

French C-ITS Deployment Coordination committee

Common technical specifications for use cases Wrong Way Driving (I2V)

Deliverable 2.4.1.2_H_D7

Activity 2: Studies

Sub Activity 2.4 > Specifications

Version 4.00

Publication Date: 14/11/2019



Co-financed by the Connecting Europe
Facility of the European Union

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Information on the document

Document: Common technical specifications for use cases – Wrong Way Driving (I2V)

Date of publication: 14/11/2019

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Status: Version 4.00 – Release 4

Publishing history

| Date | Version | Author(s) | Updates & changes | Diffusion |
|------------|---------|-----------|--|-----------|
| 14/11/2019 | 4.00 | A. AUDIGÉ | <ul style="list-style-type: none"> Consolidated version for release 4 | Release 4 |

Black highlighted texts are issues with standards.

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

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

Profile / Status:

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

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

Quality rules

Reference to the version administration

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

- **R** corresponds to the release number: it is upgraded each time SC Studies validates the diffusion of a new release,
- **X** is the major version number: it is upgraded each time SC Studies validates the deliverable,
- **Y** is the minor version number: it is upgraded each time a contributor changes anything.

Once the deliverable is approved, its version number is upgraded from vR.XY to vR.(X+1)0

Once the deliverable is release, its version number is upgraded from vR.XY to v(R+1).00

As illustration:

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

Requirements identification & traceability

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

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

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

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

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

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

In the table here below:

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

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

ZZZ > is the numeration of the requirement

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

Acronyms & abbreviations

| | |
|------------------|--|
| C-ITS | Cooperative Intelligent Transport Systems |
| DENM | Decentralized Environmental Notification Message |
| HLN | Hazardous Location Notification |
| ITS | Intelligent Transport Systems |
| Nfr-ITS-S | French National ITS Station |
| N-ITS-S | National ITS Station |
| PF | Platform |
| R-ITS-S | Roadside ITS Station |
| RW | Road Works |
| TCC | Traffic Control Center |
| TMS | Traffic Management System |
| UC | Use Case |
| V-ITS-S | Vehicular ITS Station |
| WWD | Wrong Way Driving |
| WWDriver | Wrong Way Driver |

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1. Figure

In order to clarify the data elements description given for the wrong way driving use case, see figure below.

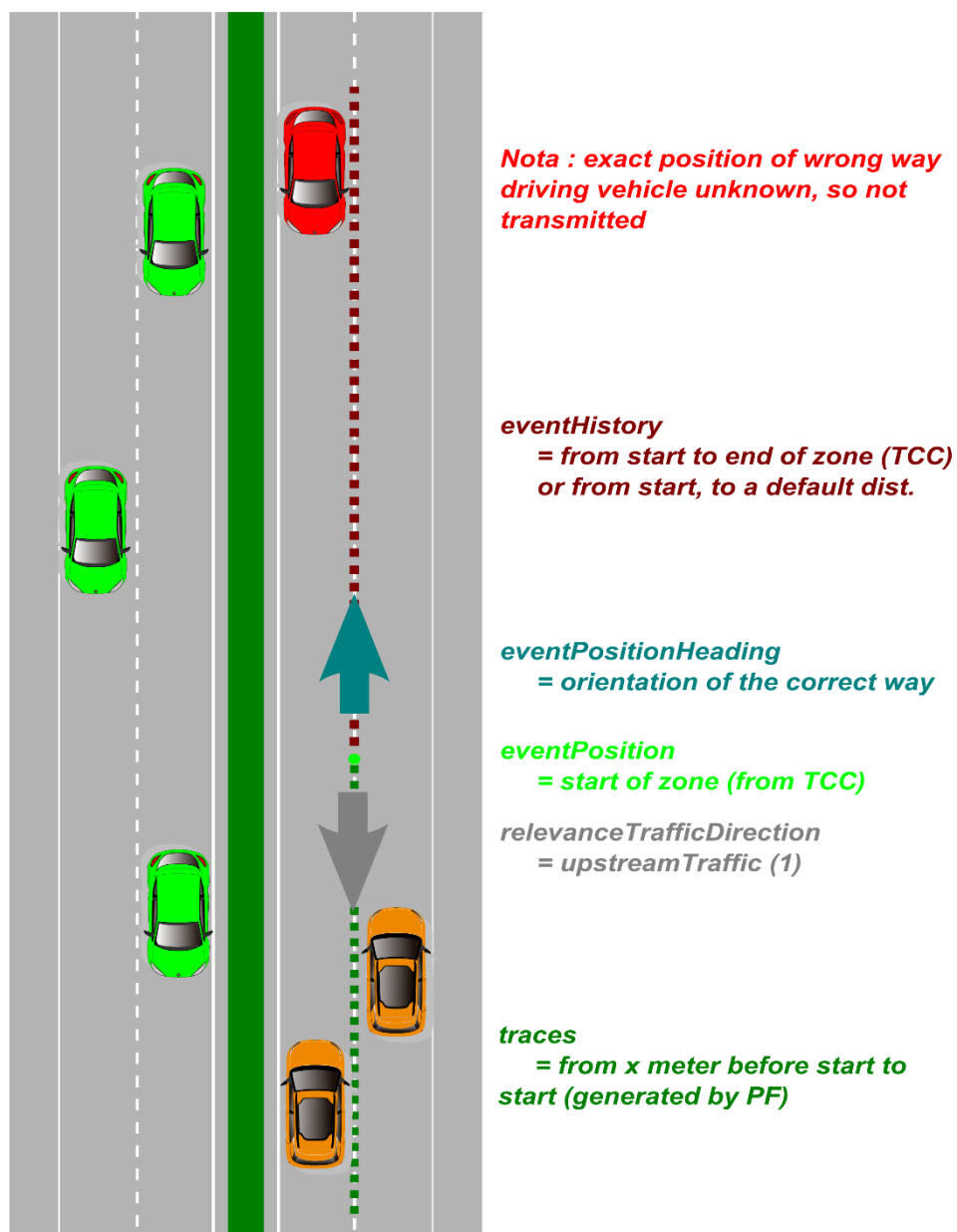
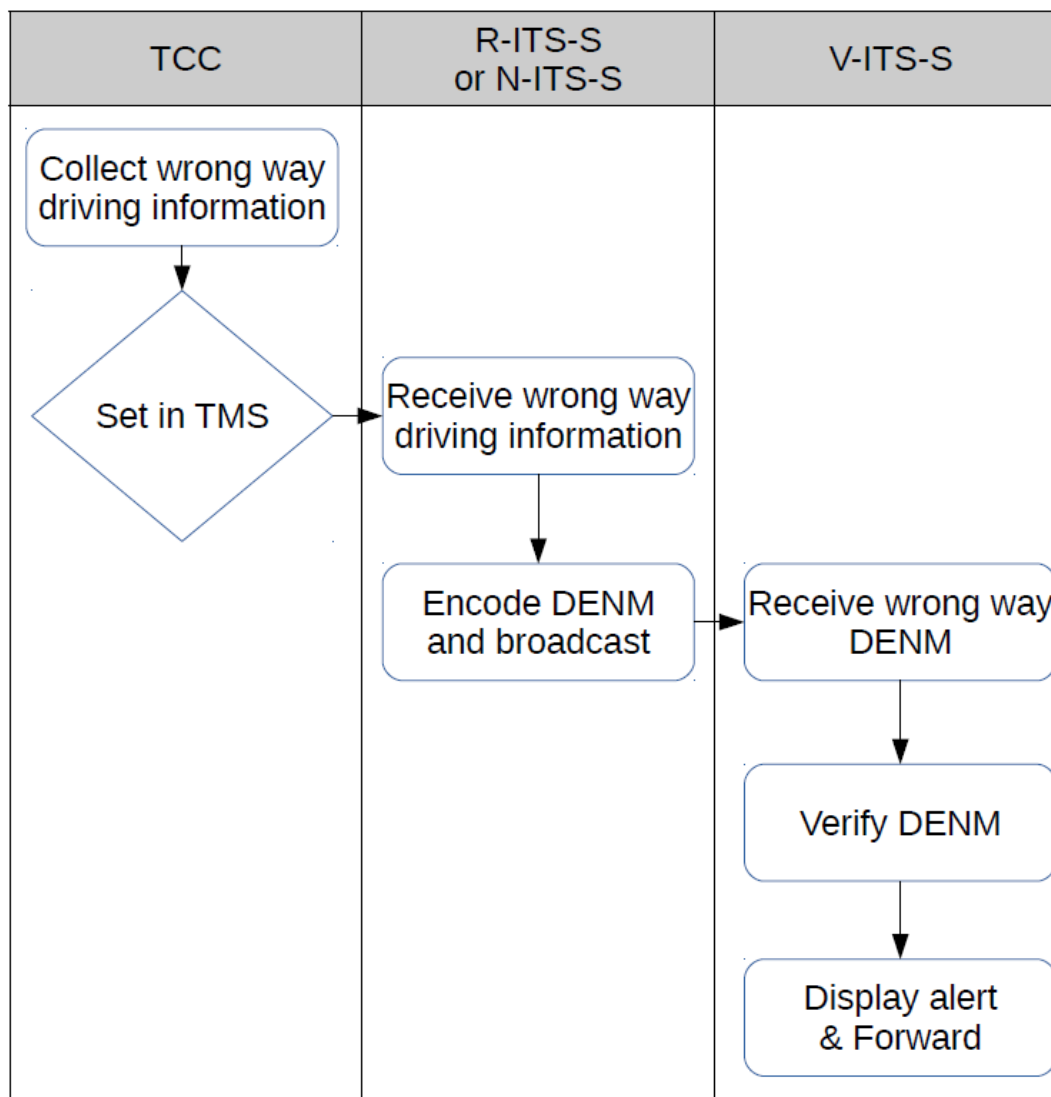


Figure 1: Wrong Way Driving example illustration

2. Step by step Diagram



Collect WWD information: information can be given to TCC by police, camera survey, patrol agent, ...

Set information in TMS: WWD driver is moving. So, a zone in which the WWD driver can be encountered by other vehicles is set in TMS (traffic management system of the traffic control center).

This zone starts before the last known position of the WWD vehicle. The start of this linear event can be set before the previous road connector. So that other vehicles could choose to leave the carriageway. This zone ends at a second position after the last known position of the WWD vehicle. Both positions have to be set in TMS.

TMS provides data in Datex II to PF.

Due to technical limitation, length of linear event may not overpass 20,9 km in DENM (see eventHistory in DENM Master document table). Therefore, if the operator would set a very long zone (over 20,9 km), the PF may have to split the event in several consecutive events to cover the whole linear. There is no need to use referenceDenms: the PF should create a first DENM of 20,9 km length from the start of WWD zone set in TMS and then a second DENM in which eventPosition would be the last point of eventHistory of the first DENM. The risk it happens for real is quite null.

Receive WWD information (R-ITS-S or Nfr-ITS-S): information incoming from PF is Datex II.

Encode DENM and broadcast: Datex II to DENM would be done in R-ITS-S and Nfr-ITS-S. Canal CCH for 100%-G5 scenario and SCH for hybrid scenario should be used (see 2.4.1_H for more details). GeoNetwork dissemination and forwarding for 100%-G5 would be the same that for SCooP1 use cases (10km area and ten times; see 2.4.1_H also).












































Receive WWD information (vehicle): through architecture. Architecture options are not treated in this document (see 2.4.1_H). Anyway, whatever route the information has followed, **DENM of an event must have the same actionID and the same detectionTime (as presented below in profile)**. So that vehicle can treat one message or the other, but not both of them.













Verify DENM and display alert: an alert is given to warn the driver he may encountered a WWD vehicle soon. The process of vehicle-receiver can be as followed:

1. The vehicle checks actionID and detectionTime to verify if event is already known, if it is a new event or if it is an update.
2. The vehicle checks validityDuration to know if event is still active.
3. The vehicle checks eventPosition to determine how far from its position the event is and calculate its time-to-event.
4. The vehicle checks causeCode/subCauseCode and relevanceTrafficDirection: it's a 14/2 (WWD/wrong direction) and upstreamTrafficDirection.
5. The vehicle checks traces. If vehicle is following one of traces, it is concerned by event (which is upstream). If not, the vehicle can compare eventPositionHeading (if given) with its own heading and the way it is approaching the eventPosition by rear to know if concerned or not (difference between headings should be more or less about +/- 30°).
6. If concerned, the vehicle displays the event before eventPosition to alert the driver (proper moment is car manufacturer domain). WWD vehicle can be encountered all the eventHistory long.

Forward: see before and 2.4.1_H.

3. Information profile – Message description (in details)

| DENM Master status | | Profile WWD | | |
|-----------------------------|---|---|---|--|
| Field | Status (Master) | Status For the UC | Comments | Value set |
| Header | | | | |
| protocolVersion |  |  | See 2.4.1.2_H_Master document / DENM | |
| messageID |  |  | See 2.4.1.2_H_Master document / DENM | (is 1) |
| stationID |  |  | See 2.4.1.2_H_Master document / DENM | |
| Management container | | | | |
| actionID |  |  | See 2.4.1.2_H_Master document / DENM | |
| detectionTime |  |  | See 2.4.1.2_H_Master document / DENM | |
| referenceTime |  |  | See 2.4.1.2_H_Master document / DENM | |
| termination |  |  | See 2.4.1.2_H_Master document / DENM. Note that for this UC, as for many HLN, it is important that TCC close the event as soon as road operator knows it's ended. | |
| eventPosition > |  |  | See 4 next lines and 2.4.1.2_H_Master document / DENM | |
| >latitude |  |  | Latitude of the start of the zone in which a WWDriver may be present. | |
| >longitude |  |  | Longitude of the start of the zone in which a WWDriver may be present. | |
| >confidencePositionElipse |  |  | See 2.4.1.2_H_Master document / DENM | |
| >altitude |  |  | See 2.4.1.2_H_Master document / DENM | |
| relevanceDistance |  | | | |
| relevanceTrafficDirection |  |  | Is upstream the zone in which encountering a WWDriver may happen | is 1 (upStreamTraffic). |
| validityDuration |  |  | Generally, no end time is set on TMS for a WWD. See Master document / DENM for the implication. With a default value of 3600s (1 hour) for this UC. | |
| transmissionInterval |  | | | |
| stationType |  |  | See 2.4.1.2_H_Master document / DENM | (is 15) |
| Situation container | | | | |
| informationQuality |  |  | R-ITS-S has to convert TMS quality as following: set as 1 for "risk", 4 for "probable" and 6 for "certain". Risk will be used for very low confidence information. Probable for high confidence information. Certain for video-camera followed live WWD activity. | by RSU is 1, 4 or 6 depending quality set on TMS |
| eventType |  |  | Derivate of type of event set in TMS. The causeCode is set to 14 (wrongWayDriving). The subCauseCode is set to 2 (wrongDirection) | is 14/2 |
| linkedCause |  |  | WWD rarely a consequence of another event. So, won't be used for this WWD UC. | |
| eventHistory |  |  | See 2.4.1.2_H_Master document / DENM | |
| Location container | | | | |
| eventSpeed |  | | See transverse choice, but especially, WWD speed is negative, unknown and variable. | |
| eventPositionHeading |  |  | When given, set as the correct way direction, so opposite to the heading of the WWD vehicle direction. Event set in TMS must be oriented as correct way direction (not WW direction). | from TMS |

| DENM Master status | | Profile WWD | | |
|--------------------------------|---|---|---|-----------|
| Field | Status (Master) | Status For the UC | Comments | Value set |
| traces |  |  | Sequence of delta position from event position to “start” of each trace | by PF |
| <i>roadType</i> |  |  | See 2.4.1.2_H_Master document / DENM | |
| <i>À la carte container</i> | | | | |
| <i>lanePosition</i> |  |  | Unknown and may change. | |
| <i>impact Reduction (DF)</i> |  | | | |
| <i>external Temperature</i> |  | | | |
| <i>roadWorks (DF)</i> |  |  | Not needed for this UC, not appropriate (not a RW UC) | |
| <i>positioning Solution</i> |  | | | |
| <i>stationary Vehicle (DF)</i> |  | | | |