

ETSI EN 302 637-3 V1.3.1 (2019-04)



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

STANDARD FOR PUBLIC REVIEW
https://standards.iteh.ai/catalog/standards/sis/3715-226-95b8-40aa-9ce8-9890a7cdc4bd/etsi-en-302-637-3-v1-3-1-2019-04

Reference

REN/ITS-0010090

Keywords

application, ITS, safety, service, transport

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
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2019.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M™ logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	7
Foreword.....	7
Modal verbs terminology.....	8
Introduction	8
1 Scope	9
2 References	9
2.1 Normative references	9
2.2 Informative references.....	9
3 Definitions, symbols and abbreviations	11
3.1 Definitions.....	11
3.2 Symbols.....	12
3.3 Abbreviations	12
4 DEN basic service introduction.....	13
4.1 Background	13
4.2 Services provided by the DEN basic service.....	14
5 DEN basic service functional description	15
5.1 Introduction	15
5.2 DEN basic service in the ITS architecture.....	16
5.3 DEN basic service functional architecture	16
5.4 Interfaces of the DEN basic service	18
5.4.1 Interfaces to the ITS application layer.....	18
5.4.1.1 Introduction.....	18
5.4.1.2 Data passed via interface IF.DEN.1 for the request type <i>AppDENM_trigger</i>	19
5.4.1.3 Data passed via interface IF.DEN.1 for the request type <i>AppDENM_update</i>	20
5.4.1.4 Data passed via interface IF.DEN.1 for the request type <i>AppDENM_termination</i>	21
5.4.1.5 Data passed via interface IF.DEN.2 for received DENM	21
5.4.1.6 Methods for data exchanges between DEN basic service and ITS application layer.....	22
5.4.2 Interface to the ITS networking & transport layer.....	22
5.4.2.1 General requirements	22
5.4.2.2 Interface to the GeoNetworking/BTP stack	23
5.4.2.3 Interface to the IPv6 stack and the combined IPv6/GeoNetworking stack	23
5.4.3 Interface to the ITS management entity.....	24
5.4.4 Interface to the ITS security entity.....	24
6 DENM dissemination.....	24
6.1 DENM dissemination concepts	24
6.1.1 Event identification.....	24
6.1.1.1 <i>actionID</i>	24
6.1.1.2 <i>stationID</i> update and <i>actionID</i> management.....	24
6.1.2 Trigger, update, repetition and termination of DENM.....	25
6.1.2.1 DENM trigger	25
6.1.2.2 DENM update	25
6.1.2.3 DENM repetition.....	25
6.1.2.4 DENM termination.....	25
6.1.3 Relevance area, location referencing and destination area	26
6.1.3.1 DENM relevance area	26
6.1.3.2 Location referencing	27
6.1.3.3 DENM destination area.....	27
6.1.4 DENM forwarding.....	27
6.1.4.1 Packet centric forwarding	27
6.1.4.2 Keep-alive forwarding	28
6.2 DENM dissemination constraints.....	28
6.2.1 General confidence constraints	28

6.2.2	General security constraints.....	28
6.2.2.1	Introduction.....	28
6.2.2.2	Service Specific Permissions (SSP).....	29
6.2.3	General priority constraints.....	31
7	DENM format specification.....	31
7.1	DENM structure.....	31
7.1.1	General structure of a DENM.....	31
7.1.2	ITS PDU header.....	32
7.1.3	DENM management container.....	32
7.1.4	DENM situation container.....	32
7.1.5	DENM location container.....	36
7.1.6	DENM à la carte container.....	37
7.2	DENM format and decoding rules.....	37
7.2.1	Common data dictionary.....	37
7.2.2	DENM data presentation.....	37
8	Protocol operation of the DEN basic service.....	38
8.1	Introduction.....	38
8.2	Originating ITS-S operation.....	38
8.2.1	Protocol data setting rules.....	38
8.2.1.1	General requirements.....	38
8.2.1.2	<i>actionID</i>	38
8.2.1.3	<i>referenceTime</i>	39
8.2.1.4	<i>termination</i>	39
8.2.1.5	<i>T_O_Validity</i> , <i>T_RepetitionDuration</i> and <i>T_Repetition</i>	39
8.2.1.6	Originating ITS-S message table.....	40
8.2.2	General protocol operation.....	40
8.2.3	Exception handling.....	47
8.2.3.1	General requirements.....	47
8.2.3.2	DENM construction exception.....	47
8.2.3.3	<i>actionID</i> non-existence exception.....	47
8.2.3.4	Time operation exception.....	47
8.3	Forwarding ITS-S operation.....	47
8.3.1	Introduction.....	47
8.3.2	Protocol data setting rules.....	47
8.3.2.1	General requirements.....	47
8.3.2.2	<i>actionID</i>	48
8.3.2.3	<i>referenceTime</i>	48
8.3.2.4	<i>termination</i>	48
8.3.2.5	<i>T_F_Validity</i> and <i>T_Forwarding</i>	48
8.3.2.6	Forwarding ITS-S message table.....	48
8.3.2.7	DENM reconstruction.....	49
8.3.3	General protocol operation.....	49
8.3.4	Exception handling.....	51
8.3.4.1	General requirements.....	51
8.3.4.2	DENM construction exception.....	51
8.4	Receiving ITS-S operation.....	52
8.4.1	Protocol data setting rules.....	52
8.4.1.1	General requirements.....	52
8.4.1.2	<i>actionID</i>	52
8.4.1.3	<i>referenceTime</i>	52
8.4.1.4	<i>termination</i>	52
8.4.1.5	<i>T_R_Validity</i>	52
8.4.1.6	Receiving ITS-S message table.....	52
8.4.2	General protocol operation.....	53
8.4.3	Exception handling.....	55
8.4.3.1	General requirements.....	55
8.4.3.2	DENM decoding exception.....	55
Annex A (normative):	ASN.1 specification of DENM.....	56
Annex B (normative):	Description for data elements and data frames.....	58

B.1	header	58
B.2	denm	58
B.3	management	58
B.4	situation	58
B.5	location	59
B.6	alacarte	59
B.7	actionID	59
B.8	carryingDangerousGoods	59
B.9	closedLanes	60
B.10	defaultValidity	60
B.11	detectionTime	60
B.12	energyStorageType	60
B.13	eventHistory	61
B.14	eventPosition	61
B.15	eventPositionHeading	61
B.16	eventSpeed	62
B.17	eventType	62
B.18	externalTemperature	62
B.19	heightLonCarrLeft	62
B.20	heightLonCarrRight	62
B.21	impactReduction	63
B.22	incidentIndication	63
B.23	informationQuality	63
B.24	lanePosition	63
B.25	lightBarSirenInUse	64
B.26	linkedCause	64
B.27	numberOfOccupants	64
B.28	posCentMass	64
B.29	posFrontAx	65
B.30	positioningSolution	65
B.31	positionOfOccupants	65
B.32	positionOfPillars	65
B.33	posLonCarrLeft	66
B.34	posLonCarrRight	66
B.35	recommendedPath	66
B.36	referenceDenms	66
B.37	referenceTime	67
B.38	relevanceDistance	67

B.39	relevanceTrafficDirection	67
B.40	requestResponseIndication	67
B.41	restriction.....	68
B.42	roadType.....	68
B.43	roadWorks	68
B.44	speedLimit.....	68
B.45	startingPointSpeedLimit.....	69
B.46	stationaryCause	69
B.47	stationarySince	69
B.48	stationaryVehicle.....	69
B.49	stationType	69
B.50	termination	70
B.51	traces.....	70
B.52	trafficFlowRule	70
B.53	transmissionInterval	71
B.54	turningRadius	71
B.55	validityDuration	71
B.56	vehicleIdentification.....	72
B.57	vehicleMass.....	72
B.58	wheelBaseVehicle	72
Annex C (informative):	Bibliography.....	73
History		74

Full STANDARD PREVIEW
 (standards.iteh.ai)
 Full standard:
<https://standards.iteh.ai/catalog/standards/sist/37b8e26-95b8-40aa-9ce8-9890a7edc4ad/etsi-en-302-637-3-v1.3.1-2019-04>

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

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

The present document is part 3 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 Decentralized Environmental Notification (DEN) basic service was initially developed in the European Car-to-Car Communication Consortium (C2C-CC) Manifesto [i.2] and in C2C-CC Message description: Decentralized Environmental Notification Message [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, SCORE@F, simTD, etc. These evaluation efforts have provided feedback to ETSI TC ITS.

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

National transposition dates

Date of adoption of this EN:	7 November 2018
Date of latest announcement of this EN (doa):	31 July 2019
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2020
Date of withdrawal of any conflicting National Standard (dow):	31 January 2020

Modal verbs terminology

In the present document "shall", "shall not", "should", "should not", "may", "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).

"must" and "must not" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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) in ETSI TR 102 638 [i.1] that can be deployed within a three-year time frame after the completion of their standardization. In BSA, the Road Hazard Warning (RHW) application is composed of multiple use cases with the objective to improve road safety and traffic efficiency using vehicle-to-vehicle and vehicle-to-infrastructure communication technologies. ETSI TC ITS defines the decentralized environmental notification (DEN) basic service that supports the RHW application.

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-S application. A 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 communications among ITS stations. At the receiving side, the DEN basic service of an receiving ITS-S processes the received DENM and provides the DENM content to an ITS-S application. This ITS-S application may present the information to the driver if 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.

1 Scope

The present document provides specification of the DEN basic service, which is in support of the RHW application.

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

The DEN basic service may be implemented in an vehicle ITS-S, a road side ITS-S, a personal ITS-S or a central ITS-S.

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>.

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

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/.

- [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 (V1.3.1): "Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary".
- [6] Recommendation ITU-T X.691/ISO/IEC 8825-2 (12-1997): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".
- [7] ETSI EN 302 637-2 (V1.4.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service".
- [8] ETSI EN 302 636-2 (V1.2.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 2: Scenarios".

2.2 Informative 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.

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

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: Available at <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); V2X Applications; Part 1: Road Hazard Signalling (RHS) application requirements specification".
 - [i.5] ETSI TS 101 539-2: "Intelligent Transport Systems (ITS); V2X Applications; Part 2: Intersection Collision Risk Warning (ICRW) application requirements specification".
 - [i.6] ETSI TS 101 539-3: "Intelligent Transport Systems (ITS); V2X Applications; Part 3: Longitudinal Collision Risk Warning (LCRW) application requirements specification".
 - [i.7] ETSI EN 302 895: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM)".
 - [i.8] 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.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 102 723-8: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 8: Interface between security entity and network and transport layer".
 - [i.14] ETSI TS 102 723-11 (V1.1.1): "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 11: Interface between networking and transport layer 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 3: Specifications of Decentralized Environmental Notification Basic Service".
 - [i.17] ETSI TS 103 097 (V1.3.1): "Intelligent Transport Systems (ITS); Security; Security header and certificate formats".
 - [i.18] ETSI TR 102 965 (V1.1.1): "Intelligent Transport Systems (ITS); Application object identifier (ITS-AID); Registration list".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in SAE J2735 [1], ETSI EN 302 665 [2], ETSI EN 302 895 [i.7] and the following apply:

actionID: identifier of an detected event

à la carte container: container of DENM that includes information of the detected event in addition to management container, situation container and location container

NOTE: Due to coding constraints in programming language, the term "alacarte" is also used.

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

NOTE: The BSA is defined in ETSI TR 102 638 [i.1].

cancellation Decentralized Environmental Notification Message (DENM): DEN message type generated by the ITS-S, which originated the new DENM, indicating the event termination

Decentralized Environmental Notification (DEN) basic service: facility at the facilities layer to support ITS-S applications, DENM management and DENM dissemination

Decentralized Environmental Notification Message (DENM): ITS facilities layer PDU providing event information

Decentralized Environmental Notification Message (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 is specified in ETSI EN 302 931 [4].

downstream traffic: direction from the event position towards the departing traffic on the same carriageway

event: road hazard, driving environment, or traffic condition

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

forwarding Intelligent Transport System Station (ITS-S): ITS-S that forwards DENMs and implements the DENM protocol

location container: container of DENM that includes location data of the detected event

management container: container of DENM that includes management data for DENM protocol

negation Decentralized Environmental Notification Message (DENM): DEN message type generated by an ITS-S other than the ITS-S, which originated the new DENM, indicating the event termination

new Decentralized Environmental Notification Message (DENM): DEN message type indicating that the event is detected for the first time

originating Intelligent Transport System Station (ITS-S): ITS-S that generates DENMs and implements the DENM protocol

receiving Intelligent Transport System Station (ITS-S): ITS-S that receives DENMs from the ITS networking & transport layer and implements the DENM protocol

relevance area: geographic area in which information concerning the event is identified as relevant for use or for further distribution

situation container: container of DENM that includes data related to the detected event

update Decentralized Environmental Notification Message (DENM): DEN message type indicating the evolution of the event

upstream traffic: direction from the event position towards the approaching traffic on the same carriageway

3.2 Symbols

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

actionID	Identifier of an event that is 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 an update DENM for an update of the event
appDENM_termination	Application request type to generate a cancellation or negation DENM for termination of the event
detectionTime	Timestamp at which an event or event update/termination is detected
IF.DEN1	Interface between the DEN basic service and ITS-S applications for DENM transmission
IF.DEN2	Interface between the DEN basic service and ITS-S applications for DENM reception
IF.Mng	Interface between the DEN basic service and the ITS management entity
IF.N&T	Interface between the DEN basic service and the ITS networking & transport layer
IF.SEC	Interface between the DEN basic service and the ITS security entity
referenceTime	Timestamp at which a new, update or cancellation DENM is generated by the DEN basic service

NOTE: A negation DENM contains the *referenceTime* of the DENM that is negated.

repetitionDuration	Duration of the DENM repetition
repetitionInterval	Time interval of the DENM repetition
stationID	Identifier of an ITS-S
T_F_VValidity	Timer that indicates the end of the DENM processing of one specific actionID of the forwarding ITS-S
T_Forwarding	Timer for the scheduling of the DENM forwarding by the forwarding ITS-S
T_O_VValidity	Timer that indicates the end of the DENM processing of one specific actionID of the originating ITS-S
T_R_VValidity	Timer that indicates the end of the DENM processing of one specific actionID of the receiving ITS-S
T_Repetition	Timer for the scheduling of the DENM repetition by the originating ITS-S
T_RepetitionDuration	Timer that indicates the end of the DENM repetition
termination	Parameter that indicates the termination of an event
transmissionInterval	Time interval for DENM transmission
validityDuration	Duration of the DENM validity

3.3 Abbreviations

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

ABS	Anti-lock Braking System
AEB	Automatic Emergency Braking
API	Application Programming Interface
ASN.1	Abstract Syntax Notation One
BSA	Basic Set of Applications
BTP	Basic Transport Protocol
C2C-CC	Car to Car Communication Consortium
CA	Cooperative Awareness
DE	Data Element
DEN	Decentralized Environmental Notification
DENM	Decentralized Environmental Notification Message
DF	Data Frame
DSRC	Dedicated Short Range Communications
EEBL	Electronic Emergency Break Light
ESP	Electronic Stability Program
FA-SAP	Facilities-Application Service Access Point
GN	GeoNetworking
HMI	Human Machine Interface

ISO	International Standardization Organization
ITS	Intelligent Transport System
ITS-AID	ITS-Application IDentifier
ITS-S	ITS Station
KAF	Keep Alive Forwarding
LDM	Local Dynamic Map
LSB	Least Significant Bit
MF-SAP	Management Facilities Service Access Point
MSB	Most Significant Bit
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
SSP	Service Specific Permissions
TEC	Traffic Event Compact
TISA	Traveller Information Services Association
TPEG™	Transport Protocol Experts Group
TS	Technical Specification
TTI	Traffic and Travel Information
VDS	Vehicle Descriptor Section
WMI	World Manufacturer Identifier

4 DEN basic service introduction

4.1 Background

Decentralized Environmental Notification Message (DENM) is a facilities layer message that is mainly used by ITS applications in order to alert road users of a detected event using ITS communication technologies. DENM is used to describe a variety of events that can be detected by ITS stations (ITS-S). A set of ITS applications are specified in ETSI TS 101 539-1 [i.4], ETSI TS 101 539-2 [i.5] and ETSI TS 101 539-3 [i.6], which includes multiple ITS use cases.

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 this event to other ITS-Ss located inside an area of relevance. The ITS-S that transmits DENM is denoted as originating ITS-S.
- DENM transmission is initiated and terminated by an ITS-S application at the ITS application layer. Examples are provided in ETSI TS 101 539-1 [i.4], ETSI TS 101 539-2 [i.5] and ETSI TS 101 539-3 [i.6].
- The transmission of a DENM may be repeated.
- DENM transmission may persist as long as the event is present.
- An ITS-S may forward a DENM. This ITS-S is denoted as forwarding ITS-S.
- The termination of DENM transmission is either automatically achieved by the facilities layer, i.e. the DEN basic service of the originating ITS-S when a predefined expiry time is reached, or by an ITS-S application that requests the generation of a DENM to inform that the event has terminated.
- An ITS-S, which receives a DENM, processes the information and may decide to present an appropriate warning or information to user, as long as the information in the received DENM is relevant to the ITS-S. This ITS-S is denoted as receiving ITS-S.