



French C-ITS Deployment Coordination committee

Common technical specifications for use cases: H2 - dynamic traffic ban to specific vehicle (I2V)

2.4.1.2_M_H2

Activity 2: Studies

Sub Activity 2.4 > Specifications

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Document: Common technical specifications for use case – H2 Dynamic Traffic Ban (I2V)

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Black highlighted text are problem with standards.

The following legend is used on the document tables:

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

Profile / Status :

- If mandatory : **✓**
- If optional in standard :
 - Used (**U**) when always used
 - Not used (**X**) when never used.
 - Sometimes (**S**) when it depends.

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

Quality rules

Reference to the version administration

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

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

As illustration :

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

Requirements identification & traceability

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

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

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

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

Inevitability used to describe 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

Acronyms & abbreviations

| | |
|---------|---|
| C-ITS | Cooperative Intelligent Transport Systems |
| DENM | Decentralized Environmental Notification Message |
| HMI | Human-Machine Interface |
| I2V | Infrastructure To Vehicle |
| 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. |
| IVIM | Infrastructure to Vehicle Information Message |
| PF | Platform |
| PFro | Road operator platform |
| R-ITS-S | Roadside ITS Station |
| TCC | Traffic Control Centre (the place where road management measures are decided) |
| TMS | Traffic Management System (the usual system in which the road operator sets its road measures and events) |
| UC | Use Case |
| V-ITS-S | Vehicle ITS Station |
| | |
| N/A | <i>Not Applicable</i> |
| TBC | <i>To Be Checked, with MS or associated partner</i> |
| WIP | <i>Work in progress : when mentioned next to the version number, it means the document is an in-between version</i> |

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1. Documents

1.1 Reference documents

| Id. | Reference | Version | Title / Content |
|--------------|-------------------------------|---------|--|
| [DR1] | 2.4.1.2_M_B1a&B1b(RWW +) | 4.20 | Common technical specifications for use cases Road Work Warning basic & enhanced (I2V) |
| [DR2] | 2.4.1_M Common specifications | 0.30 | Functional and technical hybrid architecture – Common specification |

1.2 Applicable documents

| Id. | Reference | Version | Title / Content |
|--------------|----------------------|---------|---|
| [DA1] | 2.4.1.2_M_Master_I2V | 4.90 | Master technical specifications for I2V use cases |

2. Figure and example of IVI message for dynamic traffic ban

In order to clarify the data elements description for the Dynamic Traffic Ban (DTB) use case, we start by describing the scenario in the figure below and then the data elements associated in the table.

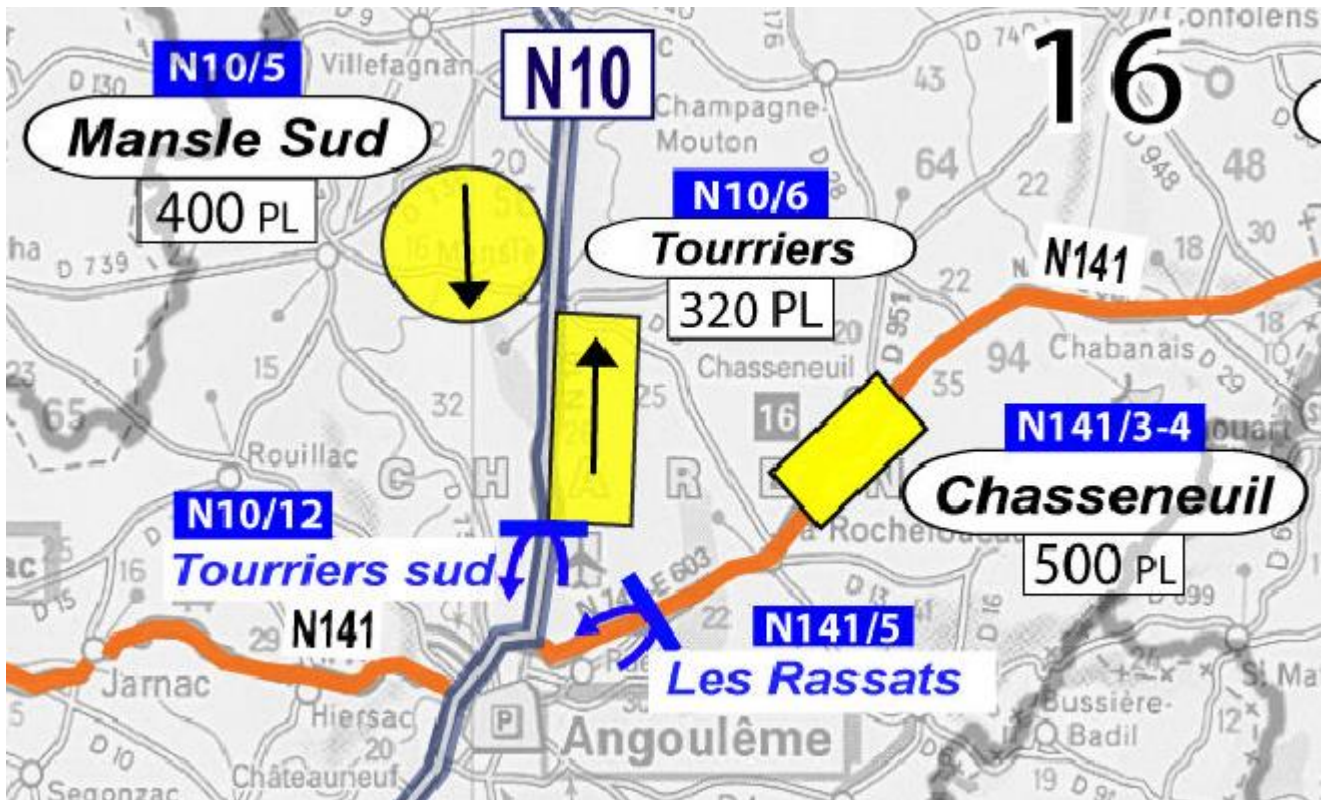


Figure 1: example by illustration, extracted from PISO 2017 (Plan Intempéries Sud Ouest / South West weather plan)

- Circle means storage on area (parking) for trucks (weight >7,5t)
- Rectangle means storage on road for trucks (weight > 7,5t)
- Arrows give the directions of the measures (no arrow means the measure concerns both directions of road)
- U-Turn means trucks (> 7,5t) have to go back to the other direction
- (Then, if situation exceed this status, road is generally closed (for all types of vehicles))

#Description of IVI for FR for DynTrafficBan UC (I2V)
#Represents the example of the figure 1 of the document
#Commented by A. AUDIGE & J.DIEZ (DIR A & DGITM)

```
value1 IVI ::= {
  header {
    protocolVersion currentVersion=2,
    messageID ivi=6,
    stationID 4711
  },
  ivi {
    mandatory {
      serviceProviderId {
        countryCode 10110 01010, #means 'FR'
        issuerIdentifier 33 #DIRA
      }
    }
  }
}
```



```

ivIdentificationNumber 123456789,
timeStamp 352425600000,
validFrom 352447200000,
validTo 352447200010,
iviStatus new=0
},
optional {
  glc : { #GLC = geographic location container = description of reference point and zones (2 zones in this example)
    referencePosition {
      latitude 481540527, #latitude of point "0"; start point of the measure
      longitude 164801006, #longitude of point "0" ; start point of the measure
      positionConfidenceEllipse {
        semiMajorConfidence unavailable=0,
        semiMinorConfidence unavailable=0,
        semiMajorOrientation unavailable=0
      },
      altitude {
        altitudeValue unavailable=800001, #But can be provided if known by the system
        altitudeConfidence unavailable=15
      }
    },
    parts {
      {
        zoneId 1, #description of a zone. Here, approach of referencePosition
        zoneHeading {
          headingValue wgs84East(900), #Heading of the road at the referencePosition
          headingConfidence unavailable=127
        }
        zone segment : {
          line deltaPositions : {
            {
              deltaLatitude -6637,
              deltaLongitude 9289
            },
            {
              deltaLatitude -5379,
              deltaLongitude 10567
            },
            {
              ... # number of point needs to be defined according to DA1 §2.3,
            }
          }
        }
      },
      {
        zoneId 2, #description of a zone. Here, zone in which the IVI applies.
        zoneHeading {
          headingValue wgs84East(900), #Heading of road at the referencePosition
          headingConfidence unavailable=127
        }
        zone segment : {
          line deltaPositions : {
            {
              deltaLatitude 7591,
              deltaLongitude -7420
            },
            {
              deltaLatitude 8278,
              deltaLongitude -5379
            },
            {
              ... # number of point needs to be defined according to DA1 §2.3,
            }
          }
        }
      }
    }
  },
  gic : { #GIC = general Ivi container = description of the traffic signs of the VMS
    { #First container = speed limit for trucks (which is under the speed limit displayed on VMS)
      detectionZonelds {
        1
      },
      relevanceZonelds {
        2
      },
      direction sameDirection=0,
      iviType regulatoryMessages=1,
      vehicleCharacteristics { #Optional, but DF attributes of DF roadSignCode shall be well defined
        {
          train {
            ranges {

```

line ">zone".

line ">zone".

(see below)

```

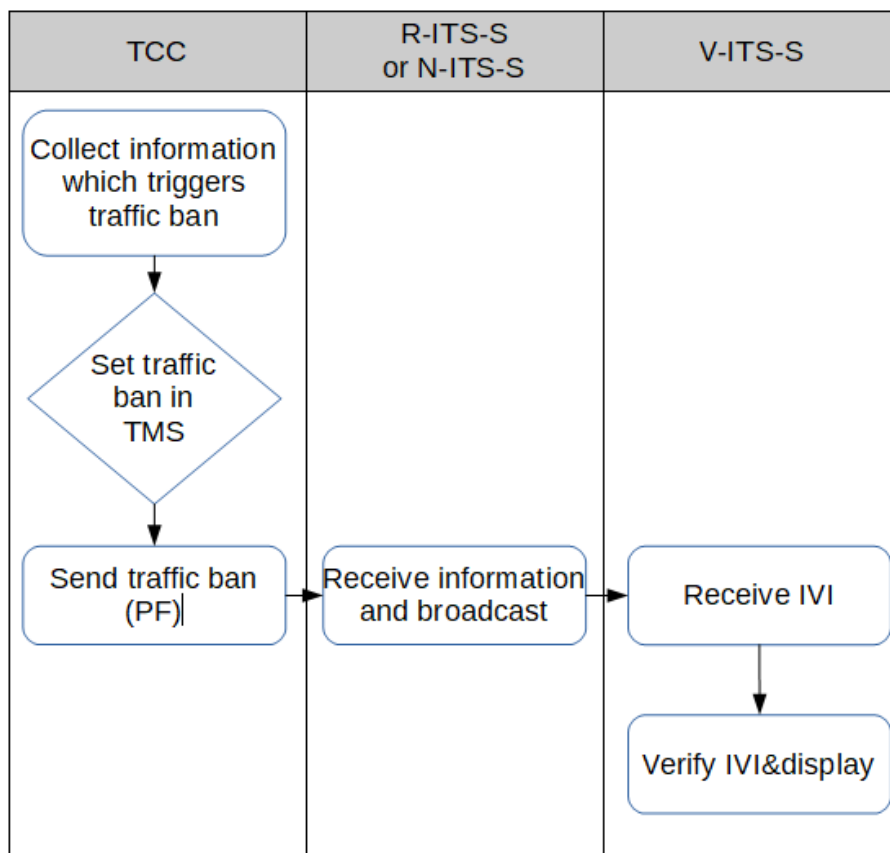
{
  vehicleTrainMaximumWeight 7500,
  roadSignCodes {
    code iso14823 : {
      pictogramCode {
        serviceCategoryCode trafficSignPictogram = regulatory, #See
        pictogramCategoryCode {
          nature 4, #See TS14823:2017 table
          serialNumber 21 #See TS14823:2017 table
        }
        attributes { #Mandatory to properly define the targeted vehicles
          ved {
            wei {
              value 750,
              unit 11 #hundredkg
            }
          }
        }
      }
    }
  },
  comparisonOperator greaterThan=0,
  limits vehicleWeightLimits : {
    vehicleMaxLadenWeight 0,
    vehicleWeightUnladen 0
  }
}

```

TS14823 table

Figure 2: IVI message associated with figure above

3. Step by step diagram



Collect information which triggers dynamic traffic ban:

Generally, traffic bans are motivated by hard weather conditions (snow, violent wind, flooding, etc). Information **can** come from the field, but most of the time by weather prediction.

Set traffic ban in traffic management system:

When the information of the decision is given to the road operator, the road operator, at the traffic control center (TCC) sets a traffic ban in his traffic management system (TMS).

Three types of measures are possible and shall not be set the same way in the TMS. The three types are: (1) storage on road (1a) or area/parking (1b); (2) U-turn and go back; (3) road is closed.

| | |
|------------------------|--|
| ID | 2.4.1.2_M_H2-SetParametersType1_1 (1) |
| Component(s) | TMS |
| Requirement | <p>TMS may set the following parameters for a storage on road (1a) or on area/parking (1b):</p> <ul style="list-style-type: none"> vehicleType: lorry (PL) if relevant weight: greater than 7,5t if relevant TYPE_ELT = RoadOrCarriagewayOrLaneManagement <ul style="list-style-type: none"> roadOrCarriagewayOrLaneManagementType: vehicleStorageInOperation Optionally: a comment can precise name of the area, rate of occupancy, etc. ComplianceOption: mandatory |
| Acceptance | |
| Additional information | |

| | |
|-------------------------------|--|
| ID | 2.4.1.2_M_H2-SetParametersType1_2 (1) |
| Component(s) | TMS |
| Requirement | TMS shall set the starting point for a storage on road (1a) at the head/first position of storage. TMS shall set the starting point for an area/parking (1b) at the J14 beacon (see below) of exit to the area/parking. |
| Acceptance | |
| Additional information | For any situation the starting point of the event is the position from which the traffic ban applies i.e no (truck) vehicle are allowed downstream this point. |

| | |
|-------------------------------|--|
| ID | 2.4.1.2_M_H2-SetParametersType2_1 (1) |
| Component(s) | TMS |
| Requirement | TMS may set the following parameters for a U-turn and go back to the other direction: <ul style="list-style-type: none"> vehicleType: lorry (PL) if relevant weight: greater than 7,5t if relevant TYPE_ELT = RoadOrCarriagewayOrLaneManagement <ul style="list-style-type: none"> roadOrCarriagewayOrLaneManagementType: turnAroundInOperation ComplianceOption: mandatory |
| Acceptance | |
| Additional information | |

| | |
|-------------------------------|--|
| ID | 2.4.1.2_M_H2-SetParametersType2_2 (1) |
| Component(s) | TMS |
| Requirement | TMS shall set the starting point for this type (2) of measure at the J14 beacon (see below) of exit to the U-turn road interchange. |
| Acceptance | |
| Additional information | For any situation the starting point of the event is the position from which the traffic ban applies i.e no (truck) vehicle are allowed downstream this point. |

| | |
|-------------------------------|--|
| ID | 2.4.1.2_M_H2-SetParametersType3_1 (1) |
| Component(s) | TMS |
| Requirement | TMS may set the following parameters for a road closed to all type of vehicles: <ul style="list-style-type: none"> TYPE_ELT = RoadOrCarriagewayOrLaneManagement <ul style="list-style-type: none"> roadOrCarriagewayOrLaneManagementType: roadClosed (if both directions are closed) or carriagewayClosures (if one direction is closed) |
| Acceptance | |
| Additional information | For this situation, a DENM may also be sent by the road operator (see DA1 about D8 use case and DR1). |

| | |
|-------------------------------|--|
| ID | 2.4.1.2_M_H2-SetParametersAllTypes (1) |
| Component(s) | TMS |
| Requirement | If the information is set as a linear in the TMS, this linear shall be set as the zone(s) in which the traffic ban applies. |
| Acceptance | |
| Additional information | |

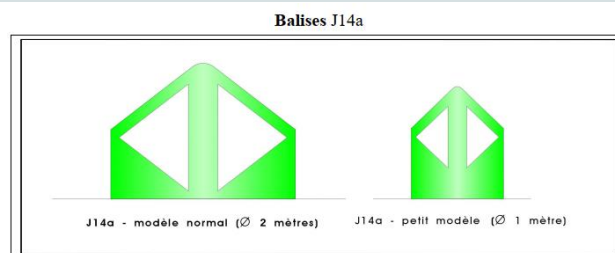


Figure 3: J14 beacon

The TMS sends a DATEX II message of the event to the PFro.

Send traffic ban to R-ITS-S or Nfr-ITS-S:

| | |
|-------------------------------|--|
| ID | 2.4.1.2_M_H2-SendeTrafficBanFromTCC (1) |
| Component(s) | TMS |
| Requirement | As the PFro will admit only Datex II format in entrance, road operators shall develop an appropriate interface between their existing tool and the PFro, if needed. |
| Acceptance | |
| Additional information | |

The PFro adapts the Datex II coming from the TMS for the R-ITS-S and Nfr-ITS-S. **The road operator should set the linear of the relevance zone in the TMS**

Receive information and broadcast (R-ITS-S or Nfr-ITS-S):

The R-ITS-S or Nfr-ITS-S constructs an IVI with the DATEX II data given by the PF.

| | |
|-------------------------------|--|
| ID | 2.4.1.2_M_H2-ReceiveAndBroadcast (1) |
| Component(s) | R-ITS-S or Nfr-ITS-S |
| Requirement | Canal CCH should be used (see DR2 for more details). |
| Acceptance | |
| Additional information | GeoNetwork dissemination and forwarding are described in DA1 . |

Receive IVI (vehicle):

| | |
|-------------------------------|---|
| ID | 2.4.1.2_M_C3-ReceiveIVI (1) |
| Component(s) | V-ITS-S |
| Requirement | <p>Architecture options are not treated in this document (see DR2).</p> <p>Whatever route taken by the message, duplicates of the same IVI messages shall be recognizable thanks to the couple of elements, which should be identical for all duplicates (as presented below in profile):</p> <ul style="list-style-type: none"> - serviceProviderId+ivIdentificationNumber - timestamp <p>Those elements are the key to identify an IVI from another.</p> |
| Acceptance | CA1: serviceProviderId+ivIdentificationNumber and timestamp do not differ when the same IVIM is following G5 and cellular paths. |
| Additional information | That allows the vehicle to treat one message or the other, but not both of them as they contain the exact same information. |

Verify IVI and display IVI:

Message is displayed on HMI before referencePosition (pre-awareness is needed) The information is displayed all the **relevanceZonelds** long if the vehicle enters it (which **shouldn't** be the case for vehicles that are concerned, because it is a traffic ban). To classify and prioritize the data between several IVI messages, the receiving vehicle **shall** use the data element iviType (see below for further details), that provides the message category. For this UC, iviType is regulatory (1).

The process of vehicle-receiver **can** be as followed:

1. The vehicle checks serviceProviderID+ivIdentificationNumber and timestamp to verify if the information is already known, if it is new or if it is an update.

2. The vehicle checks validFrom and validTo to determine if information is currently applicable.
3. The vehicle checks referencePosition to determine if the traffic ban is near or far from its position.
4. The vehicle checks the zones described in the message to determine whether it is concerned by the information. It can do this analysis by different means (using detectionZones, relevanceZone or zoneHeading for example) depending on the OEM's implementation.

5. The vehicle checks absence of Text container and checks :

- presence of trafficSignPictogram, nature and serialNumber with parameters "regulatory", nature "4", serial "21" (i.e B8 in French-IISR).



In this case the UC is the dynamic traffic ban to all truck vehicles (note that if a Text Container is present, the UC is an e-VMS instead).

- presence of trafficSignPictogram, nature and serialNumber with parameters "regulatory", nature "5", serial "12" (i.e B8 in French-IISR) with attributes of wei (DE wei of DF attributes of DF roadSignCodes).



for 5,5t example

In this case the UC is the dynamic traffic ban to truck vehicles heavier than the indicated weight (note that if a Text Container is present, the UC is an e-VMS instead).

- Or presence of trafficSignPictogram, nature and serialNumber with parameters "regulatory", nature "4", serial "15" (i.e B0 in French-IISR) without attributes (no DF attributes of DF roadSignCodes).



In this case the UC is the dynamic traffic ban to all vehicles (note that if a Text Container is present, the UC is an e-VMS instead).

6. HMI displays the message before referencePosition point (pre-awareness), when the vehicle is along the linear of detectionZone. Lane specific is not applicable. VehicleCharacteristics **can** be processed by the vehicle-receiver and message **can** be **not** displayed in the vehicles that are not concerned (if the vehicle-receiver knows its own characteristics and that vehicleCharacteristics is provided).

4. Information profile - Message description (in details)

| | |
|-------------------------------|---|
| ID | 2.4.1.2_M_H2 – IVIProfile (1) |
| Component(s) | R-ITS-S, Nfr-ITS-S |
| Requirement | The IVIM transmitted by the R-ITS-S or N-ITS-S shall respect what's expected in the following table (IVIM profile for H2). |
| Acceptance | Referring to the "Status for the UC" column in the table : CA1: All mandatory V DE and used U DE shall be present in the message emitted, with the defined values. CA2: All optional S DE can be present in the message emitted. See expected values in the table when defined. CA3: All not used X DE shall be absent in the message emitted. |
| Additional information | At reception, V-ITS-S receiving a message with not used X DE shall not discard the message. |

| IVI Master_I2V status | | Profile H2 (DTB) | | |
|--------------------------------------|-----------------|-------------------|---|-------------------|
| Field | Status (Master) | Status For the UC | Comments | Value set |
| Header | | V | | |
| protocolVersion | V | V | See Master_I2V document / IVI | (is 2) |
| messageID | V | V | See Master_I2V document / IVI | (is 6) |
| stationID | V | V | See Master_I2V document / IVI | |
| Management container | | V | | |
| serviceProviderId | V | V | See Master_I2V document / IVI | by PF |
| iviIdentification Number | V | V | See Master_I2V document / IVI | by PF |
| <i>timestamp</i> | U | U | See Master_I2V document / IVI | by PF |
| <i>validFrom</i> | S | S | See Master_I2V document / IVI | From TMS |
| <i>validTo</i> | U | U | See Master_I2V document / IVI | From TMS or by PF |
| <i>connectedIviStructures</i> | X | | | |
| iviStatus | V | V | See Master_I2V document / IVI | by PF |
| <i>connectedDenms</i> | X | | | |
| Geographic Location Container | | V | | |
| referencePosition | V | V | Position of the start of the dynamic traffic ban zone. Transverse position is in the middle of the carriageway . | by PF |
| <i>referencePosition Time</i> | X | | | |
| <i>referencePosition Heading</i> | X | | | |
| <i>referencePositionSpeed</i> | X | | | |
| parts | V | V | See 5 next lines | |
| >zoneId | V | V | First zone(s) Ids may be used to define the "detection zone(s)", approach of the dynamic traffic ban. Then, next zone Ids may be used to define "relevance zone(s)" in which the dynamic traffic ban is relevant. At least one detection zone and one relevance zone shall be provided. | by PF |
| <i>>laneNumber</i> | X | | | |
| <i>>zoneExtension</i> | X | | | |

| IVI Master_I2V status | | Profile H2 (DTB) | | |
|-----------------------------------|-----------------|-------------------|--|--------------|
| Field | Status (Master) | Status For the UC | Comments | Value set |
| >zoneHeading | U | U | Heading direction of the carriageway concerned by the DTB at the point of referencePosition. If unknown, the confidence is set to unavailable (127) | by PF |
| >zone | U | U | See Master_I2V document / IVI | by PF |
| General IVI Application Container | | U | | |
| detectionZoneIds | U | U | See Master_I2V document / IVI | by PF |
| its-rrid | X | | | |
| revelanceZoneIds | U | U | See Master_I2V document / IVI | by TMS or PF |
| direction | U | U | See Master_I2V document / IVI | Is 0 |
| driverAwareness ZoneIds | X | | | |
| minimumAwareness Time | X | | | |
| applicableLanes | S | X | Traffic ban applies to all lanes. | |
| iviType | V | V | Dynamic traffic ban is a B8 in french IISR, corresponding to TS14823 regulatory-4-21. By consequence, iviType is regulatory for this UC. | is 1 |
| iviPurpose | X | | | |
| laneStatus | X | | | |
| vehicleCharacteristics | S | S | To be provided for describing the type of vehicles the traffic ban applies to. It is optional, the UC can work without the vehicleCharacteristics (what is essential is the provided roadsign). Note that if a coach has often a weight over 7,5t the roadsign B8/regulatory-4-21 does not apply to it (it applies to trucks (only)). | by PF |
| driverCharacteristics | X | | | |
| layoutId | X | | | |
| preStoredLayoutId | X | | | |
| roadSignCodes | V | V | For all trucks traffic ban, ServiceCategoryCode shall be regulatory, nature shall be 4 and serialNumber shall be 21 (no attributes provided in that case). For trucks traffic ban depending on the weight, ServiceCategoryCode shall be regulatory, nature shall be 5 and serialNumber shall be 12. Attributes wei shall be given in this case. For all vehicle traffic ban, ServiceCategoryCode shall be regulatory, nature shall be 4 and serialNumber shall be 15 (no attributes provided in that case). | by PF |
| extraText | S | S | See Master_I2V document / IVI. | by PF |
| Road Configuration Container | | X | Not used as applicableLanes is not used and it is not the goal of the use case to describe the topology of the area. | |
| Text Container | | X | Not used, it allows the receiver to distinguish between eVMS use case and this use case. | |
| Layout Container | | X | | |