the “stationID” data element of the DENM to fill the “sourceIdentification” of the DATEX II message which corresponds to the “transmitterID”.

#### 5.2.2.3.2.3 The DATEX II <Comment> class

ID	2414_H-SITUATIONRECORD_CLASS-012
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<comment> class can not be filled.
Acceptance criteria	
Additional information	The DATEX II <b>&lt;comment&gt;</b> class is used to enter open comments that the operator can use to exchange unstructured information or observations. The comments can be for general use or restricted use. It is proposed not to use such information.

#### 5.2.2.3.2.4 The DATEX II <Cause> class

ID	2414_H-SITUATIONRECORD_CLASS-013
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S

Requirement	<Cause> class can be fulfilled when a situation is the cause of the event defined here. When, for example, roadwork is the consequence of an accident.
Acceptance criteria	
Additional information	<p>The DATEX II <b>&lt;Cause&gt;</b> class is used when a situation is the cause of the event defined here. When, for example, roadwork is the consequence of an accident.</p> <p>There are two types of Cause in datex. From the SCOP Platform to the V-ITS-S, only the &lt; NonManagedCause&gt; class will be used. The description attribute is not mandatory. The attribute &lt;causeType&gt; shall be complete to precise the type of event.</p> <p>This attribute will be used to fill in the “<b>linkedCause</b>” in the DENM.</p>

*NOTE: the values to use or not to use in DENM, are not yet specified by the Deliverable 2412H. So the correspondence between DATEX II and DENM will be define in anupdate of the document.*

#### 5.2.2.3.2.5 The DATEX II <Validity> class

ID	2414_H-SITUATIONRECORD_CLASS-014
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<p>&lt;Validity&gt; class shall be fulfilled with</p> <ul style="list-style-type: none"> <li>• &lt;validityStatus&gt; attribut</li> <li>• &lt;overallStartTime&gt; attribut</li> <li>• &lt;overallEndTime&gt; attribut</li> </ul>
Acceptance criteria	
Additional information	<p>In the French C-ITS Projects and in all use cases, the <b>&lt;overallStartTime&gt;</b> and <b>&lt;overallEndTime&gt;</b> shall be filled in all messages from the PFro to the R-ITS-S, Nfr-ITS-S or Vro-ITS-S. These two attributes will be used to construct the “validityDuration” data element of the DENM.</p> <p>Consequently, for messages coming from TMS, if the end date is not filled in, the platform modifies the validity definition of the original DATEX II message such that the “validityStatus” attribute is made as “definedByValidityTimeSpec”. The “overallEndTime” is filled in from the “overallStartTime” value and adding the duration defined in deliverable 2.4.1.2_M depending on the considered use case.</p>

If the end date is unknown, the DATEX II **<Validity>** class is instantiated as follows:

```
...
<validity>
  <validityStatus>active</validityStatus>
  <validityTimeSpecification>
    <overallStartTime>2015-01-01T17:13:39+01:00</overallStartTime>
  </validityTimeSpecification>
</validity>
...
```

If the end date is known, the DATEX II **<Validity>** class should be instantiated as follows:

```
...
<validity>
  <validityStatus>definedByValidityTimeSpec</validityStatus>
  <validityTimeSpecification>
    <overallStartTime>2015-01-01T17:13:39+01:00</overallStartTime>
    <overallEndTime>2015-05-25T19:13:39+01:00 </overallEndTime>
  </validityTimeSpecification>
</validity>
```

These elements are presented in the Table 5.

*NOTE: The platform receive scheduled events sent from TMS. See the deliverable 2.4.3..2\_H for details.*

*NOTE: The platform, under conditions, can send updates of an event if it is not finish (modifying overallStartTime and overallEndTime)*

#### 5.2.2.3.2.6 The DATEX II **<groupOfLocations>**

For the event related messages transmitted, one should specify the location of the event, with the class **<groupOfLocations>**.

ID	2414_H-GROUPEOFLOCATION-001
Component(s)	<del>TMS</del> , PFro
Requirement	<p>In the case of point locations (e.g. there is no eventHistory in DENM message):</p> <ul style="list-style-type: none"> <li>If there is no trace, one shall use <b>&lt;groupOfLocations&gt;</b> of type "point" <ul style="list-style-type: none"> <li>pointByCoordinates (= eventPosition)</li> <li>See: 3.4</li> </ul> </li> <li>If there is 1 trace, one shall use <b>&lt;groupOfLocations&gt;</b> of type "point" <ul style="list-style-type: none"> <li>&lt;PointAlongLinearElement&gt; (= "trace")</li> <li>pointByCoordinates (= "eventPosition")</li> <li>See: 3.6</li> </ul> </li> <li>If there are 2 traces or +, one shall use <b>&lt;groupOfLocations&gt;</b> of type "NonOrderedLocationGroupByList" containing "Point" <ul style="list-style-type: none"> <li>point 1 ==&gt; Trace 1 <ul style="list-style-type: none"> <li>pointAlongLinearElement (= trace)</li> <li>pointByCoordinates (= eventPosition) <ul style="list-style-type: none"> <li>point 2 ==&gt; Trace 2</li> </ul> </li> <li>pointAlongLinearElement (= the trace)</li> <li>Optionally: pointByCoordinates (= eventPosition) <ul style="list-style-type: none"> <li>point 3 ==&gt; Trace 3</li> </ul> </li> <li>pointAlongLinearElement (= the trace)</li> <li>Optionally: pointByCoordinates (= eventPosition) <ul style="list-style-type: none"> <li>Etc.</li> <li>See: 3.7</li> </ul> </li> </ul> </li> </ul> </li> </ul>
Acceptance criteria	
Additional information	

*NOTE: for the case of an event positioned manually on the SCOOP application: the bearing will probably not be filled in. For more information, see C-ITS deliverables.*



ID	2414_H-GROUPEOFLOCATION-002 (2)
Component(s)	<del>TMS</del> , PFro
Requirement	<p>In the case of linear locations (EventHistory present in DENM message):</p> <ul style="list-style-type: none"> <li>If there is 1 trace or more, one shall use <b>&lt;groupOfLocations&gt;</b> of type "NonOrderedLocationGroupByList" containing "Linear" <ul style="list-style-type: none"> <li>linearWithinLinearElement: index =1 (EventHistory) <ul style="list-style-type: none"> <li>"PointCoordinates" with the relation "locationForDisplay" (= eventPosition))</li> <li>FromPoint: (=eventPosition = beginning of the EventHistory)</li> <li>ToPoint: (= end of the EventHistory) <ul style="list-style-type: none"> <li>linearWithinLinearElement: index = 2 (Trace 1)</li> <li>linearWithinLinearElement: index = 3 (Trace 2)</li> <li>etc.</li> <li>See: 3.8.</li> </ul> </li> </ul> </li> </ul> </li> </ul> <p><del>The Roadtype is expressed in Punctual Location (see chepter 3.9.2). It shall be at the end of the Location.</del></p>
Acceptance criteria	
Additional information	

*NOTE: The coordinates transmitted by the platform, are not necessarily those of a "PR" or "PLO" ... In consequence, when the coordinates are not "PR" or "PLO", the "referentType", set to "referenceMarker" in the examples in the present document, shall not be set to "RIU", but to "roadNode", as for R-ITS-S. For more information, see deliverables for the platform.*

*NOTE: The vehicles have their own algorithm for the points. Sometimes, there can be no points inside a trace. For more information, see deliverables for the V-ITS-S.*

#### 5.2.2.3.2.7 The kinematics of events

DATEX II can be used to manage versions of messages and therefore events. This particularity of DATEX II is not detailed in this deliverable. Readers should refer to the DATEX II [4] guide.

#### 5.2.2.3.3 THE CLASSES INHERITED FROM THE <SITUATIONRECORD> CLASS: <ACCIDENT>, <GENERALOBSTRUCTION>, ETC. EXCEPT ROADWORKS

Several classes inherit the abstract **<SituationRecord>** class. These derivative classes are used to define the type of use case encountered.

Here is an extract of an xml message indicating how to perform this heritage between the

**<SituationRecord>** class and the **<accident>** class.

```

...
<situationRecord xsi:type="Accident" version="1" id="GUID2A22530C-D452-4ae8-B942-
993BC2923D14">
...
  <accidentType>accidentInvolvingHazardousMaterials</accidentType>
...
</situationRecord>

```

The following table describe the correspondence in the context of the French C-ITS Projects between the DATEX II messages and the DENMs. This table describes:

- the messages sent by the R-ITS-S to the platform
- the messages sent by the platform to the R-ITS-S
- the messages sent by the platform to the TMS

ID	2414_H-UC-001 (1)
Component(s)	TMS
Requirement	The messages sent by the TMS to the platform shall refer to <del>this table 9</del> the 2.4.1.4_M ANNEXE 2
Acceptance criteria	
Additional information	<p>However, TMS may know other classes. In order to be as interoperable as possible, this document proposes a second table in the appendix, with the correspondence between the classes recommended by the DATEX II France WG and the French C-ITS DENMs.</p> <p>The “TISA” column in the following table indicates whether the correspondence proposed for the case in question complies with the correspondence of the document defined in the document [3] written by TISA. The “DATEX II France” column indicates whether the correspondence proposed for the case is present in the guide [4].</p> <p>The appendix of this document contains the list of all derivative classes of <b>&lt;SituationRecord&gt;</b> and a correspondence in DENM.</p>

*NOTE: there is not always strict correspondence of the meanings between the DATEX II class and the DENM (for example: loss of the “temporary” aspect of a slippery road in DENM, to a DATEX, or the DATEX II message signalling “black ice” in DATEX, implies that the road is slippery).*

the French C-ITS use-cases Name	CC / subC		TISA	DATEX II France	Derivative class of <SituationRecord>	Typical attribute of the derivative class and value of the attribute	Comments
A3-D5: Unprotected accident-area	2	0	no	yes	GeneralObstruction	obstructionType = UnprotectedAccidentArea	This attribute value is not recommended by the DATEX II France WG, but corresponds to the DENM.
D5: Unprotected accident-area	2	0	no	yes	Accident	accidentType = accident	

#### 2.4.1.4\_M-SPECIFICATION OF DATEX II V2.3 MESSAGES IN CONJUNCTION WITH C-ITS MESSAGES

the French C-ITS use cases Name	CC / subC		TISA	DATEX II France	Derivative class of <SituationRecord>	Typical attribute of the derivative class and value of the attribute	Comments
D5: Unprotected accident area	2	1	no	yes	Accident	accidentType = multivehicAccident	
D5: Unprotected accident area	2	2	no	no	Accident	accidentType = seriousAccident	
D5: Unprotected accident area	2	3	no	yes	Accident	accidentType = accidentInvolvingHeavyLorries	
D5: Unprotected accident area	2	4	no	yes	Accident	accidentType = accidentInvolvingBuses	
D5: Unprotected accident area	2	5	no	yes	Accident	accidentType = accidentInvolvingHazardous Materials	
D5: Unprotected accident area	2	7	yes	yes	GeneralObstruction	obstructionType = UnprotectedAccident Area	This attribute value is not recommended by the DATEX II France WG, but corresponds exactly to the DENM.
A2-D1 and D1: temporarily slippery road	6	0	yes	no	WeatherRelatedRoadCondition	weatherRelatedRoadConditionType = slipperyRoad	
D1: Temporarily slippery road - persistent frost	6	1	no	yes	poorEnvironmentConditions	poorEnvironmentType = frost	
D1: Temporarily slippery road - diesel fuel	6	2	yes	yes	NonWeatherRelatedRoadConditions	nonWeatherRelatedRoadConditionType = petrolOnRoad	
D1: Temporarily slippery road - mud	6	3	yes	yes	NonWeatherRelatedRoadConditions	nonWeatherRelatedRoadConditionType = mudOnRoad	
D1: Temporarily slippery road - snow	6	4	no	yes	WeatherRelatedRoadCondition	WeatherRelatedRoadConditionType = snowOnTheRoad	
D1: Temporarily slippery road - ice	6	5	yes	no	WeatherRelatedRoadCondition	weatherRelatedRoadConditionType = ice	
D1: Temporarily slippery road - black ice	6	6	yes	yes	WeatherRelatedRoadCondition	weatherRelatedRoadConditionType = blackIce	
D1: Temporarily slippery road - oil	6	7	yes	yes	NonWeatherRelatedRoadConditions	nonWeatherRelatedRoadConditionType = oilOnRoad	
D1: Temporarily slippery road - gravel	6	8	yes	yes	NonWeatherRelatedRoadConditions	nonWeatherRelatedRoadConditionType = looseChippings	
D1: Temporarily slippery road - black ice	6	9	no	yes	WeatherRelatedRoadCondition	WeatherRelatedRoadConditionType = freezingRain	
D1: Road temporarily slippery - roads salted	6	10	no				No possibility currently in DATEX II to send a message signifying "The road is slippery, even though it has been salted." The following message cannot be sent with the DATEX II

## 2.4.1.4\_M-SPECIFICATION OF DATEX II V2.3 MESSAGES IN CONJUNCTION WITH C-ITS MESSAGES

the French C-ITS use cases Name	CC / subC		TISA	DATEX II France	Derivative class of <SituationRecord>	Typical attribute of the derivative class and value of the attribute	Comments
							standard version. Therefore it is proposed to operators to send two messages: "slippery road" and/or "salting underway", which will result in 2 different DENMs: 6/0 and 3/3.
A3-D8 and D8: Unsecured Blockage on the road	5	0	no	yes	GeneralObstruction	ObstructionType = obstructionOnTheRoad	The trafficConstrictionType = roadBlocked attribute should be specified. See 5.2.2.3.2.1 The DATEX II <Impact> class. In DATEX II, this class does not automatically imply blockage.
D8: Unsecured Blockage on the road	5	0	yes	yes	EnvironmentalObstruction	environmentalObstructionType = rockfalls	The trafficConstrictionType = roadBlocked attribute should be specified. See 5.2.2.3.2.1 The DATEX II <Impact> class. In DATEX II, this class does not automatically imply blockage.
D8: Unsecured Blockage on the road	5	0	no	yes	EnvironmentalObstruction	environmentalObstructionType = subsidence	The trafficConstrictionType = roadBlocked attribute should be specified. See 5.2.2.3.2.1 The DATEX II <Impact> class. In DATEX II, this class does not automatically imply blockage.
D8: Unsecured Blockage on the road	5	0	yes	yes	WeatherRelatedRoadCondition	weatherRelatedRoadConditionType = snowDrifts	The trafficConstrictionType = roadBlocked attribute should be specified. See 5.2.2.3.2.1 The DATEX II <Impact> class. In DATEX II, this class does not automatically imply blockage.
D8: Unsecured Blockage on the road	5	0	no	yes	InfrastructureDamageObstruction	infrastructureDamageType = burstPipe	The trafficConstrictionType = roadBlocked attribute should be specified. See 5.2.2.3.2.1 The DATEX II <Impact> class. In DATEX II, this class does not automatically imply blockage.
A3-D3 and D3: Obstacle on the road	10	0	yes	yes	GeneralObstruction	obstructionType = objectOnTheRoad	
A3-D2a and D2a: animal on the road	11	0	yes	yes	AnimalPresenceObstruction	animalPresenceType = animalsOnTheRoad	For the D2a case, we should give priority to express the "animalsOnTheRoad" attribute in DENM. In DATEX, one cannot specify "wild" or "small".
D2a Animal on the road - wild	11	1	no	yes	AnimalPresenceObstruction	animalPresenceType = animalsOnTheRoad	No exact correspondence in DATEX II. Preferably use the subcausecode 0 in the platform to R-ITS-S direction. Note that the notion "wild animal" is present in TPEG. A request to upgrade DATEX II should be made to that end.
D2a Animal on the road - herd	11	2	yes	no	AnimalPresenceObstruction	animalPresenceType = herdOfAnimalsOnTheRoad	
D2a Animal on the road - small animal	11	3	no	yes	AnimalPresenceObstruction	animalPresenceType = animalsOnTheRoad	No exact correspondence in DATEX II. Preferably use the subcausecode 0 in the platform to R-ITS-S direction. Today there is no exact correspondence in DATEX II nor in TPEG. The DENM 11/3 will not be sent by an R-ITS-S but the R-ITS-S can interpret the message if it receives it.
D2a Animal on the road - big animal	11	4	yes	no	AnimalPresenceObstruction	animalPresenceType = largeAnimalsOnTheRoad	
A3-D2b and D2b: People on the road	12	0	yes	yes	GeneralObstruction	obstructionType = peopleOnRoadway	

#### 2.4.1.4\_M-SPECIFICATION OF DATEX II V2.3 MESSAGES IN CONJUNCTION WITH C-ITS MESSAGES

the French C-ITS use cases Name	CC / subC	TISA	DATEX II France	Derivative class of <SituationRecord>	Typical attribute of the derivative class and value of the attribute	Comments
E6: Warning exceptional weather conditions	17 1	yes	yes	poorEnvironmentConditions	poorEnvironmentType = stormForceWinds	In DATEX II, the code to use depends on the wind speed. We assume that we are talking of severe winds currently encountered in France: between 90 km/h and 120 km/h (preconized by Météo France)
E6: Warning exceptional weather conditions	17 4	no	no	poorEnvironmentConditions	poorEnvironmentType = thunderstorms	
A2-D6 and D6: Warning reduced visibility	18 0	yes	no	poorEnvironmentConditions	poorEnvironmentType = visibilityReduced	
D6: Warning reduced-visibility	18 1	yes	yes	poorEnvironmentConditions	poorEnvironmentType = denseFog	
D6: Warning reduced-visibility	18 2	yes	no	poorEnvironmentConditions	poorEnvironmentType = smokeHazard	Even though not present today, "smokeHazard" should be quickly added to the guide [4].
D6: Warning reduced-visibility	18 3	yes	yes	poorEnvironmentConditions	poorEnvironmentType = snowFall	
D6: Warning reduced-visibility	18 4	no	yes	poorEnvironmentConditions	poorEnvironmentType = heavyRain	
D6: Warning reduced-visibility	18 5	no	no	poorEnvironmentConditions	poorEnvironmentType = hail	
A2-E6: Warning exceptional weather conditions	19 0	no	yes	poorEnvironmentConditions	poorEnvironmentType = badWeather	Note, there is no exact correspondence in DATEX II. The DATEX II value signifies "bad weather" while the DENM value signifies "rain".
A2-D11: warning end-of queue	27 0	no		AbnormalTraffic	abnormalTrafficType = queuingTraffic abnormalTrafficType = stationaryTraffic	Note, there is no exact correspondence in DATEX II. The DATEX II value signifies "low speed, stop and go traffic", while the DENM value signifies "End of hazardous end of queue". According 2431_H, TMS shall not send D11.
A2-D4a and D4a: stationary vehicle	94 0	no	yes	VehicleObstruction	vehicleObstructionType = vehicleStuck	We can add the vehicle's characteristics. Note, there is no exact correspondence in DATEX II. The DATEX II value signifies that the vehicle is blocked due to environmental conditions, while the DENM value signifies that the vehicle is stationary (but not a case of a breakdown or accident). The DATEX II France WG will propose to extend this value to the case of a stationary vehicle for a reason other than a breakdown or accident.
A2-D4b and D4b: broken down vehicle	94 2	no	yes	VehicleObstruction	vehicleObstructionType = brokenDownVehicle	We can add the vehicle's characteristics. In the A2-D4b case, the DENM transmitted does not specify whether the vehicle blocks the road or is on the side of the road. In the D4b case, we can specify this.
A2-D5: Unprotected accident area	94 3	no	yes	VehicleObstruction	vehicleObstructionType = damagedVehicle	We can add the vehicle's characteristics (In DATEX II, the same logic as the DENM, we do not report the accident, but the fact that the vehicle is damaged). The DENM transmitted does not specify whether the vehicle blocks the road or is on the side of the road.

## 2.4.1.4\_M-SPECIFICATION OF DATEX II v2.3 MESSAGES IN CONJUNCTION WITH C-ITS MESSAGES

the French C-ITS use cases Name	CC / subC		TISA	DATEX II France	Derivative class of <SituationRecord>	Typical attribute of the derivative class and value of the attribute	Comments
A2-D10 warning emergency brake	99	1	no		VehicleObstruction	vehicleObstructionType = dangerousSlowMovingVehicle	Note, there is no exact correspondence in DATEX. The DATEX II value signifies "slow moving vehicles", while the DENM value signifies "Brake lights on."
D7: Wrong way vehicle	14	2	yes	yes	VehicleObstruction	vehicleObstructionType = vehicleOnWrongCarriageway	Some vehicle's characteristics can be added to the message, but won't be used in the DENM.
E7 : traffic jam ahead	4	0			AbnormalTraffic	abnormalTrafficType = stationaryTraffic abnormalTrafficType = queuingTraffic	

*Table 9 : Correspondence between the DATEX II messages and the DENM messages*

### 5.2.2.3.4 THE <ROADWORKS> CLASS

#### 5.2.2.3.4.1 The <RoadWorks> class attributes

ID	2414_H-ROADWORK_CLASS-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	The following attributes can be filled in: <ul style="list-style-type: none"> <li>“underTraffic”.</li> <li>“urgentRoadworks”</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>“underTraffic”: Roadwork under traffic indicates if the roadwork is done under traffic (Boolean). “underTraffic = True” means that the roadwork encroaches on the carriageway and can affect road traffic. “underTraffic = False” means that the roadwork does not affect road traffic or that the road is closed.</li> <li>“urgentRoadworks”: <b>Urgent roadwork</b> indicates if the roadwork is considered urgent (Boolean)</li> </ul>

Since there is no equivalent in a DENM, the R-ITS-S will not use these two attributes in preparing the messages.

#### 5.2.2.3.4.2 The classes linked to the <RoadWorks> class

##### 5.2.2.3.4.2.1 The DATEX II <Mobility> class

ID	2414_H-ROADWORK_CLASS-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<Mobility> class can be used to specify the mobility of the roadworks:
Acceptance criteria	
Additional information	“mobilityType” are : <ul style="list-style-type: none"> <li>“stationary”</li> <li>“mobile”</li> <li>“unknown”</li> </ul>

ID	2414_H-ROADWORK_CLASS-003
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<b>Particularity for the uplink cases</b> <ul style="list-style-type: none"> <li>In the obstruction cases, if the eventSpeed is present in the DENM and positive, then the mobilityType shall be set to mobile.</li> <li>In the obstruction cases, if the eventSpeed is zero, then the mobilityType shall be set to stationary.</li> </ul>
Acceptance criteria	
Additional information	

ID	2414_H-ROADWORK_CLASS-004
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<b>Particularity for the uplink cases</b> <ul style="list-style-type: none"> <li>In Roadworks cases, the mobilityType shall correspond to the DENM SubCauseCode : see Table 10</li> </ul>
Acceptance criteria	
Additional information	In any other case, mobility class shall not be present.

DENM CauseCode/SubCauseCode	DATEX II mobilityType
3/3 (Slow moving Road Maintenance)	mobilityType = mobile
15/0 (Rescue and recovery work in progress)	mobilityType = mobile
26/1 (maintenance Vehicle)	mobilityType = mobile
95/0 (Emergency vehicle approaching)	mobilityType = mobile
26/6 (snow plough)	mobilityType = mobile
26/8 (salting vehicle)	mobilityType = mobile
3/6 (winter service)	mobilityType = mobile

Table 10 : Correspondance for “mobilityType” for uplink cases

ID	2414_H-ROADWORK_CLASS-005
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<b>Particularity for the downlink cases</b> R-ITS-S shall use the translation table (Table11) for the C-ITS Projects, for the messages from the platform to the R-ITS-S.
Acceptance criteria	
Additional information	



Data in the DATEX II message from the platform	R-ITS-S shall change into this value:
Value = Stationary	3/0 or 3/1 (depending on the other DATEX II values)
Value = Mobile	3/3
Value = Unknown	3/0
Data Absent	3/0

*Table 11 : Correspondance for “mobilityType” for downlink cases*

*NOTE: This class is only usable with three DATEX II classes. Besides road works, it can be found with the <Activity> and <Obstruction> classes. This does not allow determining the DENM “EventSpeed” data element.*

## 5.2.2.3.4.2.2 The DATEX II &lt;MaintenanceVehicles&gt; class (optional)

ID	2414_H-ROADWORK_CLASS-006
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<MaintenanceVehicles> class can be used to provide information about the vehicles involved in the roadwork.
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>- “numberOfMaintenanceVehicles”: the number of vehicles involved (not used because there is no equivalent in DENM).</li> <li>- “maintenanceVehicleActions”: this attribute details the action mode of the operator vehicles (several simultaneous values are possible): <ul style="list-style-type: none"> <li>• “maintenanceVehiclesMergingIntoTrafficFlow” (operator vehicle in traffic)</li> <li>• “saltAndGritSpreading” (salting / grit spreading)</li> <li>• “slowMoving” (slow moving operator vehicle)</li> <li>• “snowClearing” (snow clearing)</li> <li>• “stoppingToServiceEquipment” (stopping to service on or near the road)</li> </ul> </li> </ul>

This class is used to clarify the “EventType” data element of the DENM.

## 5.2.2.3.4.2.3 The DATEX II Subjects class (optional)

ID	2414_H-ROADWORK_CLASS-007
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<Subjects> class shall not be used its content in preparing the messages.
Acceptance criteria	
Additional information	<p>This class is used to specify what the roadwork concerns:</p> <ul style="list-style-type: none"> <li>• “numberOfSubjects”: number of subjects concerned</li> <li>• “subjectTypeOfWorks”: attribute that specifies the type, for example: “bridge”, “gasMainWork” (gas main), “junction” (intersection), “roadSigns” (VMS), etc. (not used because there is no equivalent in DENM).</li> </ul>

### 5.2.2.3.4.3 The inherited classes of the <RoadWorks> class

The <RoadWorks> class shall be instantiated in the form of one of its two inherited classes.

#### 5.2.2.3.4.3.1 The DATEX II <ConstructionWorks> class

ID	2414_H-ROADWORK_CLASS-008
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<<ConstructionWorks> class can not be used. Since there is no equivalent in a DENM, the R-ITS-S will not use its content in preparing the messages
Acceptance criteria	
Additional information	It only includes one attribute: “ <b>constructionWorkType</b> ”, which specifies the type of construction work underway. The possible values are: <ul style="list-style-type: none"> <li>• “blastingWork” (blasting)</li> <li>• “constructionWork” (Construction work)</li> <li>• “demolitionWork” (Demolition work)</li> </ul> (The other values are not recommended in France).

#### 5.2.2.3.4.3.2 The DATEX II <MaintenanceWorks> class

ID	2414_H-ROADWORK_CLASS-009
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<< MaintenanceWorks > class can be used. This class is used to clarify the “EventType” data element of the DENM.
Acceptance criteria	
Additional information	It only includes one attribute: “roadMaintenanceType”, which specifies the type of work, including equipment maintenance or installation. The values are, for example: <ul style="list-style-type: none"> <li>• “maintenanceWork”</li> <li>• “repairWork”</li> <li>• “roadsideWork”</li> <li>• “saltingInProgress”</li> <li>• “snowploughsInUse”</li> <li>• “treeAndVegetationCuttingWork”</li> </ul>

### 5.2.2.3.5 THE <NETWORKMANAGEMENT> CLASS

This chapter only concerns the networkmanagement class as a second, or third, situationrecord in the publication. It means when DATEX II data are used to enhanced information inside a DENM.

#### 5.2.2.3.5.1 The class attributes

ID	2414_H-NETWORKMANAGEMENT_CLASS-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<p>The attribute “complianceOption” shall be present.</p> <ul style="list-style-type: none"> <li>Indicates if the action is advisory or mandatory</li> </ul> <p>The other following attributes can be used:</p> <ul style="list-style-type: none"> <li>“applicableForTrafficDirection”: The direction concerned by the network management operation</li> <li>“applicableForTrafficType”: The type of traffic concerned by the network management operation</li> <li>“automaticallyInitiated”: Indicates if the network management operation is implemented automatically by a system</li> <li>“placesAtWhichApplicable”: Locations concerned by the network management operation.</li> </ul>
Acceptance criteria	
Additional information	The “applicableForTrafficDirection” attribute will be used to establish the DENM data element “relevanceTrafficDirection”: “ <b>upstreamTraffic</b> ” or “ <b>allTrafficDirection</b> s”.

*NOTE: This attribute is used for defining the actually impacted driving direction(s) regarding the traffic management actions and the ones where road works are located. The given direction is either geographic (e.g. “northBound”) or topologic (e.g. “outerRing”). To do this the DATEX II <AffectedCarriagewayAndLanes> class is also used.*

ID	2414_H-NETWORKMANAGEMENT_CLASS-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<p><b>Particularity for the uplink cases</b></p> <p>In case of upload messages from DENM that do not include the “closedLanes” or “restriction” attributes, the R-ITS-S shall not instantiate the DATEX II &lt;NetworkManagement&gt; class.</p> <p>If the uploaded message includes one or the other of these attributes a DATEX II &lt;NetworkManagement&gt; shall be instantiated with “complianceOption” attribute set to “mandatory”.</p>
Acceptance criteria	
Additional information	

ID	2414_H-NETWORKMANAGEMENT_CLASS-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<p><b>Particularity for the downlink cases</b></p> <p>In case of downlink messages, the platform shall fill in the attribute depending on what is sent by TMS.</p>
Acceptance criteria	
Additional information	

### 5.2.2.3.5.2 The classes linked to the <NetworkManagement> class

ID	2414_H-NETWORKMANAGEMENT_CLASS-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<p>&lt;VehicleCharacteristics&gt; attribute can be used to fill in the “Restriction” data element of the DENM:</p> <ul style="list-style-type: none"> <li>• The DATEX II &lt;VehicleCharacteristics&gt; class or if this class is present the “vehicleType” attribute is missing then the DENM “restriction” data frame is missing.</li> <li>• The restriction applies to all vehicle types: when the DATEX II “vehicleType” attribute = “anyVehicle” then the DENM restriction = {all stations}</li> <li>• The restriction applies to some vehicle types: when the DATEX II “vehicleType” attribute = {some stations} then the DENM restriction = {same stations}</li> <li>• Information is unknown: when the DATEX II “vehicleType” attribute = “unknown” then the DENM restriction = “unknown”</li> </ul>
Acceptance criteria	
Additional information	The DATEX II <VehicleCharacteristics> class used to describe the characteristics of the vehicle is linked to the <b>&lt;NetworkManagement&gt;</b> class by the “forVehiclesWithCharacteristicsOf” association. This reusable class contains the description of the vehicle categories that the operating applications apply to.

### 5.2.2.3.5.3 The inherited classes of the <NetworkManagement> class

In the French C-ITS projects, the <NetworkManagement> class can be instantiated by one of the following classes:

#### 5.2.2.3.5.3.1 The DATEX II <GeneralNetworkManagement> class

ID	2414_H-NETWORKMANAGEMENT_CLASS-003
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<GeneralNetworkManagement> is not used. These attributes are not used to generate the DENM.
Acceptance criteria	
Additional information	The attributes are as follows: <ul style="list-style-type: none"> <li>“generalNetworkManagementType”: Type of action, for example: “convoyService”, “obstacleSignalling”, “temporaryTrafficLights”, “tollGatesOpen”, etc.</li> <li>“trafficManuallyDirectedBy”: Type of person who manages the traffic (applicable if “generalNetworkManagementType” is “trafficBeingManuallyDirected”). For example, police officer, etc.</li> </ul>

#### 5.2.2.3.5.3.2 The DATEX II <SpeedManagement> class

ID	2414_H-NETWORKMANAGEMENT_CLASS-004
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<speedmanagement> class is used to provide the speed limit to comply with on the roadwork.
Acceptance criteria	
Additional information	The attributes are as follows: <ul style="list-style-type: none"> <li>“speedManagementType”: Type of action on the speed, for example: “reduceYourSpeed”, “observeSpeedLimit”, “policeSpeedChecksInOperation” (speed camera check in progress), etc.</li> <li>“temporarySpeedLimit”: Temporary speed that can correspond to a recommended or mandatory speed (expressed in km/h)</li> </ul> <p>This attribute will be used to fill in the “B.44 SpeedLimit” data element of the DENM.</p>

### 5.2.2.3.5.3.3 The DATEX II <RoadOrCarriagewayOrLaneManagement> class

ID	2414_H-NETWORKMANAGEMENT_CLASS-005
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<RoadOrCarriagewayOrLaneManagement> class is used to specify the type of action expected by users.
Acceptance criteria	
Additional information	<p>The attributes are as follows:</p> <ul style="list-style-type: none"> <li>“roadOrCarriagewayOrLaneManagementType”: Type of road, carriageway or lane management action. The values are, for example: “clearALaneForEmergencyVehicles”, “carPoolLaneInOperation”, “clearALaneForSnowploughsAndGrittingVehicles”, “keepToTheLeft”, etc.</li> <li>“minimumCarOccupancy”: Minimum number of people required in the vehicle if “roadOrCarriagewayOrLaneManagementType” = “carPoolLaneInOperation”.</li> </ul>

### 5.2.2.3.5.3.4 The DATEX II <WinterDrivingManagement> class

ID	2414_H-NETWORKMANAGEMENT_CLASS-006
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<WinterDrivingManagement> class will not be used in SCOOP wave 1. It will be studied for SCOOP wave 2.
Acceptance criteria	
Additional information	<p>The attribute is as follows:</p> <ul style="list-style-type: none"> <li>“winterEquipmentManagementType”: Type of winter equipment to use (e.g., chains, snow tyres, etc.)</li> </ul>



#### 5.2.2.3.5.3.5 The DATEX II <GeneralInstructionOrMessageToRoadUsers> class

ID	2414_H-NETWORKMANAGEMENT_CLASS-007
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	< GeneralInstructionOrMessageToRoadUsers > class will not be used in SCOOP wave 1. It will be studied later
Acceptance criteria	
Additional information	<p>The attributes are as follows:</p> <ul style="list-style-type: none"> <li>“generalInstructionToRoadUsers”: Type of general instruction to users (e.g., “allowEmergencyVehiclesToPass”, “avoidTheArea”, “observeAmberAlert”, “observeSigns”, “switchOffEngine”, “useFogLights”, etc.</li> <li>“generalMessageToRoadUsers”: free composition to signal a general message to users (e.g. kidnapping warning).</li> </ul>

#### 5.2.2.3.5.4 Correspondence between DENM and the DATEX II <RoadWorks> class

Name	CC/ SCC	MaintenanceWorks:: RoadMaintenanceType =	Mobilit yType =	MaintenanceVehicl eActions =
B1 Roadwork Warning - planned roadwork - stationary	3/0	roadworks	stationary	<i>Absent</i>
B1c Roadwork Warning - planned roadwork - mobile	3/3	roadworks	mobile	<i>Absent</i>
B2c Roadwork Warning – road operator intervention – operator vehicle on patrol	26/1	roadworks	mobile	slowMoving
B2b Roadwork Warning – road operator intervention – operator vehicle stopped in protected mode	15/0	roadworks	mobile	stoppingToServiceEquipments
B2a Roadwork Warning – road operator intervention – operator vehicle out on service call (alert operator vehicle approaching)	95/0	roadworks	mobile	maintenanceVehiclesMergingIntoTrafficFlow
B3c – Roadwork Warning - winter maintenance – winter road maintenance vehicle on road	3/6	saltingInProgress	mobile	slowMoving
B3b – Roadwork Warning - winter maintenance – winter road maintenance vehicle clearing snow	26/6	snowploughsInUse	mobile	snowClearing
B3a – Roadwork Warning - winter maintenance – winter road maintenance vehicle is salting	26/8	saltingInProgress	mobile	saltAndGritSpreading

*Table 12 : Correspondence between DENM and the DATEX II <RoadWorks> class*

Some other values may be transmitted by TMS in case of downlink DATEX II messages. All these values are translated by the platform into a DATEX II “MaintenanceWorks” class with the “roadMaintenanceType” attribute set to “roadworks”. This includes all the cases defined by the DATEX II “ConstructionWorks” class.

#### 5.2.2.3.6 CASE OF THE TEMPERATURE

For all use cases using the **<PoorEnvironnementConditions>** class, the outside temperature can be sent.

```
<situationRecord xsi:type="PoorEnvironmentConditions" version="1" id="GUID2A22530C-
D452-4ae8-B942-993BC2923D14">
```

```
...
  <temperature>
    <airTemperature>-1</airTemperature>
  </temperature>
...
</situationRecord>
```

This attribute will be used to fill in the “B.18 ExternalTemperature” data element of DENM.

#### 5.2.2.3.7 SPECIAL CASES FOR TRAFFIC JAM AHEAD

In DATEX II, this case will be covered by the messages where the type of “SituationRecord” is value StationaryTraffic in “AbnormalTraffic.abnormalTrafficType”.

## 6 VMS publication

This chapter is completed by:

- 2.4.1.4\_H Annex3: Translation of a VMS Datex II message into an IVI,
- 2.4.1.4\_H Annex6: DATEXII Schema\_2\_2\_3\_PFroDatexII.xsd.

### 6.1 Description of the use case

This C3 use case is only in the downlink direction.

Two types of data are required by an IVI message.

- Some are static: position, contact data.
- And the others are dynamic: text or pictogram...

The IVI message contains dynamics mandatory attributes.

The TMS or VMS control system sends the static data, in the table of the location of the e-VMS to the platform.

The TMS or VMS control system sends the dynamic information of the DATEX II VMS messages to the platform.

The platform, with the two precedent publications, sends one relevant publication to the R-ITS-S, Vro-ITS-S and the national Nfr-ITS-S. The ITS Station sends IVIs based on the parameters received.

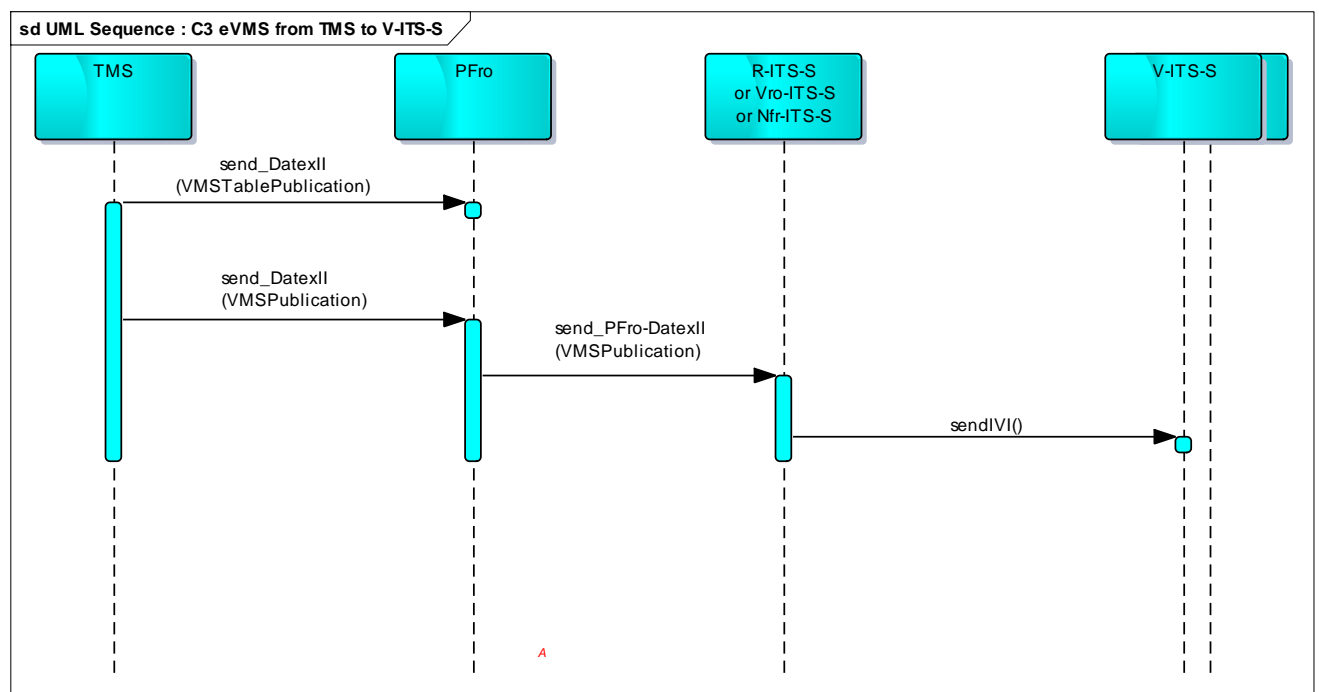


figure 17. UML sequence diagram for the VMS locations and messages from TMS to V-ITS-S, downlink flow

NOTE: more details about the translation of the DATEX II into the IVI structure are in the Annex3.

## 6.2 Overview of the DATEX II model

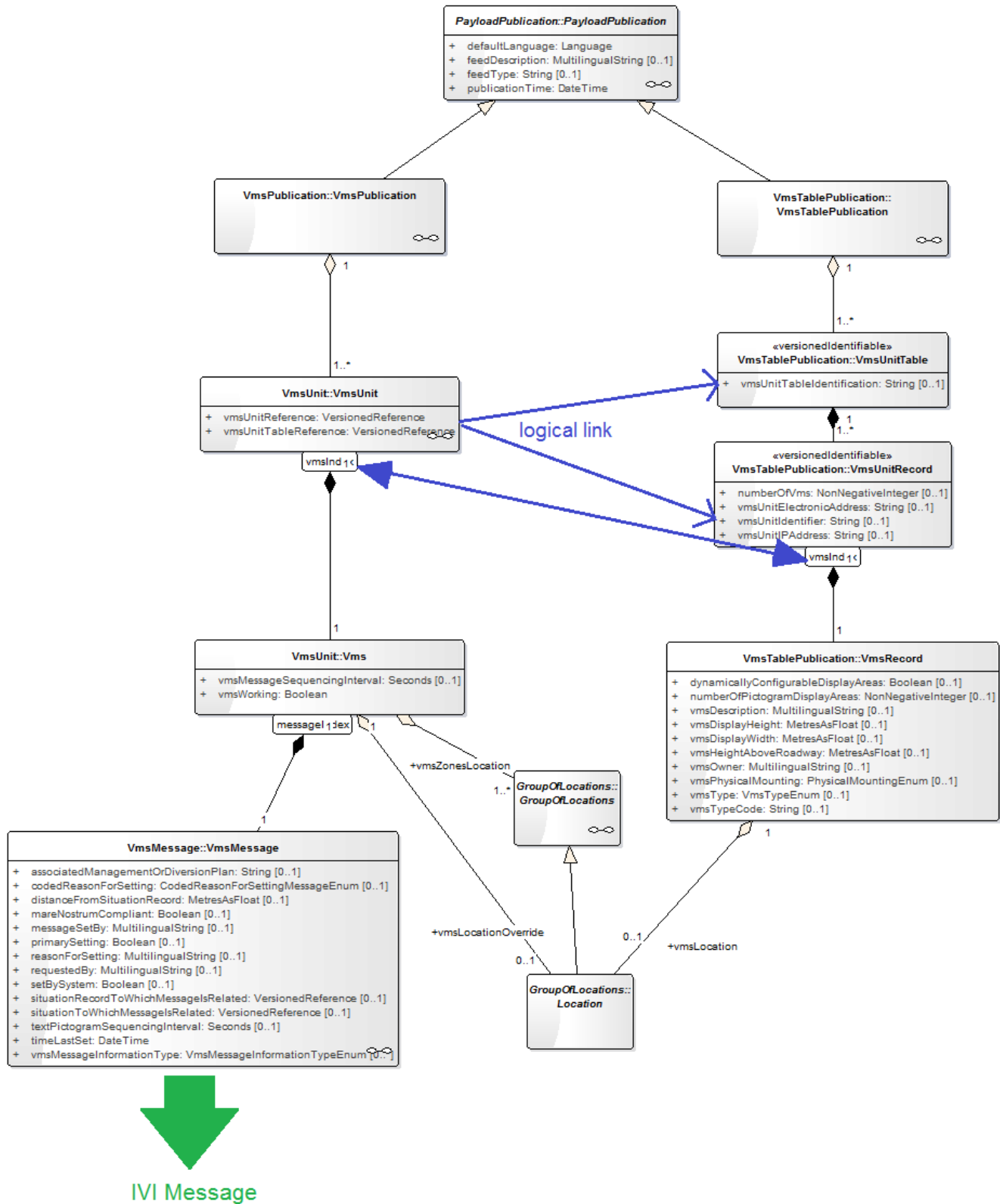


figure 18. Overview of the DATEX II model about VMS

*NOTE: This is only an extract; the entire model is available on the [datex2.eu](http://datex2.eu) website and in the 2.4.1.4\_H Annex xsd : DATEXIISchema\_2\_2\_3\_PFroDatexII.xsd.*

## 6.3 Configuration of the VMS location between TMS and Platform based on <VmsTablePublication>

This publication will only be used between TMS and the platform to send the position and characteristics of the VMS.

There is no change in this publication, than in the DATEX II one. Consequently, the reader will refer to DATEX II documentation about this publication (TS 16157-4).

A synthesis of the publication is set here for information.

- A <VmsTablePublication> (= the message) includes numerous <VmsUnitTable> (= numerous sets of groups of VMS, example all of DIRIF).
- Each one includes numerous <VmsUnitRecord> (a logical group of Vms, example all with two pictogram display areas of the A4 road, or the 3 “red cross / green arrow” just before a tunnel).
- Each one includes numerous <VmsRecord> (= a Vms)
- Each one has a location, and its characteristics.

ID	2414_H-VMS-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	The location is not mandatory in DATEX II, but it is set mandatory for C-ITS projects. Each VMS shall be matching a VMSRecord in at least one VMSTable publication sent to the platform. These VMS can correspond to a real VMS on the road, or can be virtual ones.
Acceptance criteria	
Additional information	The attributes <VmsUnitReference> and <VmsUnitTableReference> in the following publication (<VmsPublication>), shall be set according to the data of this publication (<VmsTablePublication>).

## 6.4 Construction of VMS message in DATEX II

### 6.4.1 Difference between TMS=>PFro VMS message and PFro => R-ITS-S VMS message

The “VmsPublication” used between the platform and the R-ITS-S is the one from the TMS, completed with the extension <VmsZonesLocation> which contains the location of the VMS, the relevance zone and the detection zone. The platform shall find the location in the VMSTablePublication, thanks to the linked attributes <VmsUnitReference> and <VmsUnitTableReference>, and completes it with its maps information.

### 6.4.2 Exchange parameters: Choosing the distribution mode

ID	2414_H-VMS_EXCHANGE-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	VMS use case shall use the “push on occurrence” mode.
Acceptance criteria	
Additional information	When the data changes, the sender returns a DATEX II message (OM1 mode). The sender transmits the data as soon as it is relevant (according to the use case) to the recipient (TMS=> PFro=>R-ITS-S).

```
...
<operatingMode>operatingModel</operatingMode>
...
<updateMethod>allElementUpdate</updateMethod>
...
```

## 6.4.3 Message content (<VmsPublication>)

### 6.4.3.1 The DATEX II <HeaderInformation> class

ID	2414_H-VMS_HEADER-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	It includes four attributes, two mandatory and two optional. It is proposed to not fill in the two optional attributes.  For the two mandatory attributes: The "confidentiality" attribute shall be filled in systematically with the "noRestriction" value; The "informationStatus" attribute shall be filled in systematically with the "real" value
Acceptance criteria	
Additional information	.

• .

### 6.4.3.2 The DATEX II <VmsUnit> class

ID	2414_H-VMS_UNIT-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	In one VmsPublication, there shall be one or more group of Vms, called VmsUnit
Acceptance criteria	
Additional information	A VmsUnit correspond to one or more, real or virtual, VMS panels. For example, a VmsUnit can gather all the VMS of a road operator, or all the VMS with the same characteristics.

Example: The three VMS on the picture could be gathered in a VmsUnit:



figure 19. *Example of a VMSUnit*

### 6.4.3.2.1 THE <VMSUNIT> CLASS ATTRIBUTES

#### 6.4.3.2.1.1 <VmsUnitTableReference>

ID	2414_H-VMS_REF-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	< <b>VmsUnitTableReference</b> > attribute shall be present for the message from TMS to the platform. This attribute is a reference to a versioned VMS Unit table in a <VmsTablePublication>.
Acceptance criteria	
Additional information	The Platform shall use this attribute (and <VmsUnitReference>) to find the location of the VMS and complete the location of the VMS in the message for the R-ITS-S.

#### 6.4.3.2.1.2 <VmsUnitReference>

ID	2414_H-VMS_REF-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	< <b>VmsUnitReference</b> > attribute shall be present for the message from TMS to Platform. This attribute is a reference to a versioned VMS unit record in a VMS Unit table in a <VmsTablePublication>, which defines the characteristics of the VMS unit.
Acceptance criteria	
Additional information	The Platform shall use this attribute (and <VmsUnitTableReference>) to find the location of the VMS and complete the location of the VMS in the message for the R-ITS-S.



ID	2414_H-VMS_REF-003
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<p>&lt; <b>VmsUnitReference</b> &gt; is unique for each VMS. PFro shall use this value to identify the message.</p> <p>If PFro doesn't have a message in progress in its database for this &lt; <b>VmsUnitReference</b> &gt;, it creates a new message.</p> <p>else PFro updates the previous message.</p>
Acceptance criteria	
Additional information	This requirement implies there is a direct link between VmsUnitReference and IvidentificationNumber.

#### 6.4.3.2.2 THE CLASSES LINKED TO THE <VMSUNIT> CLASS: <VMS>

In one VmsUnit, there can be one or more Vms, which can show one or more messages. As on the real VMS, there can be different messages at different times shown on the panel.

##### 6.4.3.2.2.1 <Vms> Attributes

ID	2414_H-VMS_CLASS-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	This class has two attributes. Only one is mandatory: <vmsWorking> shall be set to the correct value (true if the Vms shall be considered by the platform and the R-ITS-S).
Acceptance criteria	
Additional information	Between TMS and the platform, the index shall be completed in accordance with the VmsTablePublication.

##### 6.4.3.2.2.2 The classes linked to the <Vms> Class

###### 6.4.3.2.2.2.1 <Location> (VmsLocationOverride )

ID	2414_H-VMS_LOCATION-001
Component(s)	PFro, TMS

Requirement	<p><b>Particularity for messages sent by TMS to the PFro</b></p> <p>According to the DATEX II rules, if &lt;VmsLocationOverride&gt; class is present in the TMS message, then the PFro shall use this data (&lt;VmsLocationOverride&gt;) and not the one (&lt;VmsLocation&gt;) in the VMSTablePublication.</p>
Acceptance criteria	
Additional information	This class is not mandatory in the message from TMS to the platform, as the two uses the VmsTablePublication

ID	2414_H-VMS_LOCATION-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<b>Particularity for messages sent by PFro to the R-ITS-S</b>  <VmsLocationOverride> class shall not be used in the message from the platform to the R-ITS-S (and Nfr-ITS-S).
Acceptance criteria	
Additional information	The locations shall be described with the next described class below:

## 6.4.3.2.2.2.2 &lt;groupOfLocations&gt; (VmsZonesLocation))

ID	2414_H-VMS_LOCATION-003
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<b>Particularity for messages sent by TMS to the PFro</b>  <VmsZonesLocation> class shall not be used in the message from the platform to the R-ITS-S (and Nfr-ITS-S).
Acceptance criteria	
Additional information	

ID	2414_H-VMS_LOCATION-004
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<p><b>Particularity for messages sent by PFro to the R-ITS-S</b></p> <p>In the published DATEX II schema, &lt;vmsUnit&gt; is linked with a simple location. For the needs of the C-ITS projects, an extended aggregation has been added between &lt;vmsUnit&gt; and &lt;groupOfLocations&gt;: &lt;vmsZonesLocation&gt;.</p> <p>This &lt;groupOfLocations&gt; shall be construct by the platform, and shall be a "NonOrderedLocationGroupByList" type, containing "Linear":</p> <ul style="list-style-type: none"> <li>linearWithinLinearElement: index =1 (externalReferencingSystem = "RELEVANCEZONE") <ul style="list-style-type: none"> <li>"PointCoordinates" with the relation "locationForDisplay" (= eventPosition))</li> <li>FromPoint: (=eventPosition = beginning of the EventHistory)</li> <li>ToPoint: (= end of the EventHistory)</li> </ul> </li> <li>...</li> <li>linearWithinLinearElement: index = X (Relevance Zone X, externalReferencingSystem = "RELEVANCEZONE")</li> <li>linearWithinLinearElement: index = X+1 (Trace 1, externalReferencingSystem = "DETECTIONZONE")</li> <li>...</li> <li>linearWithinLinearElement: index = X+Y (Detection Zone Y, externalReferencingSystem = "DETECTIONZONE"))</li> </ul>
Acceptance criteria	
Additional information	<p>This class refers to the position of the VMS, and to the positions of zones relevant for an IVI message.</p> <p>This class is mandatory in the message from the platform to the R-ITS-S (and Nfr-ITS-S).</p>

*NOTE: As explain in the Deliverable 2.4.1.2\_M, the "direction" attribute in IVI, is set to "samedirection". Contrary to the DENM direction, there is no upstream or downstream consideration.*

The construction rules are explained in the chapter: 3.8 Case of the linearly located events.

#### 6.4.3.2.2.2.3 <VmsMessage>

ID	2414_H-VMS_MESSAGE-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	The <VmsMessage> class shall describe the text and the pictogram of the Vms.
Acceptance criteria	
Additional information	

##### 6.4.3.2.2.2.3.1 Attribute of the <VmsMessage>

ID	2414_H-VMS_MESSAGE-002
Component(s)	TMS, PFro
Requirement	For the needs of the C-ITS projects, the TMS shall complete <vmsMessageInformationType>.
Acceptance criteria	
Additional information	<timeLastSet>, the date/time at which the sign was last set, is the only attribute mandatory in DATEX II.

ID	2414_H-VMS_MESSAGE_EXT-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<p><u>Extension attribute: &lt; IVIIdentificationNumber &gt;</u></p> <p>The platform shall create the “IVIIdentificationNumber” attribute by concatenating the following information:</p> <ul style="list-style-type: none"> <li>• supplier nationalIdentifier value (32-bit integer in hexadecimal format left padded with 0),</li> <li>• followed by an incremental number (16-bit integer in hexadecimal format left padded with 0),</li> <li>• followed by 0 (4-bits integer in hexadecimal format left padded with 0).</li> </ul>
Acceptance criteria	
Additional information	<p>For the needs of the C-ITS French project, in the message between the PFro and the R-ITS-S, a new attribute “IVIIdentificationNumber” shall be created. Its name is the name of the IVI attribute that shall be filled with. This attribute shall not be used for the message from TMS to the platform. This attribute is mandatory for the message from PFro to R-ITS-S. The PFro will complete the value according to the table of the current VMS. This reference, in the form of a text chain, may therefore not be provided by TMS. In any case, the platform creates it because it is used to define the IVI “ividentificationNumber” data frame.</p>

### Example 1

One number in the hexadecimal base corresponds exactly 4 numbers in binary base.  
The “IvidentificationNumber” is on 13 hexadecimal characters.

Example of a IviIdentificationNumber (in C-ITS-DATEX) from PFro		0	0	0	0	2	7	6	E	0	0	E	7	0
Meaning for an R-ITS-S:		Not used by the R-ITS-S								iviIdentificationNumber				Not used by the R-ITS-S
Value in IVI		10094 (ex for DIRIF)								231				Nothing

figure 20. *example of translation of the IvidentificationNumber in the downlink cases.*

Example 2 downlink :

Message C3 from SAGT  
nationalIdentifier payload /exchange= Sirius  
SituationrecordCreationReference=toto

Message C3 from PF  
nationalIdentifier payload= 10000

nationalIdentifier exchange = DIRIF\_PFSCOOP

IviIdentificationNumber=0000276EABCD0 (276E corresponds to 10094, ABCD is an incrément, 0 for VMS to keep the same structure as a situation) (13 hexadecimal characters)

Message C3 from UBR

IssuerIdentifier=2710 (hexadecimal value at 10000)

IviIdentificationNumber=276EABCD (8 hexadecimal characters)

*NOTE: See Deliverables 2.4.1.2\_M master and 2.4.3.2\_H: 2.4.1.2\_M set it is an integer from*

*1 to 32767 and the platform set the value of this id.*

ID	2414_H-VMS_MESSAGE_EXT-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<u>Extension attribute: &lt;validTo&gt;</u> For the needs of the C-ITS French project, in the message between the platform and the R-ITS-S, a new attribute shall be created. Its name <validTo> is the name of the IVI attribute that shall be filled with.
Acceptance criteria	
Additional information	This attribute shall not be used for the message from TMS to the platform. This attribute is mandatory for the message from the platform to R-ITS-S. The Platform will complete the value according to the table of the current VMS. As this IVI attribute is a "TimestampIts", the corresponding DATEX II attribute is a time in GMT.

*NOTE: See Deliverables 2.4.1.2\_M master and 2.4.3.2\_H: 2.4.1.2\_M set it is the "end time of the validity period of the message."*

#### 6.4.3.2.2.3.2 Class <VmsText>

This class contains the text of the Vms.

ID	2414_H-VMS_MESSAGE_TEXT-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<ul style="list-style-type: none"> <li>One &lt;VmsMessage&gt; shall have at least one page called &lt;textPage&gt;. One &lt;VmsMessage&gt; can have more than one page. The pages are indexed by their &lt;pageNumber&gt;, attribute mandatory in the case of numerous pages.</li> <li>Each page shall contain at least one line, called &lt;VmsTextLine&gt;, of type "string". One &lt;textPage&gt; can have more than one line. The lines are indexed by their &lt;lineIndex&gt;, attribute mandatory in the case of numerous lines.</li> </ul>
Acceptance criteria	
Additional information	<p>No attribute are mandatory, for the class &lt;vmsText&gt; and &lt;vmsTextLine&gt;, except the attribute called &lt;vmsTextLine&gt;.</p> <p>The values of the indexes give an indication of the order in which items should appear on the screen. (1 = the first, then, the second, and so on...)</p>

*NOTE: the Deliverable [2.4.1.2\_M\_IVI] about IVI set the maximum number of lines and pages:*

**Set in VMS pilot system:** FR consortium choose that max VMS may contain (as IISR9 application) a text of at most four lines of 21 characters each [...] with 2 pages max (alternate screening of two VMS).

ID	2414_H-VMS_MESSAGE_TEXT-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<ul style="list-style-type: none"> <li>In consequence, in the C-ITS projects, the &lt;VmsMessage&gt; shall contain a maximum of two &lt;textPage&gt;.</li> <li>A &lt;textPage&gt; shall contain a maximum of four &lt;VmsTextLine&gt;.</li> <li>The maximum number of characters in the string &lt;VmsTextLine&gt; shall be 21.</li> </ul>
Acceptance criteria	
Additional information	



### 6.4.3.2.2.3.3 Class <VmsPictogramDisplayArea>

#### 6.4.3.2.2.3.3.1 DATEX II explanations

This class contains the pictograms associated to the Vms.

No attribute of the class <VmsPictogramDisplayArea> is mandatory.

ID	2414_H-VMS_MESSAGE_PICTO-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<ul style="list-style-type: none"> <li>One &lt;VmsMessage&gt; shall have at least one area called &lt;VmsPictogramDisplayArea&gt;.</li> <li>Each area shall contain at least one pictogram, called &lt;VmsPictogram&gt;.</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>One &lt;VmsMessage&gt; can have more than one area for pictograms. The areas are indexed by their &lt;PictogramDisplayAreaIndex&gt;, attribute mandatory in the case of numerous areas.</li> <li>One &lt;VmsPictogramDisplayArea &gt; can have more than one pictogram. The pictograms are indexed by their &lt;pictogramSequencingIndex&gt;, attribute mandatory in the case of numerous pictograms.</li> </ul>

The attribute <presenceOfRedTriangle> of the <VmsPictogram>, indicates the presence of a red triangle around the pictogram, often used to indicate imminence, typically within 2km, of signed danger. This attribute is a Boolean, and is mandatory in DATEX II. It does not match any IVI attribute.

Each <VmsPictogram> can have a supplementary text (called in French “Pannonceau”), with the class <VmsSupplementaryPanel>, containing <VmsTextLine> or <VmsSupplementaryPictogram>.

The values of the indexes give an indication of the order in which items should appear on the screen. (1 = the first, then, the second, and so on...)

#### 6.4.3.2.2.3.3.2 French C-ITS project application

*NOTE: the Deliverable [2.4.1.2\_M\_IVI] about IVI, set the maximum number of pictograms and:*

*Set in VMS pilot system: FR consortium choose that max VMS may contain [...] one pictogram with sub-text eight characters max [...].*

In consequence, in the C-ITS projects, only the following <VmsMessage> types are authorised:

*All other types shall be not created by the TMS. (It implies for example: PageNumber shall be 1 or 2, pictogramSequencingIndex shall be equal to 1 or 2...).*

*All other types shall be rejected by the elements (R-ITS-S, PFro... For example if PageNumber >2 ...).*

*Note: the VmsPictogramDisplayArea contains the VmsPictogram classes.*

Constitution of the DATEX II VmsMessage			Constitution of the IVI	
Number of "VmsText" presents in the Message	Number of "VmsPictogram"	Value of "synchronized Sequencing WithTextPages"	First container of gic	Second container of gic
0	1	whatever	Vmspictogram	No present
0	2	Whatever	Vmspictogram with pictogramSequencingIndex = 1	Vmspictogram with pictogramSequencingIndex = 2
1	/	/	VmsText	No present
1 VmsText with PageNumber	1 Vmspictogram with pictogramSequencingIndex = PageNumber	True	VmsText + Vmspictogram	No present
1 VmsText with PageNumber	1 Vmspictogram with pictogramSequencingIndex > PageNumber	True	VmsText	Vmspictogram
1 VmsText with PageNumber	1 Vmspictogram with pictogramSequencingIndex < PageNumber	True	Vmspictogram	VmsText
1	1	False or absent	VmsText	Vmspictogram
1 VmsText with PageNumber =1	2	True	VmsText + Vmspictogram with pictogramSequencingIndex = 1	Vmspictogram with pictogramSequencingIndex = 2
1 VmsText with PageNumber = 2	2	True	Vmspictogram with pictogramSequencingIndex = 1	VmsText + Vmspictogram with pictogramSequencingIndex = 2

1	2	False or absent	VmsText + Vmspictogram with pictogramSequencingIndex = 1	VmsText + Vmspictogram with pictogramSequencingIndex = 2
2	/	/	VmsText with Pagenumber = 1	VmsText with Pagenumber = 2
2	1 Vmspictogram with pictogramSequencingIndex = 1	True	VmsText with Pagenumber = 1 + Vmspictogram	VmsText with Pagenumber = 2
2	1 Vmspictogram with pictogramSequencingIndex = 2	True	VmsText with Pagenumber = 1	VmsText with Pagenumber = 2 + Vmspictogram
2	1	False or absent	VmsText with Pagenumber = 1 + Vmspictogram	VmsText with Pagenumber = 2+ Vmspictogram
2	2	whatever	VmsText with Pagenumber = 1+ Vmspictogram with pictogramSequencingIndex = 1	VmsText with Pagenumber = 2+ Vmspictogram with pictogramSequencingIndex = 2

Each <VmsPictogram> can be complete with one <VmsSupplementaryPanel>, containing one <VmsTextLine>, which attribute <VmsTextLine> will be a text of eight characters max.

*NOTE: the Deliverable [2.4.1.2\_M\_IVI] about IVI, set that: "coding of sub-roadsign panel is coded between "/" (example: //25km//) in the first container of extraText" in the IVI message.*

ID	2414_H-VMS_MESSAGE_PICTO-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<ul style="list-style-type: none"> <li>The R-ITS-S shall take into account the DATEX II attribute &lt;VmsSupplementaryPanel&gt; for the IVI extratext.</li> <li>The R-ITS-S shall add the « // » before and after the text.</li> </ul>
Acceptance criteria	
Additional information	

ID	2414_H-VMS_MESSAGE_PICTO-003
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<ul style="list-style-type: none"> <li>Moreover, in the C-ITS projects, the attribute <b>&lt;pictogramCode&gt;</b> of the <b>&lt;VmsPictogram&gt;</b> shall be set mandatory.</li> </ul>
Acceptance criteria	
Additional information	<p>This attribute will be filled by the TMS, based on IISR or on the standard 14 823, as stated by the IVI standards.</p> <p>See the 2.4.1.4_H annex 3 for the translation details.</p> <p>The format will be as follows (for a speed limitation):</p> <p>12-557 for 14 823</p> <p>XB14 for IISR9</p>

In some cases, the 14823 code can be the same for different meanings. For these case, the TMS shall complete the corresponding attribute “distanceAttribute”, “lengthAttribute”, “speedAttribute”, “weightAttribute”, ... according to the deliverable “TMS”.

For example, 5-57 in 14823 is a speed limit. It can correspond to a pictogram “50 km” or “120 km”.

## 6.5 Update and repetition

ID	2414_H-VMS_UPDATE-001
Component(s)	PFro
Requirement	<p>If the PFro doesn't have an identifier for this message (this identifier depends on the VMS), then the message is being created by the PFro</p> <p>If the Pfro has an identifier for this message (this identifier depends on the VMS), then:</p> <p>If the message is being modified for the same PMV, it is an update:</p> <ul style="list-style-type: none"> <li>Either the TMS sends an empty message, then PFro sends a termination of the previous message</li> <li>Or the TMS sends a new message, then PFro sends this new message (it will replace the previous one, because the identifier is the same)</li> </ul> <p>In all cases, the message's identifier must not change.</p>
Acceptance criteria	
Additional information	

ID	2414_H-VMS_REPETITION-001
Component(s)	PFro
Requirement	PFro shall repeat the message until receiving a new message from TMS. At each repetition, PFro shall update validTo.
Acceptance criteria	
Additional information	Repetition frequency and validTo are configurable.

## 6.6 Examples

### 6.6.1 From TMS to the platform

Here is a part of an example of VmsPublication (be careful, some attributes are voluntary omitted in the example):

```

...
<vmsUnit>
  <vmsUnitTableReference targetClass="vmsUnitTable" version="12"
id="MY_TABLE_OF_PMV"/>
  <vmsUnitReference targetClass="vmsUnitRecord" version="12" id="MY_GROUP_OF_PMV"/>
  <vms vmsIndex="1">
    <vmsWorking>true</vmsWorking>
    <vmsMessage messageIndex="1">
      <vmsMessage>
        <timeLastSet>2018-04-12T10:35:54+02:00</timeLastSet>
        <vmsMessageInformationType>travelTime</vmsMessageInformationType>
        <textPage pageNumber="1">
          <vmsText>
            <vmsTextLine lineIndex="1">
              <vmsTextLine> N104>A6:      </vmsTextLine>
            </vmsTextLine>
            <vmsTextLine lineIndex="2">
              <vmsTextLine>      33 min      </vmsTextLine>
            </vmsTextLine>
          </vmsText>
        </textPage>
        <textPage pageNumber="2">
          ...
        </textPage>
      </vmsMessage>
    </vms>
  </vmsUnit>

```

```

    <vmsPictogramDisplayArea pictogramDisplayAreaIndex="1">
      <synchronizedSequencingWithTextPages> True
    </synchronizedSequencingWithTextPages>
    <vmsPictogram pictogramSequencingIndex="1">
      <pictogramCode>regulatory---6-13</pictogramCode>
      <presenceOfRedTriangle>false</presenceOfRedTriangle>
    </vmsPictogram>
  </vmsPictogramDisplayArea>
</vmsMessage>
</vms>
<vms vmsIndex="2">
  ...
</vms>
</vmsUnit>

```

Associated to this part of a VmsTablePublication:

```

...
<vmsUnitTable id=" MY_TABLE_OF_PMV" version="12">
  <vmsUnitRecord id="MY_GROUP_OF_PMV" version="12">
    <vmsRecord vmsIndex="1">
      <vmsLocation xsi:type="Point">
        <pointAlongLinearElement>
          <directionRelativeAtPoint>aligned</directionRelativeAtPoint>
          <linearElement>
            <roadNumber>My_ROAD_NAME</roadNumber>
          </linearElement>
          <distanceAlongLinearElement
xsi:type="DistanceFromLinearElementReferent">
            <distanceAlong>190</distanceAlong>
            <fromReferent>
              <referentIdentifier>MY_PR</referentIdentifier>
              <referentType>referenceMarker</referentType>
            </fromReferent>
          </distanceAlongLinearElement>
        </pointAlongLinearElement>
      </vmsLocation>
    </vmsRecord>
    <vmsRecord vmsIndex="2">
      ...
    </vmsRecord>
  </vmsUnitRecord>
  <vmsUnitRecord ...>
    ...
  </vmsUnitRecord>
</vmsUnitTable>

```

## 6.6.2 From PFro to R-ITS-S and Nfr-ITS-S

The platform shall change the precedent xml messages into this example:

```

...
<vmsUnit>

```

```

<vmsUnitTableReference targetClass="vmsUnitTable" version="12"
id="MY_TABLE_OF_PMV"/>
<vmsUnitReference targetClass="vmsUnitRecord" version="12" id="MY_GROUP_OF_PMV"/>
<vms vmsIndex="1">
  <vmsWorking>true</vmsWorking>
  <vmsMessage messageIndex="1">
    <vmsMessage>
      <timeLastSet>2018-04-12T10:35:54+02:00</timeLastSet>
      <vmsMessageInformationType>travelTime</vmsMessageInformationType>
      <textPage pageNumber="1">
        <vmsText>
          <vmsTextLine lineIndex="1">
            <vmsTextLine> N104<math>\geq</math>A6:      </vmsTextLine>
          </vmsTextLine>
          <vmsTextLine lineIndex="2">
            <vmsTextLine>      33 min      </vmsTextLine>
          </vmsTextLine>
        </vmsText>
      </textPage>
      <textPage pageNumber="2">
        ...
      </textPage>
      <vmsPictogramDisplayArea pictogramDisplayAreaIndex="1">
        <synchronizedSequencingWithTextPages> True
      </synchronizedSequencingWithTextPages>
      <vmsPictogram pictogramSequencingIndex="1">
        <pictogramCode>regulatory---6-13</pictogramCode>
        <presenceOfRedTriangle>>false</presenceOfRedTriangle>
      </vmsPictogram>
    </vmsPictogramDisplayArea>
  </vmsMessage>
  <vmsZonesLocation xsi:type="NonOrderedLocationGroupByList">
    <locationContainedInGroup xsi:type="Linear">
      <externalReferencing>
        <externalLocationCode>1</externalLocationCode>
        <externalReferencingSystem>RELEVANCEZONE</externalReferencingSystem>
      </externalReferencing>
      <locationForDisplay>
        <latitude>48.817291</latitude>
        <longitude>2.422936</longitude>
      </locationForDisplay>
      <linearWithinLinearElement>
        <directionRelativeOnLinearSection>aligned</directionRelativeOnLinearSection>
        <linearElement xsi:type="LinearElementByPoints">
          <roadNumber>MY_ROAD_NUMBER</roadNumber>
          <startPointOfLinearElement>
            <referentIdentifier>1</referentIdentifier>
            <referentType>roadNode</referentType>
            <pointCoordinates>
              <latitude>48.817291</latitude>
              <longitude>2.42509</longitude>
            </pointCoordinates>
          </startPointOfLinearElement>
          <intermediatePointOnLinearElement index="1">
            <referent>
              <referentIdentifier>2</referentIdentifier>
              <referentType>roadNode</referentType>
              <pointCoordinates>
                <latitude>48.81717</latitude>
                <longitude>2.427258</longitude>
              </pointCoordinates>
            </referent>
          </intermediatePointOnLinearElement>
        </linearElement>
      </linearWithinLinearElement>
    </locationContainedInGroup>
  </vmsZonesLocation>
</vms>

```

```

        </pointCoordinates>
    </referent>
</intermediatePointOnLinearElement>
<intermediatePointOnLinearElement index="2">
    ...
</intermediatePointOnLinearElement>
...
<endPointOfLinearElement>
    <referentIdentifier>23</referentIdentifier>
    ...
</endPointOfLinearElement>
</linearElement>
<fromPoint xsi:type="DistanceFromLinearElementReferent">
    <distanceAlong>0.0</distanceAlong>
    <fromReferent>
        <referentIdentifier>1</referentIdentifier>
        <referentType>roadNode</referentType>
    </fromReferent>
</fromPoint>
<toPoint xsi:type="DistanceFromLinearElementReferent">
    <distanceAlong>0.0</distanceAlong>
    <fromReferent>
        <referentIdentifier>23</referentIdentifier>
        <referentType>roadNode</referentType>
    </fromReferent>
</toPoint>
</linearWithinLinearElement>
</locationContainedInGroup>
<locationContainedInGroup xsi:type="Linear">
    <externalReferencing>
        <externalLocationCode>2</externalLocationCode>
        <externalReferencingSystem>DETECTIONZONE</externalReferencingSystem>
    </externalReferencing>
    <linearWithinLinearElement>
<directionRelativeOnLinearSection>aligned</directionRelativeOnLinearSection>
    <linearElement xsi:type="LinearElementByPoints">
        <roadNumber>MY_ROAD_NUMBER</roadNumber>
        <startPointOfLinearElement>
            <referentIdentifier>1</referentIdentifier>
            <referentType>roadNode</referentType>
            <pointCoordinates>
                <latitude>48.817315</latitude>
                <longitude>2.422835</longitude>
            </pointCoordinates>
        </startPointOfLinearElement>
        <intermediatePointOnLinearElement index="1">
            ...
        </referent>
        </intermediatePointOnLinearElement>
        ...
    </linearWithinLinearElement>
</locationContainedInGroup>
</vmsZonesLocation>
</vms>
<vms vmsIndex="2">
    ...
</vms>
</vmsUnit>
...

```

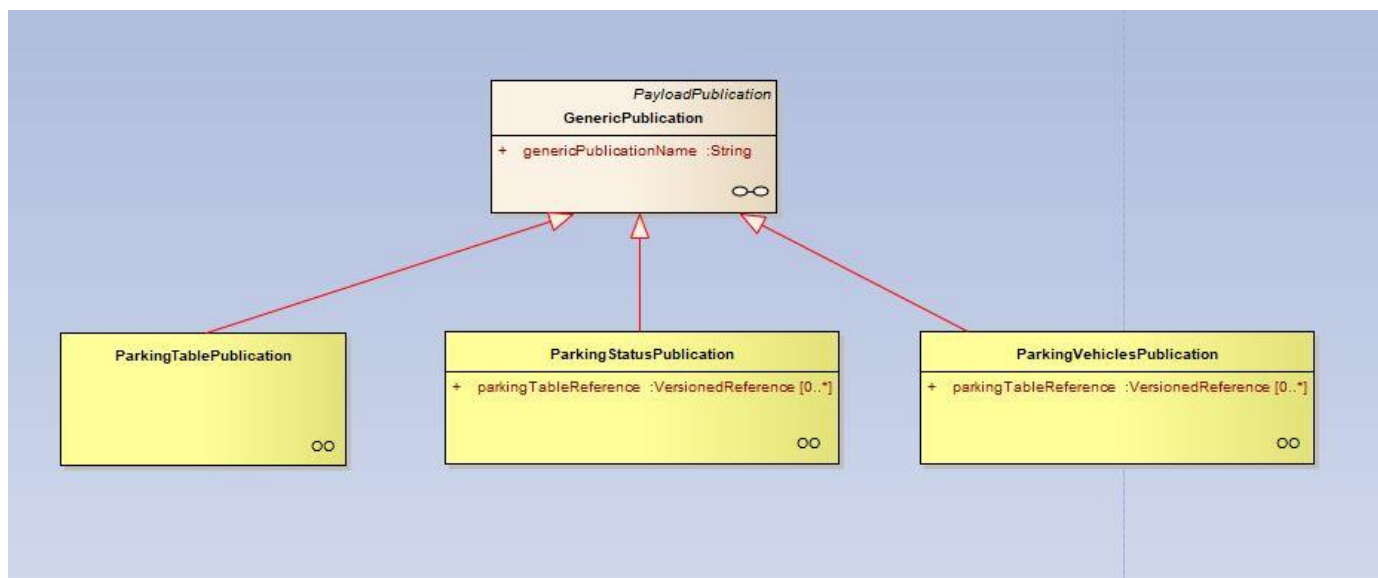


## 7 Parkings position and availability message

This chapter is completed by:

- 2.4.1.4\_H Annex 5: Translation of a Parking Datex II message into a POI-Parking

### 7.1 Overview



### 7.2 Description of the use case

This use case is described in the deliverable 2.4.1.2\_M – F1 POI Parking.  
It is only in the downlink direction.

Two types of data are required by a POI parking message:

- Some are static: position, contact data...
- And the others are dynamic: number of free places...

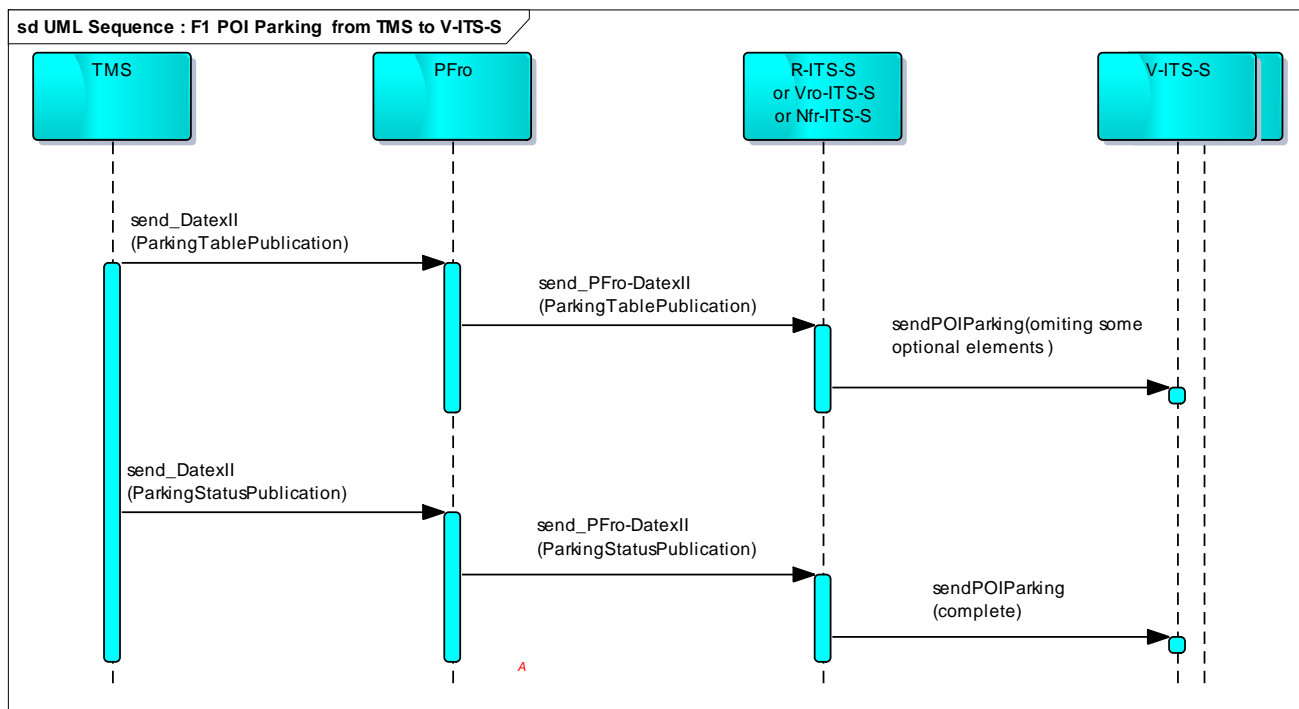


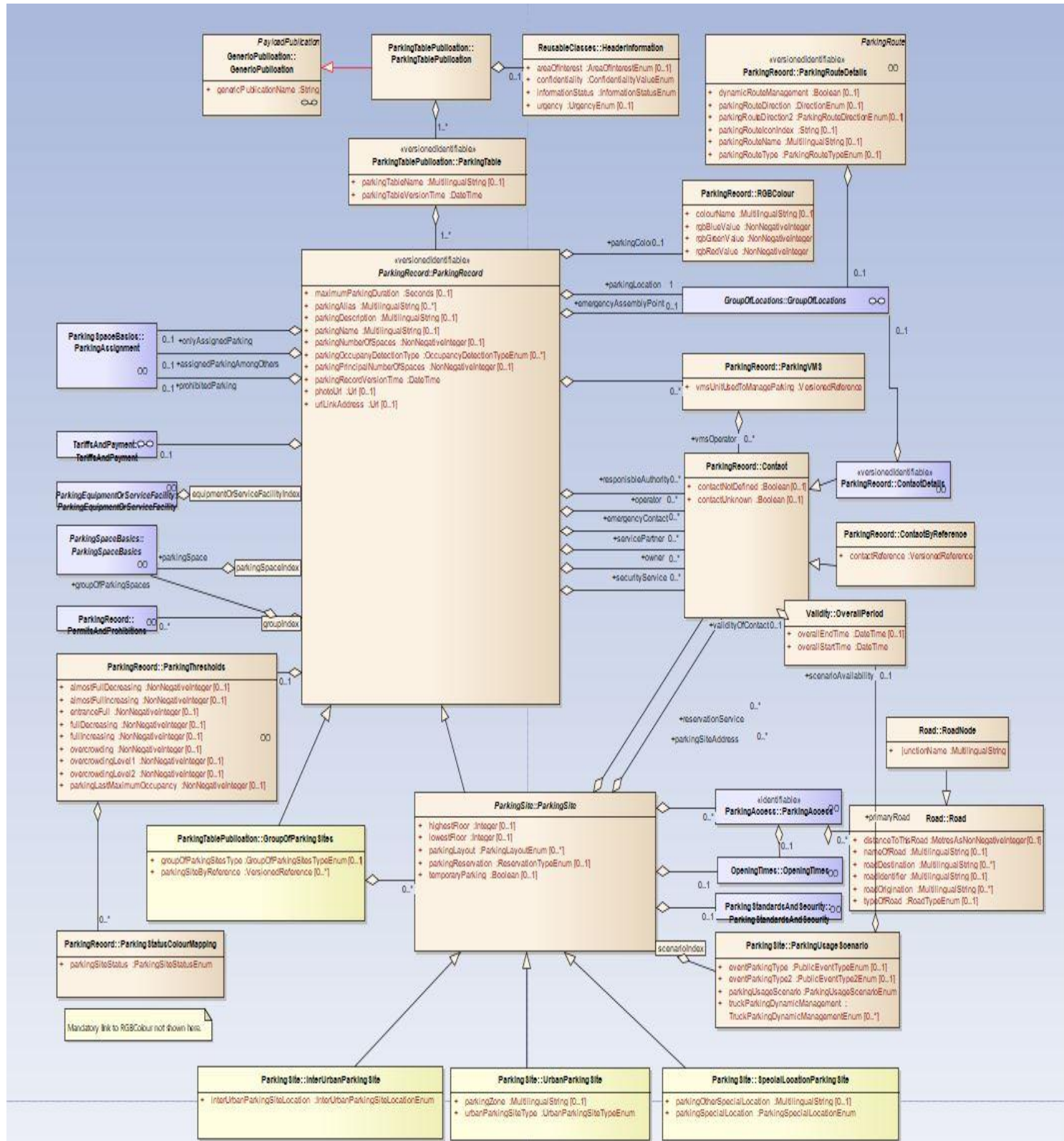
figure 21. UML sequence diagram for the POI-Parking publication

The TMS or parking control system sends the static data, in a `<ParkingTablePublication>` format to the platform. The platform completes data according to the Nfr-ITS-S DATEX II rules (location...) and sends it to the R-ITS-S. The R-ITS-S shall record the data, and sends a POI Message, with the available data (no current disponibility for example).

The TMS or Parking control system sends the dynamic information, in the `ParkingStatusPublication`, to the Platform. The platform complete data according to the PFro-DATEX II rules (location...) and send it to the R-ITS-S. The R-ITS-S shall record the data, and, if relevant, will send a new or updated POI Message.

# 7.3 Construction of ParkingTablePublication DATEX II Message by the TMS

## 7.3.1 Overview





## 7.3.3 Message Content

ID	2414_H-PARKING-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<ul style="list-style-type: none"> <li>The publication shall be a genericPublication, specified in &lt;parkingTablePublication&gt;.</li> <li>The &lt;publicationTime&gt; shall be present. It corresponds to the "timestamp" in the POI Message.</li> <li>The &lt;publicationCreator&gt; shall be present.</li> <li>The R-ITS-S shall have a table to translate the &lt;country&gt; in the &lt;publicationcreator&gt; into the country code. (« FR » into « 10110 01010 » (value in the 2.4.1.2_M(C3) )).</li> </ul>
Acceptance criteria	
Additional information	PFro will send the <nationalIdentifier> in the <publicationcreator> as the issuerIdentifier format required by the table in the 2.4.1.2_M(F1).

*NOTE: two fields « country » and two fields « nationalIdentifier » are present in the DATEX II Message. PFro and R-ITS-S shall translate the appropriate ones.*

### Example:

```

<payloadPublication xsi:type="GenericPublication" lang="fre">
  <publicationTime>2015-07-20T08:34:14+02:00</publicationTime>
  <publicationCreator>
    <country>fr</country>
    <nationalIdentifier>SEE 2.4.1.2_M</nationalIdentifier>
  </publicationCreator>
  <genericPublicationName>ParkingTablePublication</genericPublicationName>
  <genericPublicationExtension>
    <parkingTablePublication>
      ...
    </parkingTablePublication>
  </genericPublicationExtension>
</payloadPublication>

```

### 7.3.3.1 The <parkingTablePublication> and the <parkingTable> Classes

The < parkingTablePublication> may contain 1 to n parkingTable.

ID	2414_H-PARKING-003
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	For easier rules, C-ITS French project requires to create only one <parkingTable> in the <parkingTablePublication>.
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>The &lt;parkingTable&gt; is a group of parkings of an operator, or an entity.</li> <li>The &lt;parkingTable&gt; is “versionedIdentifiable”, so version and class identifier are mandatory. They will be used to link dynamic and static data.</li> <li>The &lt;parkingTableVersionTime&gt; is mandatory, and will be used by PFro and R-ITS-S to determine the most up-to-date DATEX II Message.</li> <li>The &lt;parkingTable&gt; may contain as many &lt;parkingRecord&gt; as necessary.</li> <li>A &lt;parkingRecord&gt; corresponds to a physical parking, ie one class &lt;parkingRecord&gt; describes one and only parking.</li> </ul>

#### Example

```

<parkingTablePublication>
  <parkingTable id="17" version="1">
    <parkingTableVersionTime>2019-01-01T00:00:00+01:00 </parkingTableVersionTime>
    <parkingRecord
...
    </parkingRecord>
  </parkingTable>
</parkingTablePublication>

```

### 7.3.3.1.1 THE <PARKINGRECORD> CLASS

ID	2414_H-PARKING-003
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<ul style="list-style-type: none"> <li>The identifier, for the needs of the C-ITS projects, shall be of type interger between 1 and 65535. It will correspond to the basicPoiNumber</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>The &lt;parkingRecord&gt; is "versionedIdentifiable", so version and class identifier are mandatory.</li> </ul>

The <ParkingRecord> shall be instanciated in a <groupOfParkingSite>, a <InterUrbanParkingSite>, a <UrbanParkingSite>, or a <SpecialLocationParkingSite>. Each one has different attributes, that are not used by the R-ITS-S.

ID	2414_H-PARKING-004
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<p>In the C-ITS projects, the following attributes shall be mandatory:</p> <ul style="list-style-type: none"> <li>&lt;parkingName&gt; corresponds to the « name » in the POI.</li> <li>&lt;parkingNumberOfSpaces&gt; corresponds to the « totalSpots » in the POI.</li> <li>&lt;parkingRecordVersionTime&gt; is used by PFro and R-ITS-S to determine the most up-to-date DATEX II Message.</li> </ul>
Acceptance criteria	
Additional information	<p>The following attributes are used to construct the POI, if they are present:</p> <ul style="list-style-type: none"> <li>&lt;urlLinkAddress&gt; corresponds to « webSite »</li> </ul>

Example :

```
<parkingRecord id="4901" version="1" xsi:type="InterUrbanParkingSite">
  <parkingName>
    <values>
      <value lang="fr">Parking de l'aire_du_meleze</value>
    </values>
  </parkingName>
  <parkingRecordVersionTime>2019-01-01T00:00:00+01:00 </parkingRecordVersionTime>
  <parkingNumberOfSpaces>1200</parkingNumberOfSpaces>
  <urlLinkAddress>www.myparking.com< urlLinkAddress >
  ...
</parkingRecord>
```



### 7.3.3.1.2 THE CLASSES LINKED TO THE <PARKINGRECORD> CLASS

#### 7.3.3.1.2.1 The <groupOfLocations> class

ID	2414_H-PARKING-LOCATION_001(2)
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	The <groupOfLocations> linked with the <parkingLocation> to the <parkingRecord>, shall be of type <PointByCoordinates>.
Acceptance criteria	
Additional information	Bearing can be omitted, as it cannot be translated in POI. It corresponds to the "latitude" and "longitude" in the "refPoint".

```

<parkingLocation xsi:type="Point">
  <pointByCoordinates>
...
  </pointByCoordinates>
</parkingLocation>

```

#### 7.3.3.1.2.2 The <contact> class

Different links are set with the <contact> class.

ID	2414_H-PARKING-005
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	The < parkingSiteAddress> should be present. (linked with the parkingSite directly, and not with the <parkingRecord>). Two options are possible: <ul style="list-style-type: none"> <li>• The &lt;contactDetailsAddress&gt; is present</li> <li>• Or the three following classes are present: &lt;contactDetailsStreet&gt;, &lt;contactDetailsPostcode&gt; and &lt;contactDetailsCity&gt;</li> </ul>
Acceptance criteria	
Additional information	The data will be used for the "address" in POI. The <owner> is recommended. It will be used for the "phoneNumber" in POI. If not present, the telephone of the < parkingSiteAddress> will be translated. Other can be present, but will not be used.

NOTE: "address" is not mandatory.

NOTE: "phoneNumber" is not mandatory.



### Example

```
<owner id="Gestionnaire_du_parking_34003" version="1" type="ContactDetails">
  <contactOrganisationName>
    <values>
      <value lang="fr">Les parkings du Haut Meleze</value>
    </values>
  </contactOrganisationName>
  <contactDetailsTelephoneNumber>+33 123456789</contactDetailsTelephoneNumber>
</owner>
```

### Example

```
<parkingSiteAddress id="ADRESSE_PARKING_7834" version="1" type="ContactDetails">
  <contactDetailsAddress>
    <values>
      <value lang="fr">3 rue de Berry, 75001, Paris</value>
    </values>
  </contactDetailsAddress>
  <contactDetailsPostcode>75001</contactDetailsPostcode>
  <contactDetailsCity>
    <values>
      <value lang="fr">Paris </value>
    </values>
  </contactDetailsCity>
  <country>fr</country>
</parkingSiteAddress>
```

#### 7.3.3.1.2.3 The <ParkingUsageScenario> class

Several <ParkingUsageScenario> can be linked.  
Several types of <ParkingUsageScenario> exist.

The attribute<ParkingUsageScenario> will be used to determine the type of POI:

ParkingUsageScenario. ParkingUsageScenario	poiType
parkAndRide	ParkAndRide
truckParking	CoachandLorryParking
If the two are presents	PFro rejects the message.
No presents / others values	See <TariffsAndPayment> class

figure 22. *Table between ParkingUsageScenario and poiType*

### Example

```
<parkingUsageScenario scenarioIndex="1">
  <parkingUsageScenario>
    <parkingUsageScenario>truckParking</parkingUsageScenario>
  </parkingUsageScenario>
</parkingUsageScenario>
<parkingUsageScenario scenarioIndex="2">
  <parkingUsageScenario>
    <parkingUsageScenario>parkAndRide</parkingUsageScenario>
  </parkingUsageScenario>
</parkingUsageScenario>
```

</parkingUsageScenario>

#### 7.3.3.1.2.4 The <OpeningTimes> Class

The POI “openingDaysHours” is optional.

It is a sequence of seven (one for each day) of four periods from opening till closing.

As the DATEX II message can be much more complex, some simplifications are made for the French C-ITS

ID	2414_H-PARKING-TIME_001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	If only one of the <available24hours> or <openAllYear> attributes are set to “true”, Then the “openingDaysHours” in the POI shall be set to (((0,1440)), ((0,1440)), ((0,1440)), ((0,1440)), ((0,1440)), ((0,1440)), ((0,1440))).
Acceptance criteria	
Additional information	

ID	2414_H-PARKING-TIME_002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	The OpeningTimes class is optional in Datex II. If it is present, TMS shall provide the schedules according to the following rules : 4 time slots are possible for each of 7 days. If one day is not specified, it means that Parking is closed this day.
Acceptance criteria	
Additional information	If OpeningTimes class is not present, it means that the parking is always open.

#### Example 1

```
<openingTimes>
  <openAllYear>true</openAllYear>
  <available24hours >true</available24hours>
</openingTimes>
```

Only the recurring period set in a weekly view will be considered. See example.  
The operator can send the data each week to update the opening hours for the week to go, and the precise the validity of the data in the <validityTimeSpecification>.

## Example 2

```
<openingTimes>
  <validity>
    <validityStatus>definedByValidityTimeSpec</validityStatus>
    <validityTimeSpecification>
      <overallStartTime>2019-01-01T00:00:00+01:00 </overallStartTime>
      <overallEndTime>2019-01-07T00:00:00+01:00 </overallEndTime>
      <validPeriod>
        <periodName>
          <values>
            <value>WEEK_OPENING</value>
          </values>
        </periodName>
        <recurringTimePeriodOfDay xsi:type="TimePeriodByHour">
          <startTimeOfPeriod>08:00:00Z</startTimeOfPeriod>
          <endTimeOfPeriod>12:00:00Z</endTimeOfPeriod>
        </recurringTimePeriodOfDay>
        <recurringTimePeriodOfDay xsi:type="TimePeriodByHour">
          <startTimeOfPeriod>14:00:00Z</startTimeOfPeriod>
          <endTimeOfPeriod>18:00:00Z</endTimeOfPeriod>
        </recurringTimePeriodOfDay>
        <recurringDayWeekMonthPeriod>
          <applicableDay>monday</applicableDay>
          <applicableDay>tuesday</applicableDay>
          <applicableDay>wednesday</applicableDay>
          <applicableDay>thursday</applicableDay>
          <applicableDay>friday</applicableDay>
          <applicableDay>saturday</applicableDay>
          <applicableDay>sunday</applicableDay>
        </recurringDayWeekMonthPeriod>
      </validPeriod>
    </validityTimeSpecification>
  </validity>
</openingTimes>
```

This example will be translated in POI in the following values: (((480, 720), (840,1080)), ((480, 720), (840,1080)), ((480, 720),(840,1080)) , ((480, 720),(840,1080)) , ((480, 720),(840,1080)), ((480, 720),(840,1080)) , ((480, 720),(840,1080)))

## Example 3

```
<openingTimes>
  <validity>
    <validityStatus>definedByValidityTimeSpec</validityStatus>
    <validityTimeSpecification>
      <overallStartTime>2019-01-01T00:00:00+01:00 </overallStartTime>
      <overallEndTime>2019-01-07T00:00:00+01:00 </overallEndTime>
      <validPeriod>
        <periodName>
          <values>
            <value>saturday</value>
          </values>
        </periodName>
        <recurringTimePeriodOfDay xsi:type="TimePeriodByHour">
          <startTimeOfPeriod>14:00:00Z</startTimeOfPeriod>
          <endTimeOfPeriod>18:00:00Z</endTimeOfPeriod>
        </recurringTimePeriodOfDay>
        <recurringDayWeekMonthPeriod>
```

```

        <applicableDay>saturday</applicableDay>
      </recurringDayWeekMonthPeriod>
    </validPeriod>
    <validPeriod>
      <periodName>
        <values>
          <value>Sunday</value>
        </values>
      </periodName>
      <recurringTimePeriodOfDay xsi:type="TimePeriodByHour">
        <startTimeOfPeriod>19:00:00Z</startTimeOfPeriod>
        <endTimeOfPeriod>23:00:00Z</endTimeOfPeriod>
      </recurringTimePeriodOfDay>
      <recurringDayWeekMonthPeriod>
        <applicableDay>sunday</applicableDay>
      </recurringDayWeekMonthPeriod>
    </validPeriod>

  </validityTimeSpecification>
</validity>
</openingTimes>

```

This example will be translated in POI in the following values: ((0,0)), ((0,0)), ((0,0)), ((0,0)), ((0,0)), ((840,1080)), ((1140,1380))

### 7.3.3.1.2.5 The <tariffsAndPayment> class

This class is optional.

ID	2414_H-PARKING-TARIFFS_001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	If the <tariffsAndPayment> class is present, the <freeOfCharge> attribute is made mandatory. It shall be used by the R-ITS-S if the parking is not a truck Parking nor a Park and Ride.
Acceptance criteria	
Additional information	

tariffsAndPayment. freeOfCharge	poiType
true	ParkingLot
false	ParkingGarage
class not present and no relevant type in parkingUsageScenario	ParkingLot

figure 23. Table between tariffsAndPayment and poiType

### Example

```
<tariffsAndPayment>
  <freeOfCharge>true</freeOfCharge>
</tariffsAndPayment>
```

#### Example

```
<tariffsAndPayment>
  <freeOfCharge>false</freeOfCharge>
</tariffsAndPayment>
```

### 7.3.3.1.2.6 The <ParkingStandardsAndSecurity> class

To comply with « Delegated Regulation (EU) N° 885/2013 – DATEX II proposal for EU core components for static data related to Secured Truck Parking Areas », the following classes and attributes can be informed.

Attribute name	Class name	Designation	Definition	Multiplicity	Type
parkingStandardsAndSecurity	ParkingSite	Parking standards and security	Security measures and standards or standard-like categorization for a parking site.	0..1	ParkingStandardsAndSecurity
certifiedSecureParking	ParkingStandardsAndSecurity	Certified secure parking	Presence of a certification for secure parking.	0..1	Boolean

### 7.3.3.1.2.7 The other classes

Other classes can be present, but will not be used by the R-ITS-S.

## 7.3.3.2 Enhancement of ParkingTablePublication DATEX II Message by the Platform

The platform, unlike the situation records, do not need to enhance the data from the TMS.

*NOTE: There are no traces in the POI message.*

*NOTE: Deliverable 2.4.3.2 could present some rejection rules.*

### 7.3.3.3 Example of <parkingTablePublication>

```
<d2LogicalModel modelBaseVersion="2" xmlns="http://datex2.eu/schema/2/2_0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <exchange>
    <supplierIdentification>
      <country>fr</country>
      <nationalIdentifier>PF_TestBBE</nationalIdentifier>
    </supplierIdentification>
    <subscription>
```

```

<operatingMode>operatingModel</operatingMode>
<subscriptionStartTime>2019-10-24T13:45:59+02:00</subscriptionStartTime>
<subscriptionState>active</subscriptionState>
<updateMethod>allElementUpdate</updateMethod>
<target>
  <address>not used</address>
  <protocol>not used</protocol>
</target>
</subscription>
</exchange>
<payloadPublication lang="fr" xsi:type="GenericPublication">
  <publicationTime>2019-10-24T13:45:59+02:00</publicationTime>
  <publicationCreator>
    <country>fr</country>
    <nationalIdentifier>4369</nationalIdentifier>
  </publicationCreator>
  <genericPublicationName>ParkingTablePublication</genericPublicationName>
  <genericPublicationExtension>
    <parkingTablePublication>
      <parkingTable id="PARKING_DE_LA_DIR" version="1">
        <parkingTableVersionTime>2019-10-24T13:45:59+02:00</parkingTableVersionTime>
        <parkingRecord id="4901" version="1" xsi:type="InterUrbanParkingSite">
          <parkingName>
            <values>
              <value lang="fr">Parking de l'aire du meleze</value>
            </values>
          </parkingName>
          <parkingRecordVersionTime>2019-10-24T13:45:59+02:00</parkingRecordVersionTime>
          <parkingNumberOfSpaces>1200</parkingNumberOfSpaces>
          <urlLinkAddress>www.myparking.com</urlLinkAddress>
          <parkingLocation xsi:type="Point">
            <pointByCoordinates>
              <bearing>108</bearing>
              <pointCoordinates>
                <latitude>50.12345</latitude>
                <longitude>2.12345</longitude>
              </pointCoordinates>
            </pointByCoordinates>
          </parkingLocation>
          <tariffsAndPayment>
            <freeOfCharge>true</freeOfCharge>
          </tariffsAndPayment>
        </parkingRecord>
      </parkingTable>
    </parkingTablePublication>
  </genericPublicationExtension>
  <parkingSiteAddress id="ADRESSE_PARKING_7834" version="1" xsi:type="ContactDetails">
    <contactDetailsAddress>
      <values>
        <value lang="de">3 rue de Berry, 75001, Paris</value>
      </values>
    </contactDetailsAddress>
    <contactDetailsPostcode>75001</contactDetailsPostcode>
    <contactDetailsCity>
      <values>
        <value lang="de">Paris</value>
      </values>
    </contactDetailsCity>
    <country>fr</country>
  </parkingSiteAddress>
  <parkingUsageScenario scenarioIndex="1">
    <parkingUsageScenario>
      <parkingUsageScenario>truckParking</parkingUsageScenario>
    </parkingUsageScenario>
  </parkingUsageScenario>
</payloadPublication>

```

```

        </parkingUsageScenario>
    </parkingUsageScenario>
    <parkingUsageScenario scenarioIndex="2">
        <parkingUsageScenario>

<parkingUsageScenario>parkAndRide</parkingUsageScenario>
        </parkingUsageScenario>
    </parkingUsageScenario>
    <openingTimes>
        <validity>

<validityStatus>definedByValidityTimeSpec</validityStatus>
        <validityTimeSpecification>
            <overallStartTime>2019-01-01T00:00:00+01:00 </overallStartTime>
            <overallEndTime>2019-01-07T00:00:00+01:00 </overallEndTime>
            <validPeriod>
                <periodName>
                    <values>
                        <value>WEEK_OPENING</value>
                    </values>
                </periodName>
                <recurringTimePeriodOfDay>

xsi:type="TimePeriodByHour">

<startTimeOfPeriod>08:00:00Z</startTimeOfPeriod>

<endTimeOfPeriod>12:00:00Z</endTimeOfPeriod>
                </recurringTimePeriodOfDay>
                <recurringTimePeriodOfDay>

xsi:type="TimePeriodByHour">

<startTimeOfPeriod>14:00:00Z</startTimeOfPeriod>

<endTimeOfPeriod>18:00:00Z</endTimeOfPeriod>
                </recurringTimePeriodOfDay>
                <recurringDayWeekMonthPeriod>
                    <applicableDay>monday</applicableDay>
                    <applicableDay>tuesday</applicableDay>
                    <applicableDay>wednesday</applicableDay>
                    <applicableDay>thursday</applicableDay>
                    <applicableDay>friday</applicableDay>
                </recurringDayWeekMonthPeriod>
            </validPeriod>
        </validityTimeSpecification>
    </validity>
    </openingTimes>

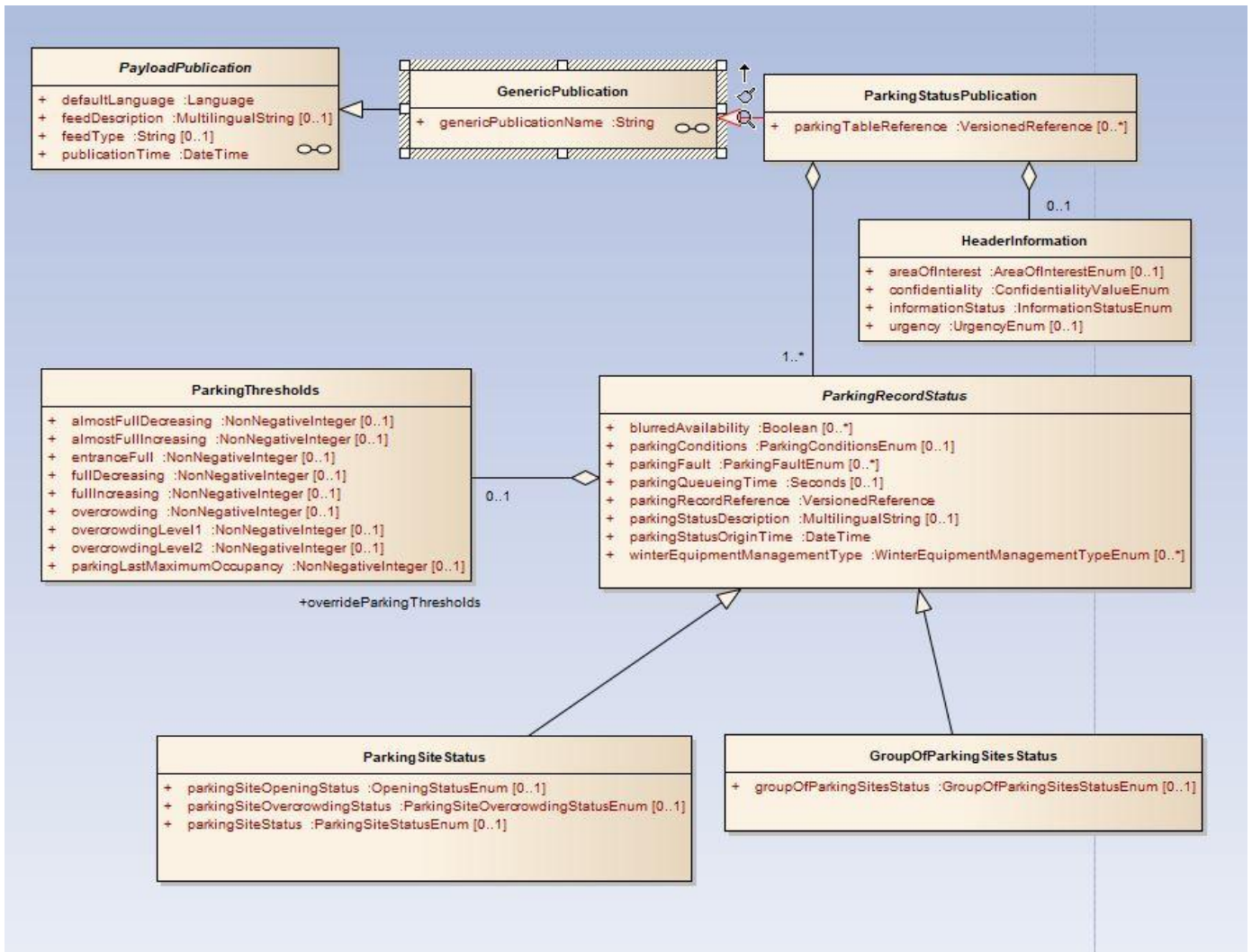
<interUrbanParkingSiteLocation>other</interUrbanParkingSiteLocation>
        </parkingRecord>
    </parkingTable>
</parkingTablePublication>
    </genericPublicationExtension>
</payloadPublication>
</d2LogicalModel>

```

## 7.4 Construction of <parkingStatusPublication>

This message will provide the dynamic data.

### 7.4.1 Overview



### 7.4.2 Exchange parameters: Choosing the distribution mode

Exactly the same as:

5.2.1 Exchange parameters: Choosing the distribution mode

### 7.4.3 Message Content

ID	2414_H-PARKING-006
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS



Requirement	<ul style="list-style-type: none"> <li>The publication shall be a genericPublication, specified in &lt;ParkingStatusPublication&gt;.</li> <li>The &lt;publicationTime&gt; shall be present. It corresponds to the "timestamp" in the POI message.</li> <li>The &lt;publicationCreator&gt; shall be present.</li> <li>The R-ITS-S shall have a table to translate the PayloadaPublication. Publicationcreator. country into the country code. (« FR » into « 10110 01010 » (value in the 2412H(C3) )).</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>PFro will send the &lt;nationalIdentifier&gt; in the &lt;publicationcreator&gt; as the issuerIdentifier format required by the table in the 2.4.1.2_M (F1).</li> </ul>

NOTE: two fields « country » and two fields « nationalIdentifier » are present in the DATEX II Message. PFro and R-ITS-S shall translate the appropriate ones.

#### Example:

```
<payloadPublication xsi:type="GenericPublication" lang="fre">
  <publicationTime>2015-07-20T08:34:14+02:00</publicationTime>
  <publicationCreator>
    <country>fr</country>
    <nationalIdentifier>SEE 2.4.1.2_M</nationalIdentifier>
  </publicationCreator>
  <genericPublicationName>ParkingStatusPublication</genericPublicationName>
  <genericPublicationExtension>
    <parkingStatusPublication>
      ...
    </parkingStatusPublication>
  </genericPublicationExtension>
</payloadPublication>
```

### 7.4.3.1The <ParkingStatusPublication> class

ID	2414_H-PARKING-006
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	The <parkingTableReference> attribute shall be filled with reference to the parkingTable containing the static data of the same parking.
Acceptance criteria	
Additional information	The R-ITS-S will use this attribute to make the link.

### 7.4.3.1.1 THE <PARKINGRECORDSTATUS> CLASS

ID	2414_H-PARKING-007
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<ul style="list-style-type: none"> <li>The &lt;parkingRecordStatus&gt; shall be instanciated by a &lt;parkingSiteStatus&gt;, and not by a &lt;groupOfParkingSiteStatus&gt;.</li> <li>The &lt;parkingRecordReference&gt; shall be filled with reference to the parkingRecord containing the static data of the same parking.</li> <li>The &lt;parkingStatusOriginTime&gt; attribute of the &lt;parkingRecordStatus&gt; is mandatory and shall corresponds to the date of the update of the data.</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>The &lt;parkingStatusPublication&gt; contains 1 to n &lt;parkingRecordStatus&gt;.</li> <li>No other attributes is mandatory.</li> </ul>

#### Exemple

```

<parkingRecordStatus xsi:type="ParkingSiteStatus">
  <parkingRecordReference id="PARKING_DE_LA_DIR"
version="1"targetClass="ParkingRecord" />
  <parkingStatusOriginTime>2019-01-02T00:00:00+01:00</parkingStatusOriginTime>
  ...
</parkingRecordStatus>

```

If the parking <parkingRecordStatus> is a <ParkingSiteStatus>, then their attributes can be used by the R-ITS-S.

ID	2414_H-PARKING-008
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<p>The &lt;parkingSiteStatus&gt; attribute called &lt;parkingSiteStatus&gt; can give information for the "freeSpots" in the "statusData":</p> <ul style="list-style-type: none"> <li>If the value is "full" or "fullAtEntrance" or "almostFull" then "freeSpots" shall be set to "full(0)".</li> <li>If the value is spacesAvailable, and the classe occupancy is not present, then "freeSpots" shall be set to "freespaces(16382)".</li> <li>If the value is "unknown", and the classe occupancy is not present, then "freeSpots" shall be set to unknown (16383).</li> </ul>
Acceptance criteria	
Additional information	

The <parkingSiteStatus> attribute called <parkingSiteOpeningStatus> can give information for the “openingStatus”:

parkingSiteOpeningStatus	openingStatus
open	open (1)
Closed or closedAbnormal	closed (0)
openingTimesInForce	open or closed, depending on the <openingTimes> in the <parkingTablePublication> unknown if <openingTimes> is not present
statusUnknown or other or class not present	unknown (15)
the R-ITS-S shall check the <applicableForUser> attribute in the <ParkingAssignment>	subscriberonly

figure 24. *Table between parkingSiteOpeningStatus and openingStatus*

ID	2414_H-PARKING-009
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<ul style="list-style-type: none"> <li>If the attribute is set to “openingTimesInForce”, the R-ITS-S shall check if the parking is open regarding the validity set in the chapter: 7.3.3.1.2.4 The &lt;OpeningTimes&gt; Class.</li> <li>For the “subscriberonly”, the R-ITS-S shall check the &lt;applicableForUser&gt; attribute in the &lt;ParkingAssignment&gt; of the parking Record.</li> </ul>
Acceptance criteria	
Additional information	

The classes linked to the < ParkingRecordStatus> class

#### 7.4.3.1.1.1 The < ParkingOccupancy> class

ID	2414_H-PARKING-010
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<p>&lt; ParkingOccupancy&gt; class is mandatory. The R-ITS-S shall translate the following attributes:</p> <ul style="list-style-type: none"> <li>• parkingNotAllowed In case of 'true', parking is not allowed (e.g. abnormal closure), and the R-ITS-S shall set the "openingStatus" to "closed".</li> <li>• parkingNumberOfSpacesOverride If this attribute is present, R-ITS-S shall used it instead of the static value 'parkingNumberOfSpaces' for "totalSpots".</li> <li>• parkingNumberOfVacantSpaces The total number of currently vacant parking spaces available in the specified parking site, group of parking sites or group of parking spaces. If this attribute is present, R-ITS-S shall used it for the "freepot" number.</li> <li>• parkingNumberOfOccupiedSpaces The number of currently occupied spaces in the specified parking site, group of parking If this attribute is present and &lt; parkingNumberOfVacantSpaces&gt; is not present, R-ITS-S shall used it to find the "freepot" number, by difference with the "TotalSpots".</li> <li>• parkingNumberOfVehicles The Number of vehicles (of specified type) on the parking site. This can be used if the parking is equipped with a vehicle counter at the entrance of the parking, but no automatic detection in each place. If this attribute is present and &lt; parkingNumberOfVacantSpaces&gt; is not present, R-ITS-S shall used it to find the "freepot" number, by difference with the "TotalSpots"</li> </ul>
Acceptance criteria	
Additional information	

ID	2414_H-PARKING-011
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro, TMS
Requirement	<p>The following attributes shall not be translated by the R-ITS-S. TMS shall send the available data in a class translated by the R-ITS-S, and so should not use the following attributes.</p> <p><i>NOTE: This rule could change in the future.</i></p> <ul style="list-style-type: none"> <li>• parkingNumberOfVacantSpacesGraded : The number of currently vacant parking spaces available in the specified parking, presented in a graded way (« lessThan10SpacesAvailable », « lessThan20SpacesAvailable »...)</li> <li>• parkingNumberOfVacantSpacesHigherThan and parkingNumberOfVacantSpacesLowerThan: the number of vacant parking spaces is higher or lower than the given value (example: More than 10 spaces are free).</li> <li>• parkingOccupancyGraded : occupied parking spaces by a percentage-grading (enumeration).</li> <li>• parkingOccupancyTrend : the trend of the occupancy of the parking spaces in the specified parking site, group of parking sites or assigned parking.</li> </ul>
Acceptance criteria	
Additional information	

### 7.4.3.2 Enhancement of ParkingStatusPublication DATEX II Message by the Platform

The platform, unlike the <situationPublications>, do not need to enhance the data from the TMS.

*NOTE: There are no traces in the POI message.*

*NOTE : Deliverable 2.4.3.2 could present some rejectement rules.*

### 7.4.3.3 Exemple of <parkingStatusPublication>

```
<?xml version="1.0" encoding="UTF-8"?>
<payloadPublication xsi:type="GenericPublication" lang="fre">
  <publicationTime>2015-07-20T08:34:14+02:00</publicationTime>
  <publicationCreator>
    <country>fr</country>
    <nationalIdentifier>SEE 2.4.1.2_M</nationalIdentifier>
  </publicationCreator>
  <genericPublicationName>ParkingStatusPublication</genericPublicationName>
  <genericPublicationExtension>
    <parkingStatusPublication>
      <parkingRecordStatus xsi:type="ParkingSiteStatus">
```

```

        <parkingRecordReference id="4901" targetClass="ParkingRecord" version="1"
/>
        <parkingStatusOriginTime>2019-01-
02T00:00:00+01:00</parkingStatusOriginTime>
        <parkingOccupancy>
            <parkingNumberOfVacantSpaces>179</parkingNumberOfVacantSpaces>
        </parkingOccupancy>
        <parkingSiteStatus>spacesAvailable</parkingSiteStatus>
    </parkingRecordStatus>
    <parkingRecordStatus xsi:type="ParkingSiteStatus">
        <parkingRecordReference id="321" targetClass="ParkingRecord" version="1"
/>
        <parkingStatusOriginTime>2019-01-
02T00:00:00+01:00</parkingStatusOriginTime>
        <parkingOccupancy>
            <parkingNumberOfVehicles>321</parkingNumberOfVehicles>
        </parkingOccupancy>
        <parkingSiteStatus>spacesAvailable</parkingSiteStatus>
    </parkingRecordStatus>
    <parkingRecordStatus xsi:type="ParkingSiteStatus">
        <parkingRecordReference id="4930" targetClass="ParkingRecord" version="1"
/>
        <parkingStatusOriginTime>2019-01-
02T00:00:00+01:00</parkingStatusOriginTime>
        <parkingOccupancy>
            <parkingNumberOfOccupiedSpaces>93</parkingNumberOfOccupiedSpaces>
        </parkingOccupancy>
        <parkingSiteStatus>spacesAvailable</parkingSiteStatus>
    </parkingRecordStatus>
</parkingStatusPublication>
</genericPublicationExtension>
</payloadPublication>

```

## 8 Dynamic speed limit

This chapter is completed by:

- 2.4.1.4\_H Annex 7: Translation of a Networkmessage Datex II message into an IVI.

### 8.1 Description of the use case

This use case is described by the deliverable 2.4.1.2\_M– C2 Dynamic speed limit. It is only in the downlink direction.

The purpose is to send a speed limit on a linear road to the users.

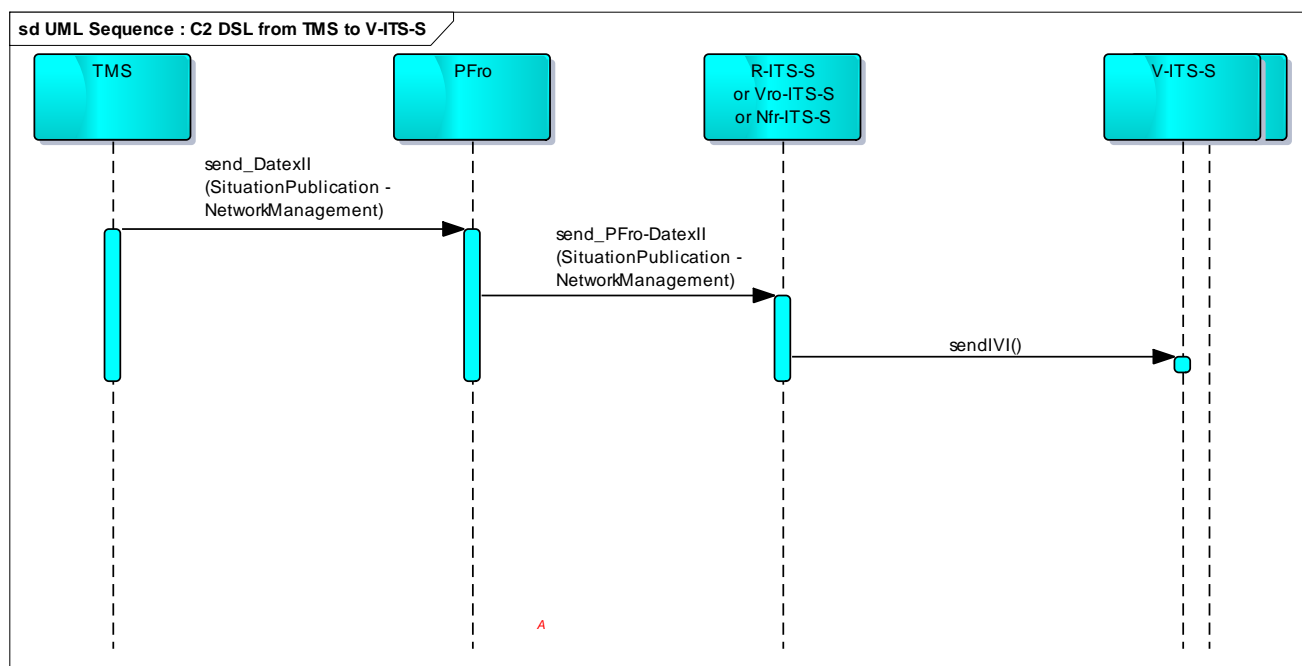


figure 25. UML sequence diagram for the speed limit management from TMS to V-ITS-S.

## 8.2 Overview of the DATEX II Model

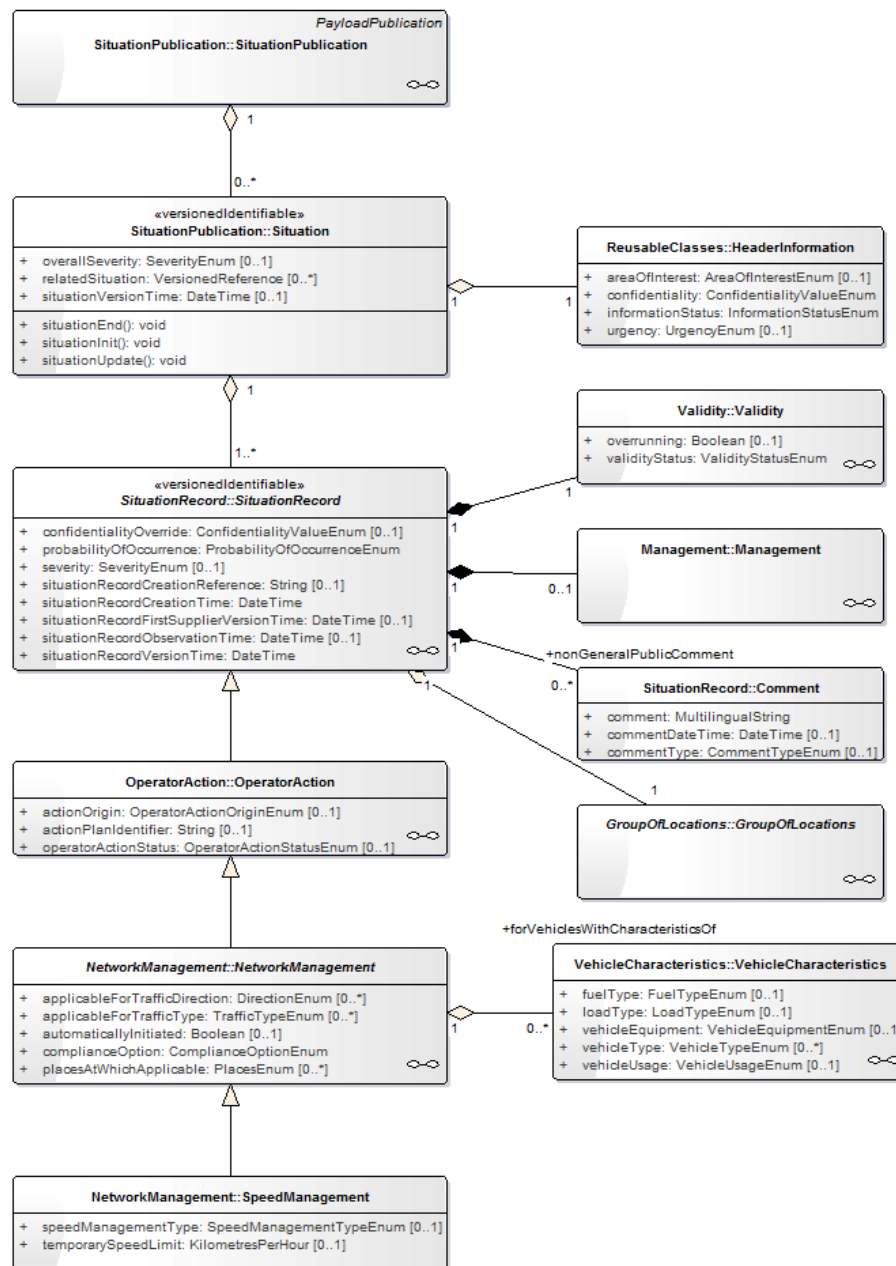


figure 26. Overview of the DATEX II model about SpeedManagement

NOTE: This is only an extract; the entire model is available on the [datex2.eu](http://datex2.eu) website.



## 8.3 Construction of DATEX II messages of speed limit management

This message is very similar to the ones translated in DENM. So, the structure of this chapter is based on the chapter 5 Traffic Events and Operator Actions Messages.

### 8.3.1 Exchange parameters: Choosing the distribution mode

Exactly the same as: 5.2.1 Exchange parameters: Choosing the distribution mode

### 8.3.2 Message content (<PayloadPublication> and <SituationPublication>)

Exactly the same as: 5.2.2 Message content (<PayloadPublication> and <SituationPublication>)

ID	2414_H-SPEED-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<ul style="list-style-type: none"> <li>R-ITS-S shall have a table to translate the country code in « publicationCreator » into the IVI country code. (« FR » into « 10110 01010 » (value given in the 2412H)).</li> <li>R-ITS-S shall use payloadpublication.publicationcreator.nationalidentifier into the IVI issuerIdentifier.</li> </ul>
Acceptance criteria	
Additional information	

*NOTE: PFro provides the relevant nationalidentifier, in the relevant format.*

ID	2414_H-SPEED-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<ul style="list-style-type: none"> <li>The situation which first situationrecord is a &lt;speedLimitManagement&gt;, shall be translated in an IVI, with respect to the deliverable 2.4.1.2_M – C2 Dynamic speed limit.</li> </ul>
Acceptance criteria	
Additional information	<p><i>NOTE: “first” means the first situationrecord described in the situation</i></p>

### 8.3.2.1 The DATEX II <HeaderInformation> class

Exactly the same as: 5.2.2.1 The DATEX II <HeaderInformation> class

### 8.3.2.2 The DATEX II <Situation> class

#### 8.3.2.2.1 IDENTIFIER OF THE CLASS

Exactly the same as: 5.2.2.2.1 Identifier of the class

*NOTE: this chapter concerns a downlink use case.*

### 8.3.2.3 The DATEX II <SituationRecord> class

The introduction in the chapter 5.2.2.3 The DATEX II <SituationRecord> class, does apply here and is completed with the following elements.

ID	2414_H-SPEED-004
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S
Requirement	<ul style="list-style-type: none"> <li>For this specific use case, a situation shall be translated in an IVI.</li> <li>For the R-ITS-S, all the situationrecords present inside the same situation shall be translated in the same IVI message, provided that the groupOflocations of each situationrecord are the same.</li> </ul>
Acceptance criteria	
Additional information	

*NOTE: According to the deliverable 2.4.3.1, the TMS should not send a situation for this use case with different groupOflocations in the same situation.*

*NOTE: According to the deliverable 2.4.3.2 and 2.4.2.2, the PFro and R-ITS-S should not spread an improper situation for this use case.*

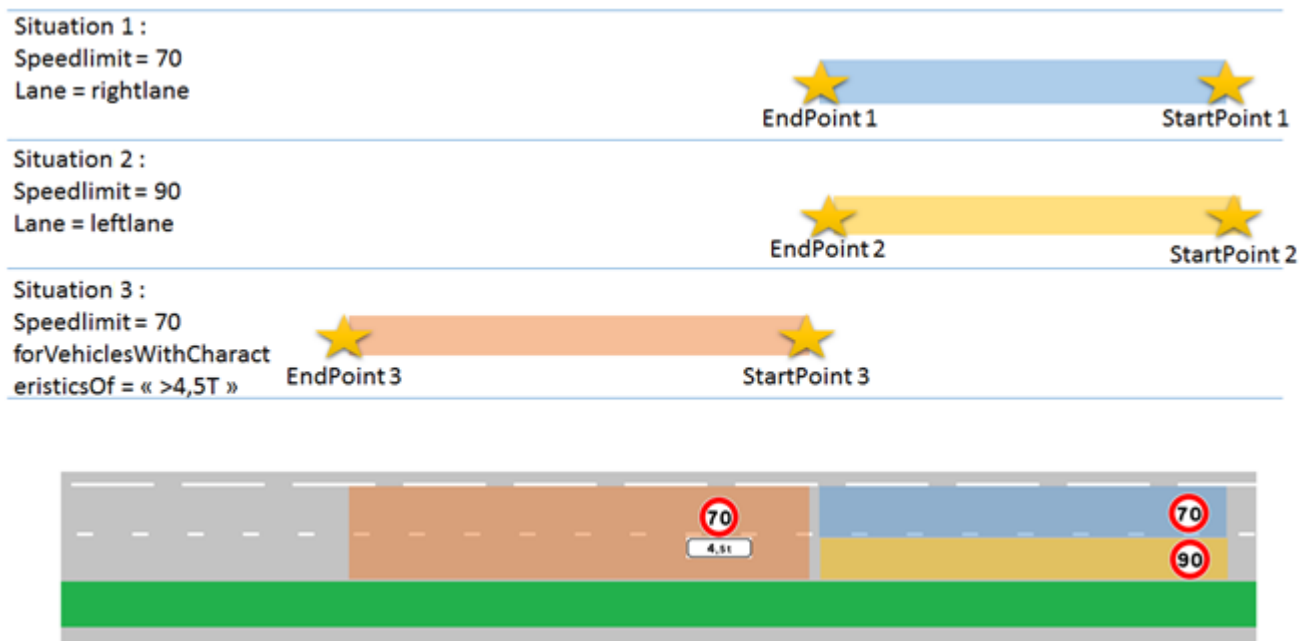


figure 27. *Illustration of three situations sent by the TMS, to be translated in three IVI.*

The regulated area shall be divided by the TMS depending on:

- the location: start and end points of each zone, called « canton » in french:
  - on the figure 21, there are 2 « cantons »
- the lanes:
  - on the figure 21, the first « canton » shall be divided in the 2 lanes.
- the vehicles concerned:
  - on the figure 21, the second « canton » only concerns certain vehicles (another speed limit could be applied, in another situation record for the same location).

### 8.3.2.3.1 THE <SITUATIONRECORD> CLASS ATTRIBUTES

#### 8.3.2.3.1.1 The class identifier

Exactly the same as: 5.2.2.3.1 The class identifier.

*NOTE: this chapter concerns a downlink use case.*

### 8.3.2.3.1.2 The “situationRecordCreationReference” attribute

ID	2414_H-SPEED-005
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<situationRecordCreationReference> shall be completed by PFro
Acceptance criteria	
Additional information	In the French C-ITS Projects, the attribute of the situation record, called <b>&lt;situationRecordCreationReference&gt;</b> becomes mandatory. This attribute contains a unique alphanumeric reference (external or GUID) of the first <b>&lt;SituationRecord&gt;</b> class occurrence version when created by the original supplier.

NOTE: it is not mandatory in the standard or in the guide [4].

#### Particularity for the downlink cases

This reference, in the form of a text chain, may therefore not be provided by the traffic information and control system. In any case, the platform creates it because it is used for defining the IVI “iviIdentificationNumber” data frame.

The PFro creates the “situationRecordCreationReference” attribute by concatenating the following information:

- supplier IssuerIdentifier (32-bit integer in hexadecimal format left padded with 0),
- followed by an incremental number (16-bit integer in hexadecimal format left padded with 0),
- followed by a sequence number in each situation starting from 1 (0 is allocated for the situation itself) (4-bits integer in hexadecimal format left padded with 0).

One number in the hexadecimal base corresponds exactly 4 numbers in binary base.

The SituationRecordCreationReference is on 13 hexadecimal characters.

Example of a “SRCR” from PFro	0	0	0	0	2	7	6	E	0	0	E	7	1
Meaning for an R-ITS-S:	Not used by the R-ITS-S								iviIdentificationNumber				Not used by the R-ITS-S
Value in IVI	10094 (ex for DIRIF)								231				Nothing

figure 28. example of translation of the SituationRecordCreationReference in the downlink cases.

#### Example

C2 message TMS towards PFro  
nationalIdentifier payload /exchange= Sirius  
SituationrecordCreationReference=toto

C2 message PFro towards R-ITS-S  
nationalIdentifier payload= 10000  
nationalIdentifier exchange = DIRIF\_PFSLOOP  
SituationrecordCreationReference=0000276EABCD1 (276E corresponds to 10094, ABCD is an incremented number, 1 for the first SituationRecord) (13 caractères hexa)

C2 essage sortie R-ITS-S towards V-ITS-S

IssuerIdentifier=2710 (valeur hexadécimale de 10000)

IvIdentifierNumber=276EABCD (8 caractères hexadécimaux )

There is no need for a separation character between the different concatenated elements due to the fix format.

The R-ITS-S that receives this message recovers the incremental number and the “stationID” from the platform (considered as the “originatingStationID” to fill in the “actionID” attribute of the DENM to transmit.

*NOTE: this chapter concerns a downlink use case.*

### 8.3.2.3.1.3 Time attributes

The rules presented in the following chapter applies: 5.2.2.3.1.3Time attributes.

Except for the table 5 which is different:

Class::attribute	Mand.	TMS=>PF and PFro=>R-ITS-S message
PayloadPublication:: publicationTime	Y	Message creation time by the platform. Not used to generate the IVI.
Situation:: situationVersionTime	N	Not used
SituationRecord:: situationRecordCreationTime	Y	Fill in (because mandatory) but not used by the R-ITS-S to create IVI.
SituationRecord:: situationRecordFirstSupplierVersionTime	Y	Fill in (because mandatory) but not used by the R-ITS-S to create IVI.
SituationRecord:: situationRecordObservationTime	Y	Time used by the R-ITS-S to construct the "timestamps" data element of IVI
SituationRecord:: situationRecordVersionTime	Y	Fill in (because mandatory) but not used by the R-ITS-S to create IVI.
validity.overallStartTime	Y	Time used by the R-ITS-S to construct the "validFrom" data element of IVI
validity. overallEndTime	Y	Time used by the R-ITS-S to construct the "validTo" data element of IVI

*Table 13 : Dates and times of a situation for the C2 use case, based on IVI*

#### 8.3.2.3.1.4 “probabilityOfOccurrence” attribute

This attribute is not used in IVI.

#### 8.3.2.3.1.5 The <OperatorAction> class attributes

This class is not used in IVI.

Exactly the same as:5.2.2.3.1.5 The <OperatorAction> class attributes (roadworks only)

#### 8.3.2.3.1.6 The other attributes

This class is not used in IVI.  
Exactly the same as: 5.2.2.3.1.6 The other attributes.

### 8.3.2.3.2 THE CLASSES LINKED TO THE <SITUATIONRECORD> CLASS

#### 8.3.2.3.2.1 The DATEX II <Impact> class

However the information of number of lanes is defined in the attribute “numberOfOperationalLanes” or “originalNumberOfLanes” (class “Impact”) and is mandatory when one transmits lanes.

The normal number of usable lanes in the specified direction that the carriageway has before reduction or activation hardshoulder due to roadworks or traffic events.

#### 8.3.2.3.2.2 The DATEX II <Source> class

This class is not used in IVI.

#### 8.3.2.3.2.3 The DATEX II <Comment> class

This class is not used in IVI.

Exactly the same as: 5.2.2.3.2.3 The DATEX II <Comment> class.

#### 8.3.2.3.2.4 The DATEX II <Cause> class

This class is not used in IVI.

#### 8.3.2.3.2.5 The DATEX II <Validity> class

In the French C-ITS Projects and in all use cases, the <overallStartTime> shall be filled in for all messages.

If the end date is unknown, the DATEX II <Validity> class is instantiated as follows:

```
...
<validity>
  <validityStatus>active</validityStatus>
  <validityTimeSpecification>
    <overallStartTime>2015-01-01T17:13:39+01:00</overallStartTime>
  </validityTimeSpecification>
</validity>
```

If the end date is known, the DATEX II <Validity> class should be instantiated as follows:

```
...
<validity>
  <validityStatus>definedByValidityTimeSpec</validityStatus>
  <validityTimeSpecification>
    <overallStartTime>2015-01-01T17:13:39+01:00</overallStartTime>
    <overallEndTime>2015-05-25T19:13:39+01:00</overallEndTime>
  </validityTimeSpecification>
</validity>
```

ID	2414_H-SPEED-006
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro

Requirement	<ul style="list-style-type: none"> <li>In the French C-ITS Projects, the <b>&lt;overallEndTime&gt;</b> shall be filled in for the messages from the PFro to the R-ITS-S, Nfr-ITS-S or Vro-ITS-S.</li> </ul>
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>These two attributes will be used to fill in “validFrom” and “validTo” data element of the IVI.</li> </ul>

Consequently, for messages coming from TMS, if the end date is not filled in, the platform shall follow the following processus:

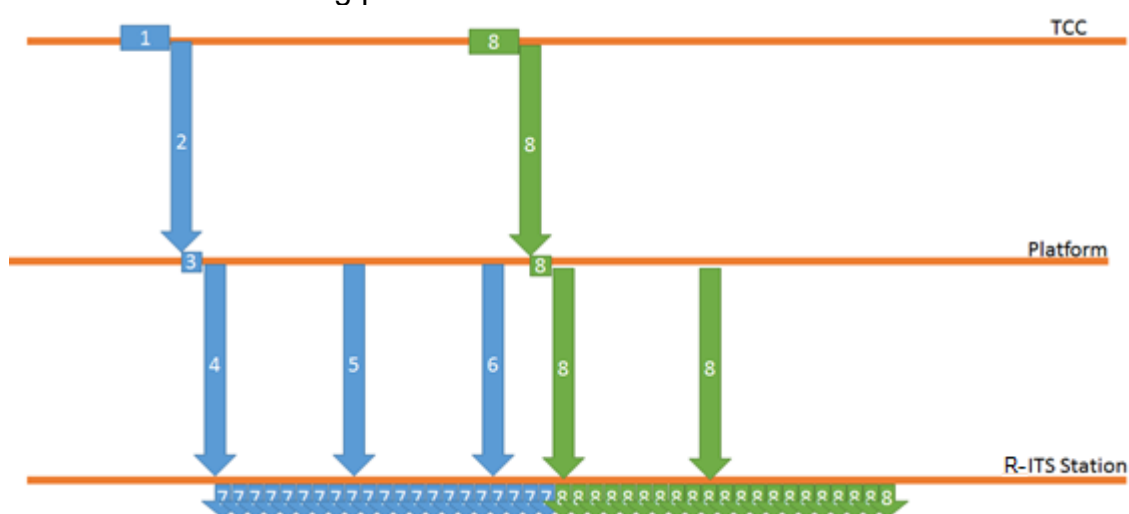


figure 29. *Processus for validity management*

- 1-2: TMS prepares and sends a message.
- 3: Platform modifies the validity definition of the original DATEX II message such that the “validityStatus” attribute is made as “definedByValidityTimeSpec”, and the “overallEndTime” is filled in from the “overallStartTime” value and adding a duration of 12 minutes
- 4: Platform sends the messages to R-ITS-S.
- 5: If, 10 minutes after the previous sending, no new message is received, the previous message is updated by the platform: the overallEndTime is filled in from the previous “overallEndTime” value and adding a duration of 10 minutes, and then the platform sends the updated message.
- 6: If, 10 minutes after the previous sending, no new message is received, the previous message is updated by the platform: the overallEndTime is filled in from the previous “overallEndTime” value and adding a duration of 10 minutes, and then the platform sends the updated message.
- 7: The R-ITS-S sends regularly the valid IVI messages, based on the DATEX II received messages from the platform.
- 8: If a new message concerning the same regulated zone is send, the platform completes the message, sends it to the R-ITS-S which update and send their messages.

These elements are presented in the Table 13 :

NOTE: The platform receive scheduled events sent from TMS. See the deliverable 2.4.3..2\_H for details.

### 8.3.2.3.2.6 The DATEX II <groupOfLocations> class

The use case concerns a linear, with different roads leading to the event.

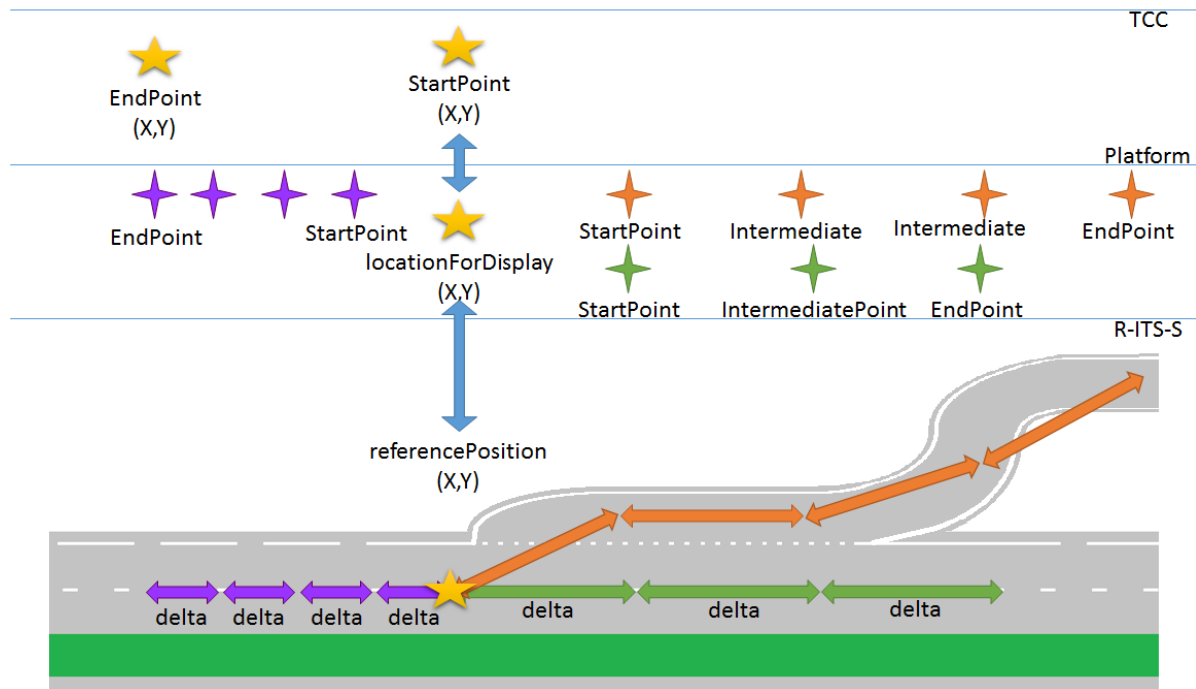


figure 30. Illustration of the groupOfLocations in one situationrecord

Platform shall apply the process described in the 3.8 Case of the linearly located events, for each groupOfLocations present in the situation.

R-ITS-S will then use the data to translate each groupOfLocations in the corresponding IVI data frame: referencePosition, and zones.

NOTE: As explain in the Deliverable 2.4.1.2\_M, the "direction" attribute in IVI, is set to "samedirection". Contrary to the DENM direction, there is no upstream or downstream consideration.

The fact that "One situation = One IVI", implies that all the groupoflocations inside the situationrecords of the same situation, shall exactly be the same, including lanes, and so on.

NOTE: According to the deliverable 2.4.3.1, the TMS should not send a situation for this use case with different groupOfLocations in the same situation.

NOTE: According to the deliverable 2.4.3.2 and 2.4.2.2, the PFro and R-ITS-S should not spread an improper situation for this use case.

NOTE: as the situation shall be translated in an IVI, the external referecing shall be set to "RELEVANCEZONE" and "DETECTIONZONE".



### 8.3.2.3.3 THE <NETWORKMANAGEMENT> CLASS

#### 8.3.2.3.3.1 The class attributes

The attributes are not used in IVI.

The description can be found in: 5.2.2.3.5.1 The class attributes.

#### 8.3.2.3.3.2 The classes linked to the <NetworkManagement> class

The DATEX II <VehicleCharacteristics> class used to describe the characteristics of the concerned vehicles is linked to the **<NetworkManagement>** class by the “forVehiclesWithCharacteristicsOf” association. This reusable class contains the description of the vehicle categories that the operating applications apply to.

This class shall be used to fill in the “VehicleCharacteristics” data element of the IVI. The deliverable 2.4.1.2\_M\_Master sets that the only characteristics to be considered is the weight of the vehicle.

*NOTE: The operator shall be aware that the vehicle uses this attribute to determine if it is concerned and if the message will be displayed. See Deliverable 2.4.2.3.*

If relevant, the <GrossWeightCharacteristic> will be used and the attributes of GrossVehicleWeight and comparisonOperator can be combined, once or twice for the same situationrecord.

Example for restriction only for the lorries which weight is comprised between 3,5T and 7,5T:

```
<forVehiclesWithCharacteristicsOf>
  <vehicleType>lorry</vehicleType>
  <grossWeightCharacteristic>
    <comparisonOperator>greaterThan</comparisonOperator>
    <grossVehicleWeight>3.5</grossVehicleWeight>
  </grossWeightCharacteristic>
  <grossWeightCharacteristic>
    <comparisonOperator>lessThan</comparisonOperator>
    <grossVehicleWeight>7.5</grossVehicleWeight>
  </grossWeightCharacteristic>
</forVehiclesWithCharacteristicsOf>
```

The vehicle type will be used by the R-ITS-S to find in the type of IVI VehicleCharacteristics, which can described a tractor, a trailer or a train.

The speedlimit always concerns the entire vehicle, so the weights will always concern the train in IVI, except for the following Datex II type trailer, which shall be translated in the trailer IVI attribute.

#### 8.3.2.3.3.3 The DATEX II <SpeedManagement> class

ID	2414_H-SPEED-007
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro

Requirement	<ul style="list-style-type: none"> <li>• &lt;SpeedManagement&gt; class shall be used to provide the speed limit for the dynamic speed management.</li> </ul>
Acceptance criteria	
Additional information	<p>The attributes are as follows:</p> <ul style="list-style-type: none"> <li>• “speedManagementType”: Type of action on the speed. Only the following shall be considered as a C2 use case by the R-ITS-S: <ul style="list-style-type: none"> <li>- ActiveSpeedControlInOperation</li> <li>- speedRestrictionInOperation</li> <li>- reduceYourSpeed</li> <li>- policeSpeedChecksInOperation</li> <li>- or the type is not present.</li> </ul> </li> <li>• “temporarySpeedLimit”: Temporary speed that shall correspond to the mandatory speed (expressed in km/h). <ul style="list-style-type: none"> <li>- This attribute will be used to fill in the “spm” attribute of the pictogram in the IVI.</li> </ul> </li> </ul>

## 9 Lane management

### 9.1 Description of use-cases

These use cases are described by the following deliverables:

- 2.4.1.2\_M– H2 Dynamic Traffic ban to specific vehicle (I2V),
  - Type 1: storage on a road or a parking area for some vehicles,
  - Type 2: u-turn and go back for some vehicles,
  - Type 3: road closed to all types of vehicles,
- 2.4.1.2\_M – H4 Dynamic Lane management – reserved lane (I2V) :
  - Type 1: High Occupancy Vehicle (HOV) lane
  - Type 2: Bus and Taxi reserved lane
- 2.4.1.2\_M – H6 HGV overtaking ban (lanes forbidden to heavy goods vehicle)

*NOTE: 2.4.1.2\_M – H4 Eco-friendly vehicle reserved lane (e.g. Crit'Air) is not covered by this version.*

They are only in the downlink direction.

The purpose is to send a lane information on a linear road to the users.

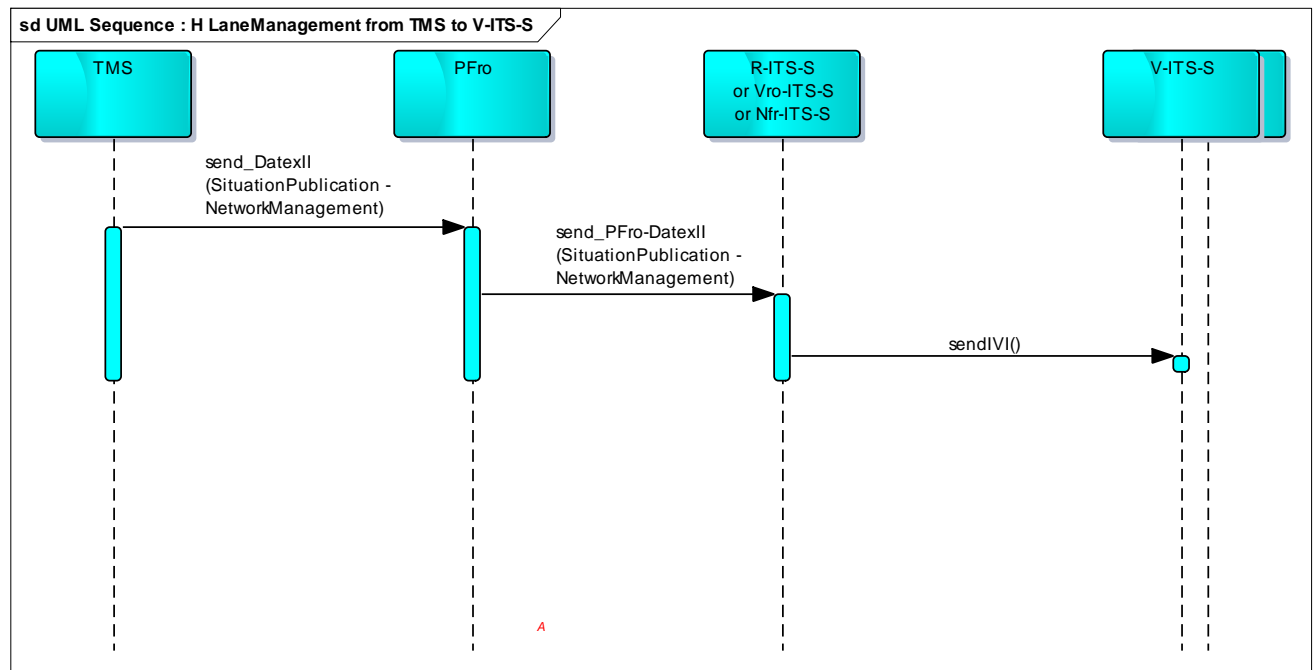


figure 31. UML sequence diagram for the lane management from TMS to V-ITS-S.

## 9.2 Overview of the DATEX II Model

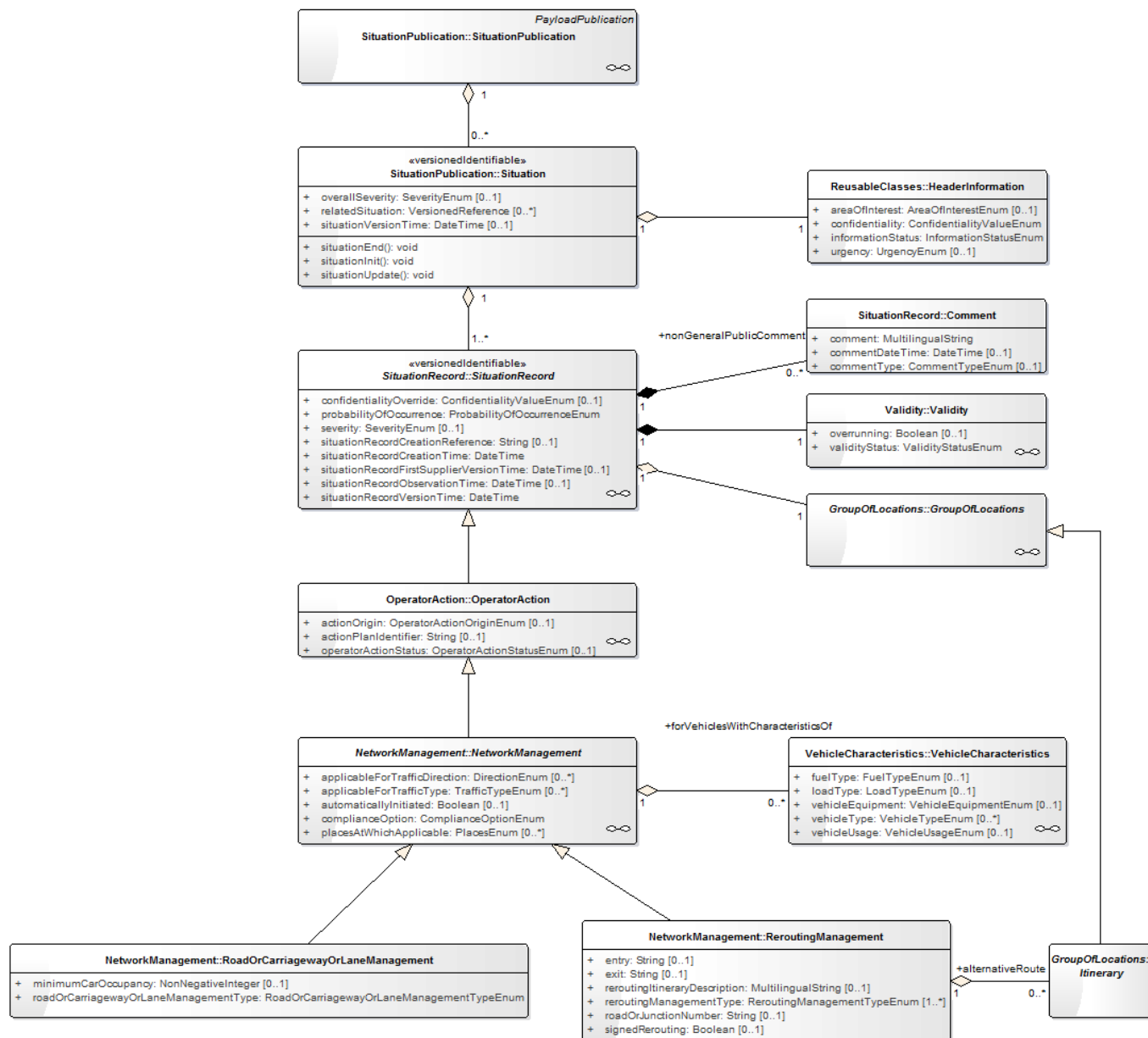


figure 32. Overview of the DATEX II model about LaneManagement

NOTE: This is only an extract; the entire model is available on the [datex2.eu](http://datex2.eu) website.

## 9.3 Construction of DATEX II messages of lane management

This message is very similar to the ones translated in DENM and to the speed limit management. So, the structure of this chapter is based on the chapter 5 Traffic Events and Operator Actions Messages.

### 9.3.1 Exchange parameters: Choosing the distribution mode

Exactly the same as : 5.2.1 Exchange parameters: Choosing the distribution mode.

### 9.3.2 Message content (<PayloadPublication> and <SituationPublication>)

Exactly the same as: 5.2.2 Message content (<PayloadPublication> and <SituationPublication>).

ID	2414_H-LANE_MANAGEMENT-001
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<ul style="list-style-type: none"> <li>R-ITS-S shall have a table to translate the country code in « publicationCreator » into the IVI country code. (« FR » into « 10110 01010 » (value given in the 2412H)).</li> <li>R-ITS-S shall use payloadpublication.publicationcreator.nationalidentifier into the IVI issuerIdentifier.</li> </ul>
Acceptance criteria	
Additional information	

*NOTE: PFro provides the relevant nationalidentifier, in the relevant format.*

ID	2414_H-LANE_MANAGEMENT-002
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<ul style="list-style-type: none"> <li>The situation which first situationrecord is a &lt;RoadOrCarriagewayOrLaneManagement&gt;, shall be translated in an IVI, with respect to the deliverable 2.4.1.2_M – H2 lane management.</li> </ul>
Acceptance criteria	
Additional information	

*NOTE: "first" means the first situationrecord described in the situation*

#### 9.3.2.1 The DATEX II <HeaderInformation> class

Exactly the same as: 5.2.2.1 The DATEX II <HeaderInformation> class.

#### 9.3.2.2 The DATEX II <Situation> class

### 9.3.2.2.1 IDENTIFIER OF THE CLASS

Exactly the same as: 5.2.2.2.1 Identifier of the class.

*NOTE: this chapter concerns a downlink use case.*

ID	2414_H-LANE_MANAGEMENT-003
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<ul style="list-style-type: none"> <li>A situation shall be translated in 1 IVI by the R-ITS-S.</li> </ul>
Acceptance criteria	
Additional information	

### 9.3.2.2.2 TWO OR MORE SITUATIONS LINK

ID	2414_H-LANE_MANAGEMENT-004
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<ul style="list-style-type: none"> <li>This use case shall not use the attribute "relatedSituation".</li> </ul>
Acceptance criteria	
Additional information	

### 9.3.2.3 The DATEX II <SituationRecord> class

Exactly the same as: 5.2.2.3 The DATEX II <SituationRecord> class.

ID	2414_H-LANE_MANAGEMENT-005
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<ul style="list-style-type: none"> <li>For this specific use case, a situation will be translated in an IVI.</li> <li>For the R-ITS-S, all the situationrecords present in a situation shall be translated in the same IVI message.</li> </ul>
Acceptance criteria	
Additional information	

### 9.3.2.3.1 THE <SITUATIONRECORD> CLASS ATTRIBUTES

#### 9.3.2.3.1.1 The class identifier

Exactly the same as: 5.2.2.3.1.1 The class identifier.

*NOTE: this chapter concerns a downlink use case.*

#### 9.3.2.3.1.2 The "situationRecordCreationReference" attribute

The principle of the chapter: 8.3.2.3.1.2 The "situationRecordCreationReference" attribute apply here.

*NOTE: this chapter concerns a downlink use case.*

#### 9.3.2.3.1.3 Time attributes

The rules presented in the following chapter applies: 8.3.2.3.1.3 Time attributes.

#### 9.3.2.3.1.4 "probabilityOfOccurrence" attribute

This attribute is not used in IVI.

#### 9.3.2.3.1.5 The <OperatorAction> class attributes

This class is not used in IVI.

Exactly the same as: 5.2.2.3.1.5 The <OperatorAction> class attributes (roadworks only).

#### 9.3.2.3.1.6 The other attributes

This class is not used in IVI.

Exactly the same as: 5.2.2.3.1.6 The other attributes.

### 9.3.2.3.2 THE CLASSES LINKED TO THE <SITUATIONRECORD> CLASS

#### 9.3.2.3.2.1 The DATEX II <Impact> class

However, the information of number of lanes is defined in the attribute "numberOfOperationalLanes" or "originalNumberOfLanes" (class "Impact") and is mandatory when one transmits lanes.

The normal number of usable lanes in the specified direction that the carriageway has before reduction or activation hardshoulder due to roadworks or traffic events.

The hardshoulder (class "AffectedCarriagewayAndLanes" in "supplementaryPositionDescription" in "GroupOfLocation") isn't counted in the summary of the lanes.

#### 9.3.2.3.2.2 The DATEX II <Source> class

This class is not used in IVI.

#### 9.3.2.3.2.3 The DATEX II <Comment> class

This class is not used in IVI.

Exactly the same as: 5.2.2.3.2.3 The DATEX II <Comment> class.

#### 9.3.2.3.2.4 The DATEX II <Cause> class

This class is not used in IVI.

#### 9.3.2.3.2.5 The DATEX II <Validity> class

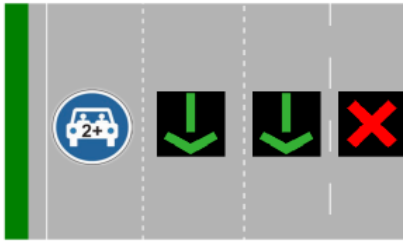
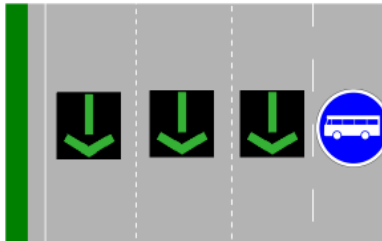
The rules presented in the following chapter apply: 8.3.2.3.2.5 The DATEX II <Validity> class.

#### 9.3.2.3.2.6 The DATEX II <groupOfLocations> class

The rules presented in the following chapter apply: 8.3.2.3.2.6 The DATEX II <groupOfLocations> class.

The description of the relevant lanes is mandatory for H4 and H6, so the affected lanes shall be described through the 3.9.3 Lane and carriageway positioning.

#### 9.3.2.3.2.7 Example

	High occupancy vehicle	Bus lane
Activated		
numberOfOperationalLanes	3	4
originalNumber of lane	3	3
AffectedCarriagewayAndLanes. lane	Lane 3 Hardshoulder	Hardshoulder



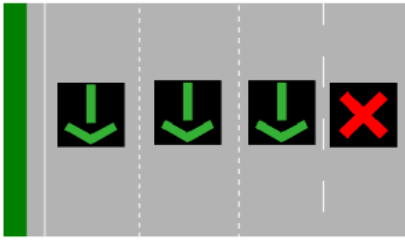
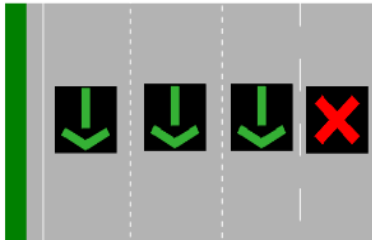
roadOrCarriagewayOrLaneManagementType.	carPoolLaneInOperation	laneClosures	UseSpecifiedLanes OrCarriageways
VehicleType			bus
Disabled			
numberOfOperationalLanes	3	3	
originalNumberoflane	3	3	
AffectedCarriagewayAndLanes		hardshoulder	hardshoulder
roadOrCarriagewayOrLaneManagementType		laneClosures	laneClosures

figure 33. *Information by lane*

### 9.3.2.3.3 THE <NETWORKMANAGEMENT> CLASS

#### 9.3.2.3.3.1 The class attributes

The attributes are not used in IVI.

The description can be found in: 5.2.2.3.5.1 The class attributes.

#### 9.3.2.3.3.2 The classes linked to the <NetworkManagement> class

The rules for <VehicleCharacteristics> presented in the following chapter apply:

8.3.2.3.3.2 The classes linked to the <NetworkManagement> class.

ID	2414_H-LANE_MANAGEMENT-006
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	For the H2 use case, at least the maximum “GrossVehicleWeight” shall be present in the DATEX II message, and the R-ITS-S shall translate it into the “wei” mandatory IVI attribute.
Acceptance criteria	
Additional information	

*Note for the R-ITS-S: the DATEX II VehicleCharacteristics class is used for the pictogram information, and not for the IVI <VehicleCharacteristic>.*

### 9.3.2.3.3.3 The DATEX II <RoadOrCarriagewayOrLaneManagement> class

ID	2414_H-LANE_MANAGEMENT-007
Component(s)	Nfr-ITS-S, Vro-ITS-S, R-ITS-S, PFro
Requirement	<RoadOrCarriagewayOrLaneManagement> class shall be used to provide the useful information for the following usecases: <ul style="list-style-type: none"> <li>• H2 use case type 1, storage on a road or a parking area for some vehicles,</li> <li>• H2 use case type 2, u-turn and go back for some vehicles,</li> <li>• H2 use case type 3, road closed to all types of vehicles,</li> <li>• H4, reserved lanes to some vehicles,</li> <li>• H6, no overtaking ban.</li> </ul>
Acceptance criteria	
Additional information	This class has two attributes. <ul style="list-style-type: none"> <li>• roadOrCarriagewayOrLaneManagementType</li> <li>• minimumCarOccupancy</li> </ul>

The first, roadOrCarriagewayOrLaneManagementType, can have different values.

Value of roadOrCarriagewayOrLaneManagementType	Translation in the use case :
vehicleStorageInOperation	H2 use case type 1
turnAroundInOperation	H2 use case type 2
carriagewayClosures	H2 use case type 3 (*)

roadClosed	H2 use case type 3 (*)
UseSpecifiedLanesOrCarriageways	H4 – for bus lane
carPoolLaneInOperation	H4 – HOV : carpool restriction.
laneClosures	H4 and H6 – see <vehiclecharacteristics>
clearALaneForEmergencyVehicles	NOT TO BE TRANSLATED
clearALaneForSnowploughsAndGrittingVehicles	NOT TO BE TRANSLATED
closedPermanentlyForTheWinter	NOT TO BE TRANSLATED
contraflow	NOT TO BE TRANSLATED
hardShoulderRunningInOperation	NOT TO BE TRANSLATED
heightRestrictionInOperation	NOT TO BE TRANSLATED
intermittentShortTermClosures	NOT TO BE TRANSLATED
lanesDeviated	NOT TO BE TRANSLATED
narrowLanes	NOT TO BE TRANSLATED
newRoadworksLayout	NOT TO BE TRANSLATED
other	NOT TO BE TRANSLATED
overnightClosures	NOT TO BE TRANSLATED
roadCleared	NOT TO BE TRANSLATED
rollingRoadBlock	NOT TO BE TRANSLATED
rushHourLaneInOperation	NOT TO BE TRANSLATED
singleAlternateLineTraffic	NOT TO BE TRANSLATED
tidalFlowLaneInOperation	NOT TO BE TRANSLATED
useOfSpecifiedLanesOrCarriagewaysAllowed	NOT TO BE TRANSLATED
doNotuseSpecifiedLanesOrCarriageways	NOT TO BE TRANSLATED
weightRestrictionInOperation	NOT TO BE TRANSLATED
keepToTheLeft	NOT TO BE TRANSLATED(*)
keepToTheRight	NOT TO BE TRANSLATED(*)

*Table 14 : List of lane management type available in DATEX II*

(\*) For these values, the translation apply only if the situationrecord is the first in the situation, otherwise it shall be used to complete the DENM according to chapter 5.

The second attribute is minimumCarOccupancy, which corresponds to the minimum number of persons required in a vehicle in order for it to be allowed to transit the specified road section.

This attribute shall be filled for the H4 – HOV : carpool restriction.

## 10 Vro-ITS-S specific DATEX II messages

### 10.1 Transmission of road operators' vehicle position

#### 10.1.1 Description

ID	2414_H-VRO_DATEXII-001
Component(s)	Vro-ITS-S, PFro
Requirement	The corresponding message is created by V-ITS-S of the road operator based on the position determined by GNSS receiver. It shall be sent directly to the platform without using any R-ITS-S.
Acceptance criteria	
Additional information	Vro-ITS-S can send a message when it is static or mobile

ID	2414_H-VRO_DATEXII-002
Component(s)	Vro-ITS-S, PFro
Requirement	The DATEX II publication named "MeasuredDataPublication" shall be used for this use case with the ancillary publication named "MeasurementSiteTablePublication" for the corresponding static elements.
Acceptance criteria	
Additional information	This message can be considered as similar to the R-ITS-S-generated message by CAM aggregation (from end-user vehicles). However, it has some specificities that are detailed below.

#### 10.1.2 Construction of the message

##### 10.1.2.1 Exchange parameters

###### 10.1.2.1.1 CHOOSING THE DISTRIBUTION MODE

See chapter 5.2.1 Choosing the distribution mode.

###### 10.1.2.1.2 DATA REPORTING PERIOD

ID	2414_H-VRO_DATEXII-003
Component(s)	Vro-ITS-S
Requirement	In "OM2" mode, the reporting period shall be configured for each Vro-ITS-S.
Acceptance criteria	
Additional information	<p>Its value is in seconds.</p> <p>To accommodate different needs and situations this parameter is defined in V-ITS-S according to Table 10, see chapter 10.3 Setting the static Vro-ITS-S parameters.</p>

## 10.1.2.2 Message content

### 10.1.2.2.1 THE DATEX II <MEASUREDDATAPUBLICATION> CLASS

ID	2414_H-VRO_DATEXII-004
Component(s)	Vro-ITS-S
Requirement	<p>the DATEX II &lt;MeasuredDataPublication&gt; class shall contain the following attributes:</p> <ul style="list-style-type: none"> <li>The "measurementSiteTableReference" attribute which provides a reference to the associated static element definition of the road operator V-ITS-S (i.e., the versioned identifier of the &lt;<b>MeasurementSiteTable</b>&gt; class instance already defined through the &lt;<b>MeasurementSiteTable</b>&gt; publication;</li> <li>As many instances of the DATEX II &lt;<b>SiteMeasurements</b>&gt; class as V-ITS-S positions.</li> </ul>
Acceptance criteria	
Additional information	<p>&lt;HeaderInformation&gt; class is mandatory with its attributes:</p> <ul style="list-style-type: none"> <li>Confidentiality</li> <li>InformationStatus</li> </ul>

### 10.1.2.2.2 THE DATEX II <SiteMeasurements> CLASS

ID	2414_H-VRO_DATEXII-005
Component(s)	Vro-ITS-S
Requirement	<measurementSiteReference> shall be a reference to a versioned measurement site record defined in a Measurement Site table. (<MeasurementSiteTable> class)
Acceptance criteria	
Additional information	<p>The DATEX II <b>&lt;MeasurementSiteRecord&gt;</b> class allows identifying the V-ITS-S of a road operator the position of which is uploaded (a reference for the road operator's V-ITS-S):</p> <pre> ... &lt;measurementSiteReference id="UEVG-EC301" targetClass="MeasurementSiteRecord" version="1"/&gt; ... </pre> <p>The version number is incremented every time one of the instance attributed is updated.</p>

ID	2414_H-VRO_DATEXII-006
Component(s)	Vro-ITS-S
Requirement	<p>The <b>&lt;SiteMeasurements&gt;</b> class shall contain an only instance of the <b>&lt;MeasuredValue&gt;</b> class that represents vehicle position to transmit.</p> <p>Each instance of <b>&lt;SiteMeasurements&gt;</b> is timestamped through the mandatory "measurementTimeDefault" attribute.</p>
Acceptance criteria	
Additional information	In case several positions are to upload in once, as many <b>&lt;SiteMeasurements&gt;</b> instances are created as positions. They are distinguished through their timestamp.

The **<MeasuredValue>** class includes an optional "measurementEquipmentTypeUsed" attribute (about operator's V-ITS-S type) which is not used for exchanging dynamic data. It can be defined in the static data publication (DATEX II **<MeasurementSiteTablePublication>** class). The other optional classes linked to this class are not used.

### 10.1.2.2.3 THE DATEX II <BASICDATA> CLASS

ID	2414_H-VRO_DATEXII-007
Component(s)	Vro-ITS-S
Requirement	The abstract <b>&lt;basicData&gt;</b> class shall be realised using the concrete <b>&lt;IndividualVehicleDataValues&gt;</b> .class (under <TrafficData> class)
Acceptance criteria	
Additional information	It is linked to the abstract <b>&lt;groupOfLocations&gt;</b> class that is realised using the <b>&lt;Point&gt;</b> (indeed using the <b>&lt;PointByCoordinates&gt;</b> class with the "bearing" attribute filled in with the heading of vehicle or trailer).

ID	2414_H-VRO_DATEXII-008
Component(s)	Vro-ITS-S
Requirement	The instance of the <b>&lt;IndividualVehicleDataValues&gt;</b> class shall be linked to an instance of the <b>&lt;SpeedValue&gt;</b> class the speed » attribute is conventionally defined depending on whether it is static or not when its position is defined. The conventional values are defined as follows: <ul style="list-style-type: none"> <li>• "speed" is set to 0 if the V-ITS-S is in a static vehicle or trailer;</li> <li>• "speed" is set to 10 if the V-ITS-S is in a moving vehicle or trailer;</li> </ul>
Acceptance criteria	
Additional information	

```

<siteMeasurements>
  <measurementSiteReference id="UEVG-EC301" targetClass="MeasurementSiteRecord"
version="1"/>
  <measurementTimeDefault>2015-07-05T00:10:05.10+02:00</measurementTimeDefault>
  <measuredValue index="1">
    <measuredValue>
      <basicData xsi:type="IndividualVehicleDataValues">
        <pertinentLocation xsi:type="Point">
          <pointByCoordinates>
            <bearing>108</:bearing>
            <pointCoordinates>
              <latitude>48.98318</latitude>
              <longitude>2.49709</longitude>
            </pointCoordinates>
          </pointByCoordinates>
        </pertinentLocation>
      </individualVehicleSpeed>
    </measuredValue>
  </measuredValue>

```

```
<speed>10</speed>
</individualVehicleSpeed>
</basicData>
</measuredValue>
</measuredValue>
</siteMeasurements>
```

## 10.2 Vro-ITS-S Sos Notification Publication

### 10.2.1 The use case description and the UML description

ID	2414_H-VRO_SOS-001
Component(s)	Vro-ITS-S
Requirement	The created message shall be transmitted every time the corresponding SOS icon is tapped on the HMI notepad in road operator's vehicle and it is based on the GNSS-positioning of V-ITS-S.
Acceptance criteria	
Additional information	It is directly transmitted to the platform without using any R-ITS-S. Some actions can be defined by the road operator when receiving this message but they do not influence the content of the message.

The considered message is a specific event message using a DATEX II extension. Some commonalities can be seen with a DENM broadcast by any V-ITS-S. To do this a specific publication (**<SosNotificationPublication>**) has been created. It is a level B extension, which means the corresponding XML schema file can validate any message created using the normal plain DATEX II schema and this latter can validate any message created using this level B extended XML schema (without being able to decode the specific extension content).



The corresponding publication can be described using the following class diagram:

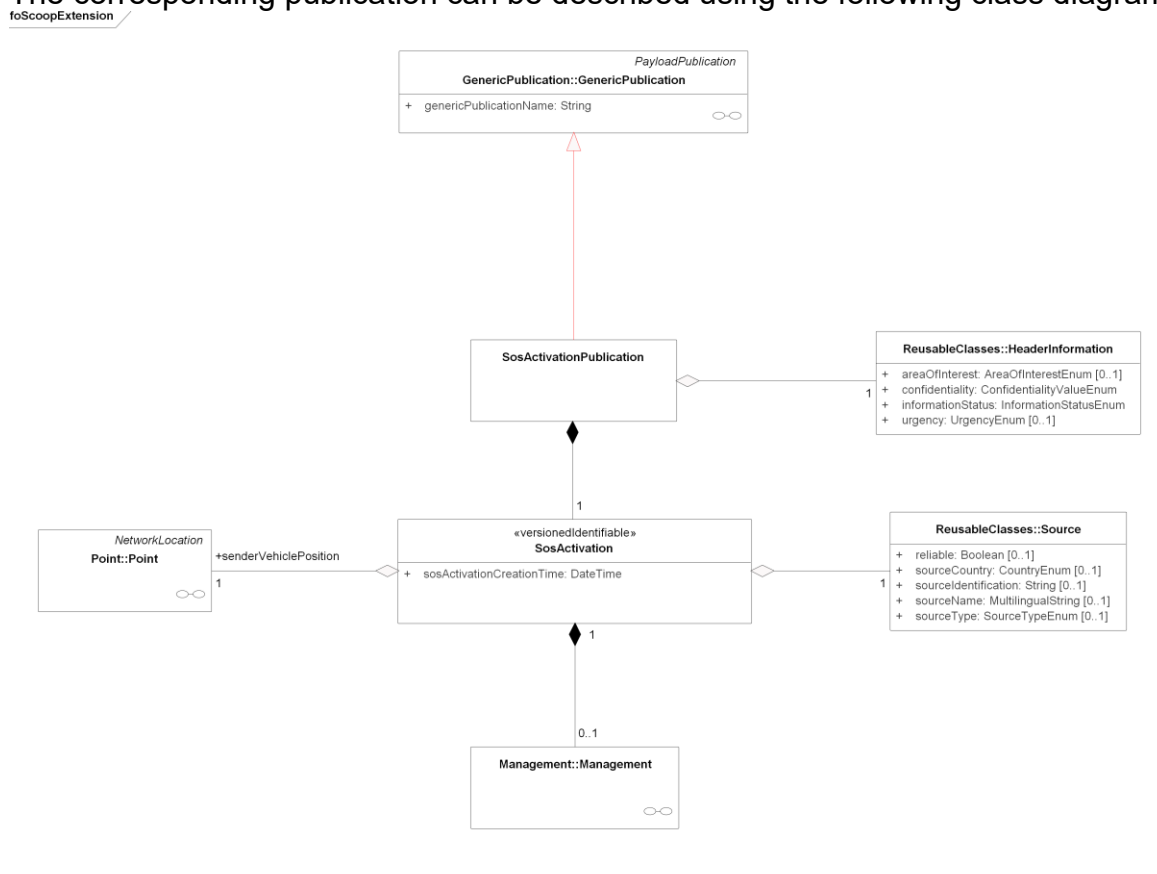


figure 34. The *SosActivationPublication* class diagram

This publication is derived of the DATEX II <GenericPublication> by inheritance. Such a publication only contains one <**SosActivation**> class defined internally.

NOTE: The DATEX II classes <Point>, <HeaderInformation> and <Source> are already defined for the TE01 to TE03 messages. However, their attributes are not filled in identically.

## 10.2.2 Construction of the message

### 10.2.2.1 Exchange parameters

#### 10.2.2.1.1 CHOOSING THE DISTRIBUTION MODE

See chapter 5.2.1 Choosing the distribution mode (attribute value: “operatingMode1”).

### 10.2.2.1.2 NOTIFYING THE SOS ACTIVATION END

ID	2414_H-VRO_SOS-002
Component(s)	Vro-ITS-S
Requirement	When the activation ends (through the SOS button) a new version of the corresponding publication shall be sent having the same classes instantiated and the attributes filled in. The only differences are:
Acceptance criteria	
Additional information	<ul style="list-style-type: none"> <li>The version number is updated</li> <li>The DATEX II &lt;LifeCycleManagement&gt; class instance (in package Management) is updated with “end” = “True”.</li> <li>The location is the current vehicle position.</li> </ul>

Thus the following XML content:

```

...
<sosActivation id="GUID3322530C-D452-4ae8-B942-993BC2923D13" version="2" >
  <sosActivationCreationTime>2015-07-05T00:00:00+02:00</sosActivationCreationTime>
  ...
  <management>
    <lifeCycleManagement>
      <end>true</end>
    </lifeCycleManagement>
  </management>
</sosActivation>
...

```

## 10.2.2.2 Message content

### 10.2.2.2.1 THE DATEX II <SOSNOTIFICATION> CLASS

ID	2414_H-VRO_SOS-003
Component(s)	Vro-ITS-S
Requirement	This class shall be “identifiable”, which means a unique identifier is added to the class definition.
Acceptance criteria	
Additional information	<p>As there is no DENM input in this case the generation process is different from the other situationPublication of this document :</p> <ul style="list-style-type: none"> <li>The identifier is created by a GUID creation process that guaranties its unicity. It is kept for new versions.</li> </ul> <p>For defining the “sosActivationCreationTime” attribute see chapter 5.2.2.3.1.3 Time attributes.</p>

*NOTE: The definition of the “sosActivationCreationTime” is identical to the one of “situationRecordCreationTime”. However, as there is no DENM input the corresponding time stems from the V-ITS-S clock.*

#### 10.2.2.2.2 THE DATEX II <HEADERINFORMATION> CLASS

ID	2414_H-VRO_SOS-004
Component(s)	Vro-ITS-S
Requirement	The attribute “confidentiality” shall be filled in with the value “internalUse”.
Acceptance criteria	
Additional information	To fill in the other attributes of this class see chapter 5.2.2.1 The DATEX II <HeaderInformation> class.

#### 10.2.2.2.3 THE DATEX II <SOURCE> CLASS

ID	2414_H-VRO_SOS-005
Component(s)	Vro-ITS-S
Requirement	The attribute “sourceType” shall be filled in with the value “roadOperatorPatrol” whereas the attribute “reliable” is set to “True”.
Acceptance criteria	
Additional information	To fill in the other attributes of this class see chapter 5.2.2.3.2.2 The DATEX II <Source> class.

*NOTE: This definition is static and independent from any stationType definition.*

#### 10.2.2.2.4 THE POINT LOCATION DESCRIPTION

ID	2414_H-VRO_SOS-006(2)
Component(s)	Vro-ITS-S

Requirement	In this case, the Point location shall be realised using the DATEX II <b>&lt;PointByCoordinates&gt;</b> class. The “bearing” attribute shall be filled in with the heading of the vehicle where the SOS message is activated
Acceptance criteria	
Additional information	For details on this point location description, see chapter 3.4 Bearing

### 10.2.2.3 Example of produced message

An example of TE05 message content can be found below (payload part):

```
<payloadPublication xsi:type="GenericPublication" lang="fre">
...
<genericPublicationName>SosActivationPublication</genericPublicationName>
<genericPublicationExtension>
  <sosActivationPublication>
    <headerInformation>
      <confidentiality>internalUse</confidentiality>
      <informationStatus>real</informationStatus>
    </headerInformation>
    <sosActivation id="GUID3322530C-D452-4ae8-B942-993BC2923D13">
      <sosActivationCreationTime>2015-07-05T00:00:00+02:00
</sosActivationCreationTime>
      <senderVehiclePosition>
        <pointByCoordinates>
          <bearing>210</bearing>
          <pointCoordinates>
            <latitude>50.12345</latitude>
            <longitude>1.23456</longitude>
          </pointCoordinates>
        </pointByCoordinates>
      </senderVehiclePosition>
      <source>
        <sourceIdentification>SCOOP_DIRIF_EC301</sourceIdentification>
        <sourceType>roadOperatorPatrol</sourceType>
        <reliable>true</reliable>
      </source>
    </sosActivation>
  </sosActivationPublication>
</genericPublicationExtension>
</payloadPublication>
```

## 10.3 Setting the static Vro-ITS-S parameters

No static data exchange is planned for Vro-ITS-S in the wave 1, including identifiers. However, such information needs to be defined through static parameters, such that the mandatory publication attributes can be filled in.

The following table helps define these parameters:

DATEX II Parameters for V-ITS-S	Default values
nationalIdentifier	To be defined (e.g. <i>SCOOP_DIRIF_UEVG_EC301</i> )
measurementSiteTableReference	To be defined (e.g. <i>SCOOP_DIRIF_UEVG</i> )
measurementSiteReference	To be defined (e.g. <i>UEVG_EC301</i> )
sourceIdentification	To be defined (e.g. <i>SCOOP_DIRIF_EC301</i> )
Period	30 (in seconds)

*Table 15 : Setting the static V-ITS-S parameters*

The naming rule for referencing the measurement is proposed as follows: “UEVG” + Inventory code (attributed by the road operator to the vehicle or the trailer where is installed V-ITS-S).

For example: “UEVG-EC301” (V-ITS-S installed in the EC301-coded vehicle).

The “nationalIdentifier” attribute is inferred from the previous one by adding the name of the project, for example “SCOOP”, and the road operator’s name (as here: DIRIF). The reference table identifier (implemented in the platform) is inferred from the previous one by removing the last element (here: “EC301”).

*NOTE: it is advised to create separate publications for the measurement sites of R-ITS-S and V-ITS-S. Therefore, no confusion is possible between the data issued by CAM aggregation and the data issued by vehicle positions (V-ITS-S). In the future if road operator’s V-ITS-S are used as mobile R-ITS-S and aggregate CAM data they are identified as such including virtual loop location.*

## 11 Appendices

### 11.1 Extract from the TISA guide proposing a correspondence between the DENM CauseCode and the DATEX II classes

Use case of the European Directive	DATEX		DENM		
	Class	Type	Cause code	Sub Cause Code	Text
Unprotected accident	GeneralObstruction	unprotectedAccidentArea	2	7	unsecured accident
Animal/People/Debris on the road	Environmental obstruction	avalanches	5	2	danger of avalanches
Animal/People/Debris on the road	Environmental obstruction	landslips	5	4	landslips
Animal/People/Debris on the road	Environmental obstruction	rockfalls	9	1	rockfalls
Animal/People/Debris on the road	GeneralObstruction	objectOnTheRoad	10	0	objects on the road
Animal/People/Debris on the road	GeneralObstruction	shedLoad	10	1	shed load
Animal/People/Debris on the road	Environmental obstruction	fallenTrees	10	5	fallen trees
Animal/People/Debris on the road	AnimalsPresenceObstruction	animalsOnTheRoad	11	0	animals on roadway
Animal/People/Debris on the road	AnimalsPresenceObstruction	herdOfAnimalsOnTheRoad	11	2	herd of animals
Animal/People/Debris on the road	AnimalsPresenceObstruction	largeAnimalsOnTheRoad	11	4	large animals
Animal/People/Debris on the road	GeneralObstruction	peopleOnRoadway	12	0	people on roadway
Animal/People/Debris on the road	GeneralObstruction	childrenOnRoadway	12	1	children on roadway
Animal/People/Debris on the road	GeneralObstruction	cyclistsOnRoadway	12	2	cyclists on roadway
Animal/People/Debris on the road	VehicleObstruction	brokenDownVehicle	13	0	broken down vehicles
Animal/People/Debris on the road	DisturbanceActivity	attackOnVehicle	20	3	stone throwing persons
Exceptional weather conditions	poorEnvironmentConditions	stormForceWinds	17	1	strong winds
Exceptional weather conditions	poorEnvironmentConditions	strongWinds	17	1	strong winds
Exceptional weather conditions	poorEnvironmentConditions	crosswinds	17	1	strong winds
Exceptional weather conditions	poorEnvironmentConditions	strongWinds	17	1	strong winds
Exceptional weather conditions	poorEnvironmentConditions	heavyRain	19	1	heavy rain
Exceptional weather conditions	poorEnvironmentConditions	heavySnowfall	19	2	heavy snowfall

#### 2.4.1.4\_M-SPECIFICATION OF DATEX II V2.3 MESSAGES IN CONJUNCTION WITH C-ITS MESSAGES

Use case of the European Directive	DATEX		DENM		
	Class	Type	Cause code	Sub Cause Code	Text
Wrong way driver	VehicleObstruction	vehicleOnWrongCarriageway	14	0 <sup>4</sup>	vehicle on wrong carriageway
Road blocked	GeneralObstruction and impact:trafficConstrictionType	obstructionOnTheRoad and roadBlocked	5	0	impassability
Slippery road	EnvironmentalObstruction	flooding	5	1	flooding
Slippery road	WeatherRelatedRoadConditions	slipperyRoad	6	0	slippery road
Slippery road	NonWeatherRelatedRoadConditions	petrolOnRoad	6	2	fuel on road
Slippery road	NonWeatherRelatedRoadConditions	mudOnRoad	6	3	mud on road
Slippery road	WeatherRelatedRoadConditions	Ice	6	5	ice on road
Slippery road	WeatherRelatedRoadConditions	icyPatches	6	5	ice on road
Slippery road	WeatherRelatedRoadConditions	blackIce	6	6	black ice on road
Slippery road	NonWeatherRelatedRoadConditions	oilOnRoad	6	7	oil on road
Slippery road	NonWeatherRelatedRoadConditions	looseChippings	6	8	loose chippings
Slippery road	WeatherRelatedRoadCondition	surfaceWater	7	0	aquaplaning
Slippery road	WeatherRelatedRoadConditions	snowDrifts	9	5	snow drifts
Roadworks	MaintenanceWorks	maintanceWork	3	0	Roadworks
Roadworks	MaintenanceWorks	RoadMarkingWork	3	2	road marking work
Roadworks	GeneralObstruction	rescueAndRecoveryWork	15	0	rescue and recovery work in progress
Roadworks	VehicleObstruction	SlowMovingMaintenanceVehicle	26	1	slow moving maintenance vehicle
Low visibility	poorEnvironmentConditions	visibilityReduced	18	0	visibility reduced
Low visibility	poorEnvironmentConditions	denseFog <sup>5</sup>	18	1	visibility reduced due to fog
Low visibility	poorEnvironmentConditions	patchyFog	18	1	visibility reduced due to fog
Low visibility	poorEnvironmentConditions	Fog	18	1	visibility reduced due to fog
Low visibility	poorEnvironmentConditions	freezingFog	18	1	visibility reduced due to fog
Low visibility	poorEnvironmentConditions	smokeHazard	18	2	visibility reduced due to smoke
Low visibility	poorEnvironmentConditions	heavySnowfall	18	3	visibility reduced due to heavy snowfall
Low visibility	poorEnvironmentConditions	lowSunGlare	18	6	visibility reduced due to low sun glare

<sup>4</sup> There is a difference between the french deliverable 2.4.1.2.M\_WrongWayDriving (14/2) and this TISA document (14/0).

<sup>5</sup> Editor's note: there is a difference between TISA's correspondence table and the DATEX II France group. Taking into account national practices this latter does not make difference between "fog" and "denseFog" and therefore recommends using "fog" in TMS.

Table 16 : Correspondence DATEX II attributes and cause codes used by DENMs

## 11.2 Available location descriptions in DATEX II

This chapter presents the descriptions of the location available in the TS 16157. DATEX II can use the aggregations of locations in the form of non-ordered groups (DATEX II <NonOrderedLocations> class) or itineraries (DATEX II <Itinerary> class).

Considering the possibilities offered by this technical specification, it should be noted that DATEX II considers each basic topological object (point - dimension 0, linear - dimension 1 and zone - dimension 2) as a container of a group of values. This means, for example, that a point type object representing a specific point in space can be represented by means of one or more location systems (e.g. with an ALERT-C location and a TPEG-LOC location).

### 11.2.1 Point location

#### 11.2.1.1 A point location in coordinates

This point is represented by:

- its longitude and latitude coordinates (only mandatory information)
- the “bearing” attribute: bearing in relation to geographic North in degrees, indicating the traffic direction of the lane on which the point is.

#### 11.2.1.2 A point location defined linearly

The linear is the location using reference markers (also named “PR” or “PLO” in French<sup>6</sup>) commonly used by operators on a defined road. They are named “Referent” in DATEX II. The following elements must be specified:

- the section of road or slip road, described via an ordered series of **<Referent>** objects (e.g., the marker (PR) or a representation of the road's geometric axis),
- a road number (**<roadNumber>**) type identifier in the usual sense or a road name (or street name, especially in urban settings; **<roadName>**), corresponding to the section of road or slip road
- identifier of the marker (which must be unique for the road considered), information contained in the **<referentIdentifier>** attribute of the **<Referent>** class
- the relative abscissa (in metres) in relation to the PR considered, information contained in the **<distanceAlong>** attribute in the **<DistanceFromLinearElementReferent>** class
- the **<directionRelativeAtPoint>** attribute, which is used to specify whether the direction of traffic in question is the same as that defined by the order of the markers used (“aligned”) or opposed (“opposite”). There are also the “both” and “unknown” values.

<sup>6</sup> Note: PR means “point of reference”, it is also sometimes called kilometre-post (KP) even if in reality the distance between two points is not always equal to 1,000 metres



- the general direction of the road: **<directionBoundAtPoint>** (values of geographical directions: N, NE, E, SE, S, SW, W, NW plus “bothWays” and “opposite”). This is the general destination of the traffic direction on the lane on which the event is located.

### 11.2.1.3 A point identified in ALERT-C

This description is related to the frame of reference for ALERT-C locations (approximately 100,000 km of road covered in France for the last version of the table). This method, used initially by the RDS/TMC road information services, is subject to European and international standards.

### 11.2.1.4 A point identified in TPEG-LOC

This description uses the TPEG-LOC method (point defined in geographic coordinates, including the name of the road concerned) such as it is implemented in the DATEX II model.

## 11.2.2 Linear location

DATEX II can be used to describe linear locations using two points, by means of the following methods:

- linear method: defined from a “fromPoint” and to a “toPoint”, to which one adds information, including the name of the road. See chapter “11.2.1. Point location”, for the basic definition of each point.
- ALERT-C method: defined by two ALERT-C points (which define an implicit direction) + one direction confirming or modifying the implicit direction (DATEX II classes **<AlertCMethod2Linear>** or **<AlertCMethod4Linear>**).
- TPEG-LOC method: defined by two points (“segment”) defined by the TPEG-LOC location method associated with a geographic or relative traffic direction (DATEX II class **<TpegLinearLoc>**).

It should be noted that the ALERT-C location system is the only one that includes natively linear type locations, which can be used directly to localise operating events or actions. Nevertheless, the precision is not as high as in the three methods above, using two points.

## 11.2.3 Area location

DATEX II can be used to describe areas using the following methods:

- ALERT-C area (DATEX II **<AlertCArea>** class, which contains the reference to a predefined area in the table of ALERT-C locations (a few towns, former districts, regions, etc.): approximately 3,000 area locations));
- TPEG-LOC area (in addition to the type – “tpegAreaLocationType” attribute, or by an area defined by its name and its type – DATEX II **<TpegNamedOnlyArea>** class, or geometrically by a circle (**<TpegGeometricArea>** class: a point defining the centre and the radius)

## 11.2.4 Transverse positioning

Moreover, DATEX II can be used to define additional elements to the preceding elements. It is possible to add:

- textual descriptive information (e.g., “in the curve”, “on the exit ramp”); and

- transverse positioning information (carriageways and lanes):
  - the carriageway concerned (corresponding to the attribute value “mainCarriageway”) or the opposite carriageway (value “oppositeCarriageway”), etc.)
  - its position on the lane, for the considered carriageway (“hard shoulder” = the lane for emergency stopping out of the road, “lane 1” = first lane numbered from nearest the hard shoulder to central reservation (i.e. in France from the right), “lane 3” = third lane from the hard shoulder; “middleLane” for the lane in the middle of the road in case of a single carriageway road, etc.)

The <SupplementaryPositionalDescription> and <AffectedCarriagewayAndLanes> classes are used for this purpose.