# SLOVENSKI STANDARD
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**Inteligentni transportni sistemi - Komunikacija med vozili - Osnovni nabor aplikacij - 2. del: Specifikacija osnovne storitve kooperativne izmenjave podatkov o vozilih**

Intelligent Transport Systems (ITS) - Vehicular Communications - Basic Set of Applications - Part 2: Specification of Cooperative Awareness Basic Service



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# ETSI EN 302 637-2 V1.4.1 (2019-04)


## Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service

Reference
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# Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).



The present document is part 2 of a multi-part deliverable covering Vehicular Communications; Basic Set of Applications, as identified below:

ETSI TS 102 637-1: "Functional Requirements";

**ETSI EN 302 637-2: "Specification of Cooperative Awareness Basic Service";**

ETSI EN 302 637-3: "Specifications of Decentralized Environmental Notification Basic Service".



The specification of the CA basic service was initially developed by the European Car-to-Car Communication Consortium, see Car2Car Communication Consortium Manifesto [i.2]. The service was evaluated by several initiatives such as the C2C-CC demonstration in 2008, ETSI Plugtests events and European projects including PRE-DRIVE C2X, DRIVE C2X, SafeSpot, CVIS, CoVeL, eCoMove, SCOR@F and simTD. These evaluation efforts have provided feedback to ETSI TC ITS.

The present document replaces ETSI TS 102 637-2 in whole. It includes improvements and enhancements of the CA basic service specifications in ETSI TS 102 637-2 according to the feedback provided by the various initiatives.

| National transposition dates | |
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| Date of adoption of this EN: | 1 April 2019 |
| Date of latest announcement of this EN (doa): | 31 July 2019 |
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| Date of withdrawal of any conflicting National Standard (dow): | 31 January 2020 |

# Modal verbs terminology

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# Introduction

Cooperative awareness within road traffic means that road users and roadside infrastructure are informed about each other's position, dynamics and attributes. Road users are all kind of road vehicles like cars, trucks, motorcycles, bicycles or even pedestrians and roadside infrastructure equipment including road signs, traffic lights or barriers and gates. The awareness of each other is the basis for several road safety and traffic efficiency applications with many use cases as described in ETSI TR 102 638 [i.1]. It is achieved by regular exchange of information among vehicles (V2V, in general all kind of road users) and between vehicles and road side infrastructure (V2I and I2V) based on wireless networks, called V2X network and as such is part of Intelligent Transport Systems (ITS).

The information to be exchanged for cooperative awareness is packed up in the periodically transmitted Cooperative Awareness Message (CAM). The construction, management and processing of CAMs is done by the Cooperative Awareness basic service (CA basic service), which is part of the facilities layer within the ITS communication architecture ETSI EN 302 665 [1] supporting several ITS applications.

The CA basic service is a mandatory facility for all kind of ITS-Stations (ITS-S), which take part in the road traffic (vehicle ITS-S, personal ITS-S, etc.). The present document focuses on the specifications for CAMs transmitted by all vehicle ITS-Ss participating in the V2X network. Nevertheless, the present document defines the CAM format with flexibility in order to be easily extendable for the support of other types of ITS-Ss or future ITS applications.



The requirements on the performance of the CA basic service, the content of the CAM and the quality of its data elements are derived from the Basic Set of Applications (BSA) as defined in ETSI TR 102 638 [i.1] and in particular from the road safety applications as defined in ETSI TS 101 539-1 [i.8], ETSI TS 101 539-2 [i.9] and ETSI TS 101 539-3 [i.10].

# 1 Scope

The present document provides the specifications of the Cooperative Awareness basic service (CA basic service), which is in support of the BSA road safety application.

This includes definition of the syntax and semantics of the Cooperative Awareness Message (CAM) and detailed specifications on the message handling.

# 2 References

## 2.1 Normative 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 https://docbox.etsi.org/Reference.

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



[1] ETSI EN 302 665 (V1.1.1): "Intelligent Transport Systems (ITS); Communications Architecture".

[2] ETSI TS 102 894-2 (V1.3.1): "Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary".



[3] SAE J2735 (2009-11-19): "Dedicated Short Range Communications (DSRC) Message Set Dictionary".

NOTE: Available at http://standards.sae.org/j2735_200911/.

[4] Recommendation ITU-T X.691/ISO/IEC 8825-2 (1997-12): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".

[5] ETSI TS 103 097 (V1.3.1): "Intelligent Transport Systems (ITS); Security; Security header and certificate formats".

## 2.2 Informative references

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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) (2009-06): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Definitions".

[i.2] Car2Car Communication Consortium (2007-08): "Car2Car Communication Consortium Manifesto", Version 1.1.

NOTE: Available at http://www.car-to-car.org/.

[i.3] ETSI TR 102 863 (V1.1.1) (2011-06): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM); Rationale for and guidance on standardization".

[i.4] ETSI TS 102 636-3 (V1.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network architecture".

[i.5] ETSI EN 302 636-4-1: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality".

[i.6] ETSI TS 102 894-1 (V1.1.1): "Intelligent Transport Systems (ITS); Users and applications requirements; Part 1: Facility layer structure, functional requirements and specifications".

[i.7] ETSI EN 302 636-5-1: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol".

[i.8] ETSI TS 101 539-1 (V1.1.1): "Intelligent Transport Systems (ITS); V2X Applications; Part 1: Road Hazard Signalling (RHS) application requirements specification".

[i.9] ETSI TS 101 539-2: "Intelligent Transport Systems (ITS); V2X Applications; Part 2: Intersection Collision Risk Warning (ICRW) application requirements specification".

[i.10] ETSI TS 101 539-3 (V1.1.1): "Intelligent Transport Systems (ITS); V2X Applications; Part 3: Longitudinal Collision Risk Warning (LCRW) application requirements specification".

[i.11] ETSI TS 102 723-5: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 5: Interface between management entity and facilities layer".

[i.12] Void.

[i.13] ETSI TS 102 723-11: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 11: Interface between networking and transport layer and facilities layer".

[i.14] Void.

[i.15] ISO EN 17419: "Intelligent Transport Systems -- Cooperative Systems -- Classification and management of ITS applications in a global context".

[i.16] ETSI TS 102 724 (V1.1.1): "Intelligent Transport Systems (ITS); Harmonized Channel Specifications for Intelligent Transport Systems operating in the 5 GHz frequency band".

[i.17] Void.

[i.18] ETSI TR 102 965 (V1.1.1): "Intelligent Transport Systems (ITS);Application Object Identifier (ITS-AID); Registration list".

[i.19] ISO 1176: "Road vehicles - Masses - Vocabulary and codes".

[i.20] ETSI EN 302 663 (V1.2.1): "Intelligent Transport Systems (ITS); Access layer specification for Intelligent Transport Systems operating in the 5 GHz frequency band".

[i.21] ETSI TS 103 613 (V1.1.1): "Intelligent Transport Systems (ITS); Access layer specification for Intelligent Transport Systems using LTE Vehicle to everything communication in the 5,9 GHz frequency band".

[i.22] ETSI TS 103 574 (V1.1.1): "Intelligent Transport Systems (ITS); Congestion Control Mechanisms for C-V2X PC5 interface; Access layer part".

# 3 Definition of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 302 665 [1], LDM given in ETSI TR 102 863 [i.3], DE and DF given in SAE J2735 [3] and the following apply:

**basic set of applications:** group of applications, supported by vehicular communication system

NOTE: The basic set of applications is defined in ETSI TR 102 638 [i.1].

**Cooperative Awareness (CA) basic service:** facility at the ITS-S facilities layer to generate, receive and process the CAM

**Cooperative Awareness Message (CAM):** CA basic service PDU

**Cooperative Awareness Message (CAM) data:** partial or complete CAM payload

**Cooperative Awareness Message (CAM) protocol:** ITS facilities layer protocol that operates the CAM transmission and reception

**empty vehicle:** complete vehicle kerb mass as defined in ISO 1176, clause 4.6 [i.19]

**ITS-G5:** access technology to be used in frequency bands dedicated for European intelligent transport System (ITS) as defined in ETSI EN 302 663 [i.20]

**LTE-V2X:** access technology to be used in frequency bands dedicated for European intelligent transport System (ITS) as defined in ETSI TS 103 613 [i.21]



**V2X:** either vehicle to vehicle (V2V), or vehicle to infrastructure (V2I) and/or infrastructure to vehicle (I2V)



## 3.2 Symbols

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

| | |
|---|---|
| IF.CAM | Interface between CAM basic service and LDM or ITS application |
| IF.FAC | Interface between CAM basic service and other facilities layer entities |
| IF.N&T | Interface between CAM basic service and ITS networking & transport layer |
| IF.SEC | Interface between CAM basic service and ITS security entity |

## 3.3 Abbreviations

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

| | |
|---|---|
| API | Application Programming Interface |
| ASN.1 | Abstract Syntax Notation 1 |
| BSA | Basic Set of Applications |
| BTP | Basic Transport Protocol |
| CA | Cooperative Awareness |
| CAM | Cooperative Awareness Message |
| DCC | Decentralized Congestion Control |
| DE | Data Element |
| DENM | Decentralized Environmental Notification Message |
| DF | Data Frame |
| FA-SAP | Facilities/Applications Service Access Point |
| GN | GeoNetworking |
| HF | High Frequency |
| HMI | Human Machine Interface |
| I2V | Infrastructure-to-Vehicle |
| ID | Identifier |

| | |
|---|---|
| ISO | International Organization for Standardization |
| ITS | Intelligent Transport Systems |
| ITS-S | ITS Station |
| LDM | Local Dynamic Map |
| LF | Low Frequency |
| LTE | Long Term Evolution |
| MF-SAP | Management/Facilities Service Access Point |
| MIB | Management Information Base |
| MSB | Most Significant Bit |
| N&T | Networking & Transport layer |
| NF-SAP | Networking & Transport/Facilities Service Access Point |
| OSI | Open System Interconnection |
| PCI | Protocol Control Information |
| PDU | Packet Data Unit |
| PER | Packed Encoding Rules |
| POTI | Position and Time management |
| RSU | Road Side Unit |
| SAE | Society of Automotive Engineers |
| SAP | Service Access Point |
| SF-SAP | Security Facilities - Service Access Point |
| SHB | Single-Hop Broadcasting |
| SSP | Service Specific Permissions |
| TC | Technical Committee |
| TR | Technical Report |
| V2I | Vehicle-to-Infrastructure |
| V2V | Vehicle-to-Vehicle |
| V2X | Vehicle-to-Everything |
| VDP | Vehicle Data Provider |



# 4 CA basic service introduction



## 4.1 Background

Cooperative Awareness Messages (CAMs) are messages exchanged in the ITS network between ITS-Ss to create and maintain awareness of each other and to support cooperative performance of vehicles using the road network. A CAM contains status and attribute information of the originating ITS-S. The content varies depending on the type of the ITS-S. For vehicle ITS-Ss the status information includes time, position, motion state, activated systems, etc. and the attribute information includes data about the dimensions, vehicle type and role in the road traffic, etc. On reception of a CAM the receiving ITS-S becomes aware of the presence, type, and status of the originating ITS-S. The received information can be used by the receiving ITS-S to support several ITS applications. For example, by comparing the status of the originating ITS-S with its own status, a receiving ITS-S is able to estimate the collision risk with the originating ITS-S and if necessary may inform the driver of the vehicle via the HMI. Multiple ITS applications may rely on the CA basic service. It is assigned to domain application support facilities in ETSI TS 102 894-1 [i.6].

Besides the support of applications the awareness of other ITS-S gained by the CA basic service may be used in the networking & transport layer for the position dependent dissemination of messages, e.g. DENM by GeoBroadcasting as specified in ETSI EN 302 636-4-1 [i.5]. The generation and transmission of CAM is managed by the CA basic service by implementing the CAM protocol.

## 4.2 Services provided by CA basic service

The CA basic service is a facilities layer entity that operates the CAM protocol. It provides two services: sending and receiving of CAMs. The CA basic service uses the services provided by the protocol entities of the ITS networking & transport layer to disseminate the CAM.