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Intelligent Transport Systems (ITS);
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Part 2: Applications and facilities layer common data dictionary

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 2 of a multi-part deliverable covering the Intelligent Transport Systems (ITS); Users and applications requirements, as identified below:

Part 1: "Facility layer structure, functional requirements and specifications";

Part 2: "Applications and facilities layer common data dictionary".

The specifications of data elements of the facilities layer messages have been tested within various European Projects such as DRIVE C2X, CVIS, SCORE@F, simTD and ETSI Interoperability Test events. Feedbacks from these testing activities have been considered in the present document. The specifications in the present document have also been checked and harmonized with common data dictionary specifications as specified by SAE International.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

ITS applications are enabled by the data exchanges among ITS stations (ITS-S) via wireless or wired communications. A basic set of application [i.1] has been defined by ETSI TC ITS. Accordingly, a set of higher layer messages and communication protocols have been specified in support of this application set.

Even though each message has specific requirements on the data being included and transmitted to other ITS-Ss, ETSI TC ITS has identified a set of data types which are commonly used in multiple ITS applications and facilities layer messages. A common data dictionary is therefore defined for this common set.

For each data type, this common dictionary includes a textual description of the semantic of the data type in question. It also includes the ASN.1 definition of the data type. Therefore, this common data dictionary can be imported by any message when necessary during the encoding and decoding procedure.

1 Scope

The present document defines a repository of a set of data elements and data element sets, denoted as data frames, that are commonly used in the ITS applications and facilities layer messages. Each data element is defined with a set of attributes, enabling the identification of the data element in question in a number of perspectives, e.g. descriptive name, ASN.1 definition, data definition, minimum data granularity requirement, etc.

The present document focuses on the data elements being used by the Cooperative Awareness basic service as outlined in ETSI EN 302 637-2 [i.2] and by the Decentralized Environmental Notification basic service as outlined in ETSI EN 302 637-3 [i.3].

The present document does not specify the syntax and requirements of data elements in the specific context of any message. Such syntax and requirements are specified in the corresponding message standards such as ETSI EN 302 637-2 [i.2] and ETSI EN 302 637-3 [i.3].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] Recommendation ITU-T X.680: "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[2] ISO 8855: "Road vehicles -- Vehicle dynamics and road-holding ability -- Vocabulary".

[3] CEN/TS 16157-3:2011: "Intelligent transport systems. DATEX II data exchange specifications for traffic management and information. Situation publication".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TR 102 638 (V1.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Definitions".

[i.2] ETSI EN 302 637-2: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service".

[i.3] ETSI EN 302 637-3: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service".

[i.4] European Agreement (Applicable as from 1 January 2011): "Concerning the International Carriage of Dangerous Goods by Road".

NOTE: Available at: http://www.unece.org/trans/danger/publi/adr/adr2011/11ContentsE.html.

[i.5] United Nations: "Recommendations on the Transport of Dangerous Goods - Model Regulations", Twelfth revised edition.

NOTE: Available at: http://www.unece.org/trans/danger/publi/unrec/12_e.html.

[i.6] ETSI TS 101 539-1 (V1.1.1): "Intelligent Transport Systems (ITS); V2X Applications; Part 1: Road Hazard Signalling (RHS) application requirements specification".

[i.7] ISO 3779 (2011-07): "Road vehicles -- Vehicle identification number (VIN) Content and structure".

[i.8] VDV recommendation 420 (1992): "Technical Requirements for Automatic Vehicle Location / Control Systems - Radio Data Transmission (BON Version) with Supplement 1 and Supplement 2".

[i.9] ISO 1176:1990 "Road vehicles -- Masses -- Vocabulary and codes".

[i.10] ISO 8601:2004: "Data elements and interchange format -- Information interchange -- Representation of dates and times".

[i.11] ETSI TS 101 556-1 (V1.1.1): "Intelligent Transport Systems (ITS); Infrastructure to Vehicle Communication; Electric Vehicle Charging Spot Notification Specification".

[i.12] SAE J2735: "ISO/CEN/SAE JOINT MSG GROUP suggested revisions to the adopted SAE J2735 Dedicated Short Range Communications (DSRC) Message Set Dictionary - MAP and SPAT message".

[i.13] ISO/WD TS 19321: "Intelligent transport systems - Cooperative ITS - Dictionary of in-vehicle information (IVI) data structures".

[i.14] ETSI TS 101 556-3 (draft V0.9.0): "Intelligent Transport Systems (ITS); Infrastructure to Vehicle Communications; Communications system for the planning and reservation of EV energy supply using wireless networks".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

bounding box: rectangular shape covering all parts of an empty load vehicle projected from top view

NOTE: The empty load vehicle is defined in ISO 1176 [i.9], clause 4.6.

data element: data type that contains one single data

data frame: data type that contains more than one data element in a predefined order

ITS data dictionary: repository of data elements and data frames used in the ITS applications and ITS facilities layer

ITS messages: messages exchanged at ITS facilities layer among ITS stations or messages exchanged at ITS applications layer among ITS stations

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ABS	Anti-lock Braking System
ACC	Adaptive Cruise Control
AEB	Autonomous Emergency Braking
ASN	Abstract Syntax Notation
ASN.1	Abstract Syntax Notation One
CAM	Cooperative Awareness Message
CAN	Controller Area Network
CEN	European Committee for Standardization
CVIS	Cooperative Vehicle-Infrastructure Systems
DE	Data Element
DENM	Decentralized Environmental Notification Message
DF	Data Frame
DR	Dead Reckoning
DSRC	Dedicated Short Range Communication
ESP	Electronic Stability Program
GNSS	Global Navigation Satellite System
ITS-S	ITS Station
IVI	In Vehicle Information
LDM	Local Dynamic Map
OEM	Original Equipment Manufacturer
RSU	Road Side Unit
SAE	Society of Automotive Engineers
SPAT	Signal Phase And Timing
TC	Technical Committee
VDS	Vehicle Descriptor Section
WGS84	World Geodetic System 84
WMI	World Manufacturer Identifier

4 ITS data dictionary structure

4.1 Introduction

The ITS data dictionary is a repository that includes a list of data elements (DE) and data frames (DF) that represent data as well as information necessary for the realization of ITS applications and ITS facilities.

A DE/DF may be used to construct ITS facilities layer or ITS applications layer messages, if needs are identified by the message in question. Examples of ITS facilities layer message are Cooperative Awareness Message (CAM) as specified in ETSI EN 302 637-2 [i.2] and Decentralized Environmental Notification Message (DENM) as specified in ETSI EN 302 637-3 [i.3]. These messages are named as ITS messages in the scope of the present document.

According to the usage purpose, a DE or a DF can be classified into the following categories:

- Message management: the DE/DF is used to support the management of an ITS facilities layer or ITS application layer message and communication protocol, e.g. protocol version.
- Application usage: the DE/DF includes information and data that are useful for the realization of one or multiple ITS applications.

The present document includes DE and DF definitions for the Cooperative Awareness Message (CAM) as given in ETSI EN 302 637-2 [i.2] and for the Decentralized Environmental Notification Message (DENM) as given in ETSI EN 302 637-3 [i.3].

The complete list of DE and DF is provided in the normative annex A of the present document.

Each DE and DF is defined by a set of attributes, enabling the identification of the data in question. These attributes are defined in clause 4.2 and clause 4.3.

4.2 Attributes for DE/DF identification

4.2.1 Descriptive name

This attribute provides a descriptive name of the DE or DF. The descriptive name shall be identical as being used in the messages specifications such as ETSI EN 302 637-2 [i.2] and ETSI EN 302 637-3 [i.3]. It shall also be unique within the common data dictionary. Furthermore, the descriptive name may be used in other ITS applications and facilities layer components, e.g. LDM.

4.2.2 Identifier

This attribute provides a unique identifier of the defined DE or DF. It always starts with the term "DataType" followed by a sequence number as unique identifier. In the present document a three digits sequence number is used.

NOTE: The identifier of a DataType is applicable within the present document, it may also be referenced in other standards.

4.2.3 ASN.1 representation

This attribute provide the ASN.1 representation of the defined DE or DF. The ASN.1 definition shall follow the specifications as defined in Recommendation ITU-T X.680 [1]. The ASN.1 type name shall be identical to the descriptive name.

4.3 Attributes for DE/DF definition

4.3.1 Definition

This attribute provides a textual explication of the defined DE or DF.

4.3.2 Category

This attribute indicates the category that DE or DF in question belongs to. Currently, the following categories are defined:

- **Vehicle information:** the DE or DF describes one or a set of in vehicle data.
- **GeoReference information:** the DE or DF provides geographical description of the data.
- **Road topology information:** the DE or DF describes one or a set of road topology information.
- **Traffic information:** the DE or DF describes one or a set of road traffic information.
- **Infrastructure information:** the DE or DF describes one or a set of ITS infrastructure information.
- **Personal information:** the DE or DF describes one or a set of ITS personal information.
- **Communication information:** the DE or DF describes one or a set of data that are relevant to the ITS application layer or ITS facilities layer communication protocol.
- **Other information:** the DE or DF that does not belong to any of the above categories.

A DE or DF shall belong to at least one of the above categories. One DE or DF may belong to more than one category. It is expected that more categories will be added in the future.

4.3.3 Unit

The applied unit for the data, if necessary.

Annex A (normative): Data type specifications

A.1 DE_AccelerationConfidence

Descriptive Name	AccelerationConfidence
Identifier	DataType_ 1
ASN.1 representation	`AccelerationConfidence ::= INTEGER {pointOneMeterPerSecSquared(1), outOfRange(101), unavailable(102)} (0 .. 102)`
Definition	The absolute accuracy of a reported vehicle acceleration value with a predefined confidence level (e.g. 95 %). The required confidence level is defined by the corresponding standards applying the DE. The value shall be set to: • 1 if the acceleration accuracy is equal to or less than 0,1 m/s^2. • n (n > 1 and n < 100) if the acceleration accuracy is equal to or less than n × 0,1 m/s^2. • 100 if the acceleration accuracy is equal to or less than 10 m/s^2. • 101 if the acceleration accuracy is out of range i.e. greater than 10 m/s^2. • 102 if the data is unavailable. The DE is used in *LateralAcceleration* DF as defined in clause A.115, *LongitudinalAcceleration* DF as defined in clause A.116, or *VerticalAcceleration* DF as defined in clause A.129. NOTE: The fact that an acceleration value is received with confidence set to 'unavailable(102)' can be caused by several reasons, such as: – the sensor cannot deliver the accuracy at the defined confidence level because it is a low-end sensor, – the sensor cannot calculate the accuracy due to lack of variables, or – there has been a vehicle bus (e.g. CAN bus) error. In all 3 cases above, the reported acceleration value may be valid and used by the application. If an acceleration value is received and its confidence is set to 'outOfRange(101)', it means that the value is not valid and therefore cannot be trusted. Such value is not useful for the application.
Unit	0,1 m/s^2
Category	Vehicle information