



**Intelligent Transport Systems (ITS);  
Vehicular Communications;  
Basic Set of Applications;  
Part 3: Specifications of Decentralized  
Environmental Notification Basic Service**

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**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
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## Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Intelligent Transport System (ITS), and is now submitted for the Public Enquiry phase of the ETSI standards EN Approval Procedure.

The present document is part 3 of a multi-part deliverable covering Vehicular Communications; Basic Set of Applications, as identified below:

Part 1: "Functional Requirements";

Part 2: "Specifications of Cooperative Awareness Basic Service";

**Part 3: "Specifications of Decentralized Environmental Notification Basic Service".**

The specification of the DEN basic service was initially developed by the European Car-to-Car Communication Consortium (C2C-CC) [i.2] and [i.3]. The service was evaluated by several initiatives, such as the C2C-CC demonstration in 2008, by ETSI Plugtest events and European projects including PRE-DRIVE C2X, DRIVE C2X, SafeSpot, CVIS, CoVeL, SCOR@F, simTD, etc. These evaluation efforts have provided feedback to ETSI TC ITS.

The present document replaces TS 102 637-3 [i.16] in whole. It includes improvements and enhancements of the DEN basic service specifications in TS 102 637-3 [i.16] according to the feedback provided by the various initiatives.

### Proposed national transposition dates

Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

## Introduction

ITS use cases are distributed over multiple instances of ITS stations (ITS-S). ITS-Ss interact in the ITS networks to provide a large diversity of co-operating customer services that satisfy different types of functional and operational requirements.

ETSI TC ITS has defined a "Basic Set of Applications" (BSA) [i.1] that can be deployed within a three-year time frame after the completion of their standardization. In this BSA, the Road Hazard Warning (RHW) application is composed of multiple use cases. ETSI TC ITS defines the decentralized environmental notification (DEN) basic service that supports the various RHW use cases.

The DEN basic service is an application support facility provided by the facilities layer. It constructs, manages and processes the Decentralized Environmental Notification Message (DENM). The construction of a DENM is triggered by an ITS application. The DENM contains information related to a road hazard or an abnormal traffic conditions, such as its type and its position. The DEN basic service delivers the DENM as payload to the ITS networking & transport layer for the message dissemination. Typically for an ITS application, a DENM is disseminated to ITS-Ss that are located in a geographic area through direct vehicle-to-vehicle or vehicle-to-infrastructure communications. At the receiver side, the DEN basic service of an receiving ITS-S processes the received DENM and provides the DENM content to an ITS application. This ITS application may request to present the information to the driver if the information of the road hazard or traffic condition is assessed to be relevant to the driver. The driver is then able to take appropriate actions to react to the situation accordingly.

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# 1 Scope

The present document provides the specification of the DEN basic service, which is in support of e.g. the BSA road safety application.

More specifically, the present document specifies the syntax and semantics of the "Decentralized Environmental Notification Message" (DENM) and the DENM protocol handling.

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

NOTE: Available at: [http://standards.sae.org/j2735\\_200911/](http://standards.sae.org/j2735_200911/)

- [2] ETSI EN 302 665 (V1.1.1): "Intelligent Transport Systems (ITS); Communications Architecture".
- [3] ETSI TS 102 636-3 (V1.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network Architecture".
- [4] ETSI EN 302 931 (V1.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Geographical Area Definition".
- [5] ETSI TS 102 894-2 (V0.0.5): "Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary".
- [6] ITU-T Recommendation X.691/ISO/IEC 8825-2 (1997-12): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".

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

NOTE: <http://www.car-2-car.org>.

- [i.3] Car2Car Communication Consortium: "Message description: Decentralized Environmental Notification Message", Version 1.0.

- [i.4] ETSI TS 101 539-1: "Intelligent Transport Systems (ITS); V2V Application; Part 1: Road Hazard Signally (RHS) application requirements specification".
- [i.5] ETSI TS 101 539-2: "Intelligent Transport Systems (ITS); V2V Application; Part 2: Intersection Collision Risk Warning (ICRW) Application Specification".
- [i.6] ETSI TS 101 539-3: "Intelligent Transport Systems (ITS); V2V Application; Part 3: Longitudinal Collision Risk Warning (LCRW) Application Specification".
- [i.7] ETSI TR 102 863: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM); Rationale for and guidance on standardization".
- [i.8] ETSI EN 302 636-4-1: "Intelligent Transport System (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.9] ETSI EN 302 636-5-1: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol".
- [i.10] TISA specification TAWG11071 (2011-11-07, drafted to potentially become ISO/TS 21219 Part 15): "Intelligent Transport Systems (ITS) - Traffic and Travel Information (TTI) via Transport Protocol Experts Group, Generation 2 (TPEG2) - Part 15: Traffic Event Compact (TPEG2-TEC-3.1/001)".
- [i.11] ISO EN 17419: "Intelligent Transport Systems - Cooperative Systems - Classification and management of ITS applications in a global context".
- [i.12] ETSI TS 102 723-5: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 5: Interface between management entity and facilities layer".
- [i.13] ETSI TS 102 723-9: "Intelligent Transport Systems; OSI cross-layer topics; Part 9: Interface between security entity and facilities layer".
- [i.14] ETSI TS 102 723-11: "Intelligent Transport Systems; OSI cross-layer topics; Part 11: Interface between network and transport layers and facilities layer".
- [i.15] ISO 3779 (2011-07): "Road vehicles - Vehicle identification number (VIN) Content and structure".
- [i.16] ETSI TS 102 637-3: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Decentralized Environmental Notification Basic Service".

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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purpose of the present document, the terms and definitions given in SAE J2735 [1], EN 302 665 [2], TR 102 863 [i.7] and the following apply:

**actionID:** identifier of an detected event by an ITS station

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

NOTE: The BSA is defined in [i.1].

**cancellation DENM:** DEN message type sent by the ITS-S which originated the new DENM to indicate termination of the event

**communication support:** subset of facilities, providing support for communications

**DEN basic service:** facility at the facilities layer to support ITS applications, DENM management and DENM dissemination

**DENM:** ITS facilities layer PDU providing event information

**DENM protocol:** ITS facilities layer protocol that operates the DENM transmission, forwarding and reception

**destination area:** geographical area for DENM dissemination

NOTE: The destination area specified in [4].

**event:** road hazard, driving environment, or traffic condition

**facility:** functionality, service or data provided by the ITS facilities layer

**negation DENM:** DEN message type sent by any of the ITS-S not origin of the new DENM to indicate event termination

**new DENM:** DEN message type sent by any originator ITS-S that detects first occurrence of an event

**originator ITS station:** ITS station that generates the DENM and implements the DENM protocol of the ITS-S

**forwarder ITS station:** ITS station that forwards the DENM and implements the DENM protocol of the ITS-S

**receiver ITS station:** ITS station that receives the DENM from the ITS networking&transport layer and implements the DENM protocol of the ITS-S

**reference position:** geographical position that is represented with geographical coordinates

**relevance area:** area in which ITS stations are concerned by an event

**update DENM:** DEN message type sent by the ITS-S which originated the new DENM to indicate the evolution of the event

## 3.2 Symbols

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

actionID	Parameter that identifies an event detected by an ITS-S
appDENM_trigger	Application request type to generate a new DENM for a newly detected event
appDENM_update	Application request type to generate a DENM for an update of the event
appDENM_termination	Application request type to generate a DENM for a termination of the event
detectionTime	Timestamp at which an event or event update/termination is detected
referenceTime	Timestamp at which a DENM is generated by the DEN basic service
IF.DEN1	Interface between DEN basic service and ITS application for DENM transmission
IF.DEN2	Interface between DEN basic service and ITS application for DENM reception
IF.Mng	Interface between DEN basic service and ITS management entity
IF.N&T	Interface between DEN basic service and ITS networking & transport layer
IF.SEC	Interface between DEN basic service and ITS security entity
isNegation	Parameter that indicates the termination of an event
repetitionDuration	Duration of the DENM repetition
T_F_VValidity	Timer that indicates the end of the DENM processing of one specific <i>actionID</i> of the forwarder ITS-S
T_Forwarding	Timer for the scheduling of the DENM forwarding by the forwarder ITS-S
T_O_VValidity	Timer that indicates the end of the DENM processing of one specific <i>actionID</i> of the originator ITS-S
T_R_VValidity	Timer that indicates the end of the DENM processing of one specific <i>actionID</i> of the receiver ITS-S
T_Repetition	Timer for the scheduling of the DENM repetition by the originator ITS-S
ValidityDuration	Duration of the DENM validity

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in EN 302 665 [2] and the following apply:

ABS	Anti-lock braking system
AEB	Automatic Emergency Braking
API	Application Programming Interface
ASN	Abstract Syntax Notation
ASN.1	Abstract Syntax Notation One
BSA	Basic Set of Applications
BTP	Basic Transport Protocol
C2C-CC	Car to Car Communication Consortium
CAN	Controller Area Network
CR	Change Request
DE	Data Element
DEN	Decentralized Environmental Notification
DENM	Decentralized Environmental Notification Message
DF	Data Frame
DSRC	Dedicated Short Range Communications
ESP	Electronic Stability Program
FA-SAP	Facilities-Application Service Access Point
HMI	Human Machine Interface
ISO	International Standardization Organization
ITS	Intelligent Transport System
ITS-S	ITS station
KAF	Keep alive forwarding
LDM	Local Dynamic Map
MF-SAP	Management Facilities Service Access Point
NF-SAP	Network Facilities Service Access Point
OSI	Open System Interconnection
PCI	Protocol Control Information
PDU	Protocol Data Unit
PER	Packed Encoding Rules
RHW	Road Hazard Warning
SAE	Society of Automotive Engineers
SF-SAP	Security Facilities Service Access Point
TEC	Traffic Event Compact
TPEG	Transport Protocol Experts Group
TS	Technical Specification
TTI	Traffic and Travel Information
UTC	Coordinated Universal Time
VDS	Vehicle Descriptor Section
WMI	World Manufacturer Identifier

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## 4 DEN basic service introduction

### 4.1 Background

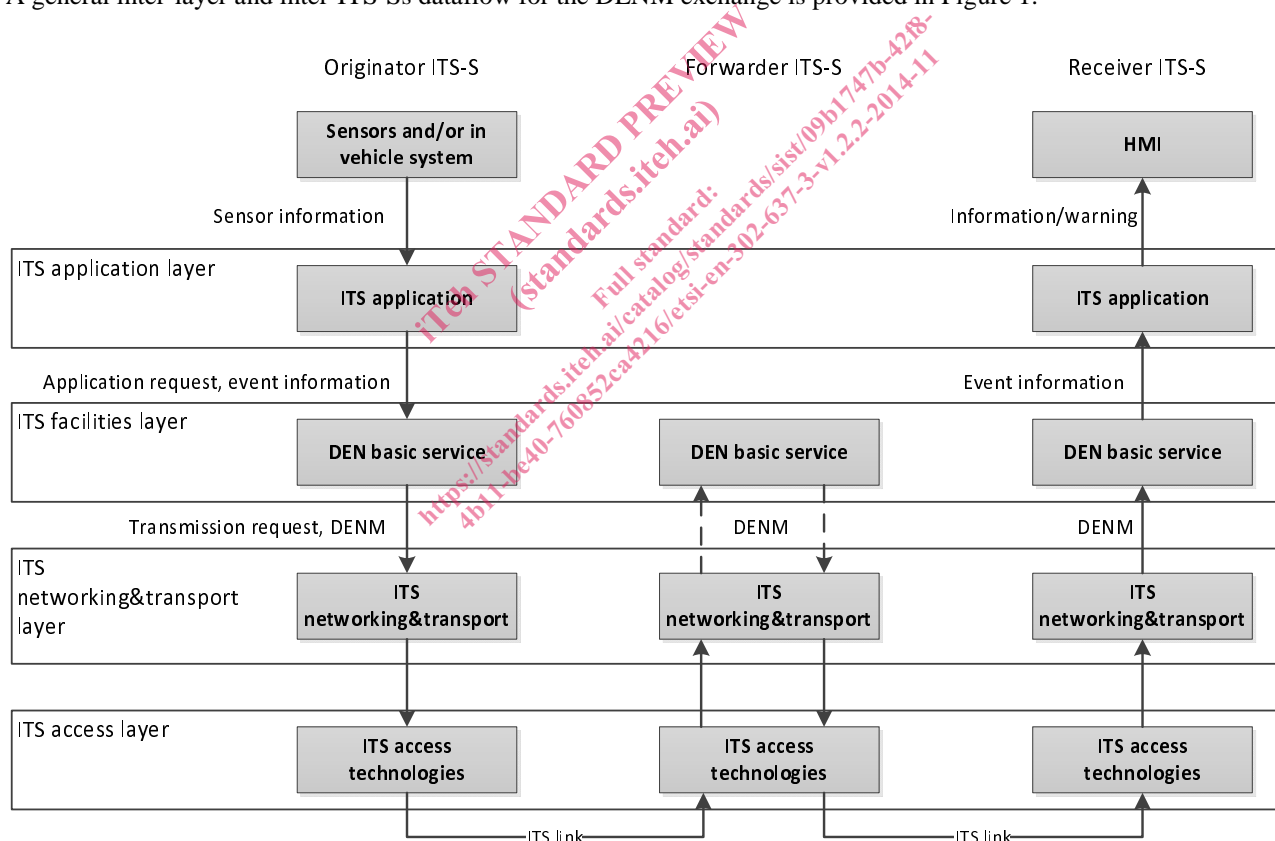
Decentralized Environmental Notification Message (DENM) is a facilities layer message that is mainly used by the ITS applications in order to alert road users of a detected event using the ITS communication technologies. A DENM contains information related to a variety of events that can be detected by ITS stations (ITS-S). A set of ITS applications are specified in [i.4], [i.5], [i.6], which includes multiple ITS use cases. It is expected that further use cases will be added in the future.

The exchange of DENM among ITS-Ss is operated by DENM protocol.

The general processing procedure of an ITS use case that is supported by the DENM protocol is as follows:

- Upon detection of an event, an ITS-S transmits a DENM in order to disseminate the information about the event to other ITS-Ss located inside an area of relevance. The ITS-S that transmits DENM is denoted as originator ITS-S.
- The DENM transmission is initiated and terminated by the ITS application layer. Examples are provided in [i.4], [i.5] and [i.6].
- The transmission of a DENM may be repeated.
- The DENM transmission may persist as long as the event is present.
- An ITS-S may forward a DENM. This ITS-S is denoted as forwarder ITS-S.
- The termination of the DENM transmission is either automatically achieved once the event disappears after a predefined expiry time, or by an ITS-S that generates a special DENM to inform that the event has disappeared.
- An ITS-S, which receives a DENM, processes the information and may decide to present an appropriate warning or information to the user, as long as the information in the DENM is relevant to the ITS-S. This ITS-S is denoted as receiver ITS-S.

A general inter-layer and inter-ITS-Ss dataflow for the DENM exchange is provided in Figure 1.



**Figure 1: General data flow for ITS-S application supported by the DEN basic service**

The solid lines illustrate the dataflow that is mandatory for all ITS applications supported by the DEN basic service. The dotted lines illustrate the dataflow that may apply only in certain situations.