



**Intelligent Transport Systems (ITS);  
Testing;  
Conformance test specifications for  
Decentralized Environmental Notification  
Basic Service (DEN);  
Part 2: Test Suite Structure and Test Purposes (TSS & TP)**

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Reference

RTS/ITS-00173

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Keywords

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

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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 Conformance test specifications for Decentralized Environmental Notification Basic Service (DEN) as identified below:

- Part 1: "Test requirements and Protocol Implementation Conformance Statement (PICS) pro forma";
- Part 2: "Test Suite Structure and Test Purposes (TSS & TP)";**
- Part 3: "Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

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## 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).

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# 1 Scope

The present document provides the Test Suite Structure and Test Purposes (TSS & TP) for Decentralized Environmental Notification Basic Service (DEN) as defined in ETSI EN 302 637-3 [1] in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [i.5].

The ISO standard for the methodology of conformance testing (ISO/IEC 9646-1 [i.2] and ISO/IEC 9646-2 [i.3]) as well as the ETSI rules for conformance testing (ETSI ETS 300 406 [i.6]) are used as a basis for the test methodology.

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## 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 <http://docbox.etsi.org/Reference>.

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

- [1] ETSI EN 302 637-3 (V1.2.2): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service".
- [2] ETSI TS 102 869-1 (V1.5.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Decentralized Environmental Notification Basic Service (DEN); Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) pro forma".

### 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 EG 202 798 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".
- [i.2] ISO/IEC 9646-1 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts".
- [i.3] ISO/IEC 9646-2 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite specification".
- [i.4] ISO/IEC 9646-6 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 6: Protocol profile test specification".
- [i.5] ISO/IEC 9646-7 (1995): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 7: Implementation Conformance Statements".

- [i.6] ETSI ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI EN 302 637-3 [1], ISO/IEC 9646-6 [i.4] and ISO/IEC 9646-7 [i.5] apply.

### 3.2 Abbreviations

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

ATS	Abstract Test Suite
BTP	Basic Transport Protocol
BTP-B	Basic Transport Protocol type B
BV	valid test events for Behaviour tests
CAN	Controller Area Network
CLT	Current Local Time
DE	Data Element
DEN	Decentralized Environmental Notification
DENM	Decentralized Environmental Notification Message
GBC	Geographically-Scoped Broadcast
ISO	International Organization for Standardization
ITS	Intelligent Transportation Systems
ITS-S	Intelligent Transport System - Station
IUT	Implementation Under Test
KAFW	Keep-Alive Forwarding
MSGF	Message Format
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
SSP	Service Specific Permissions
TI	Timer tests
TP	Test Purposes
TS	Test Suite
TSS	Test Suite Structure

## 4 Test Suite Structure (TSS)

### 4.1 Structure for DEN tests

Table 1 shows the DEN Test Suite Structure (TSS) including its subgroups defined for conformance testing.

**Table 1: TSS for DEN**

Root	Group	category
DEN	Message format	Valid
	Event Generation	Valid
	Event Update	Valid and Inopportune
	Event Termination	Valid, Inopportune and Timer
	Message Repetition	Valid
	Lower-layer parameters	Valid
	Message reception	Valid and Inopportune
	Keep-Alive Forwarding	Valid and Timers

The test suite is structured as a tree with the root defined as DEN. The tree is of rank 2 with the first rank a functional area and the second rank is the standard ISO conformance test categories.

## 4.2 Test groups

### 4.2.1 Introduction

The test suite has a total of three levels. The first level is the root. The second level separates the root into various functional areas. The third level is the standard ISO conformance test categories.

### 4.2.2 Root

The root identifies the Decentralized Environmental Notification Basic Service (DEN) given in ETSI EN 302 637-3 [1].

### 4.2.3 Groups

This level contains height functional areas identified as:

- Message format
- Event Generation
- Event Update
- Event Termination
- Message Repetition
- Lower-layer parameters
- Message reception
- Keep-alive Forwarding

### 4.2.4 Categories

This level contains the standard ISO conformance test categories behaviour: valid events and inopportune events and Timer.

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## 5 Test Purposes (TP)

### 5.1 Introduction

#### 5.1.1 TP definition conventions

The TP definition is built according to ETSI EG 202 798 [i.1].

## 5.1.2 TP Identifier naming conventions

The identifier of the TP is built according to table 2.

**Table 2: TP naming convention**

Identifier:	TP/<root>/<gr>/<x>/<nn> or TP/<root>/<gr>/<x>/<nn>-<v>		
	<root> = root	DEN	
	<gr> = group	MSGF	Message transmission - Message format
		EVGN	Message transmission - Event Generation
		EVUP	Message transmission - Event Update
		EVTR	Message transmission - Event Termination
		EVRP	Message transmission - Message Repetition
		PAR	Message transmission - Lower-layer parameters
		MSRV	Message reception
		KAFW	Keep-alive Forwarding
		SSP	Service Specific Permissions
	<x> = type of testing	BV	Behaviour: Valid event tests
		BO	Behaviour: Inopportune event tests
		TI	Timer tests
	<nn> = sequential number		01 to 99
	<v> = variant		01 to 99

## 5.1.3 Rules for the behaviour description

The description of the TP is built according to ETSI EG 202 798 [i.1].

ETSI EN 302 637-3 [1] does not use the finite state machine concept. As consequence, the test purposes use a generic "Initial State" that corresponds to a state where the IUT is ready for starting the test execution. Furthermore, the IUT shall be left in this "Initial State", when the test is completed.

Being in the "Initial State" refers to the starting point of the initial device configuration. There are no pending actions, no instantiated buffers or variables, which could disturb the execution of a test.

## 5.1.4 Sources of TP definitions

All TPs have been specified according to ETSI EN 302 637-3 [1].

## 5.1.5 Mnemonics for PICS reference

To avoid an update of all TPs when the PICS document is changed, table 3 introduce mnemonics name and the correspondence with the real PICS item number.

The PICS item column refers to tables and items of ETSI TS 102 869-1 [2]. The 'PICS item' as defined in ETSI TS 102 869-1 [2] shall be used to determine the test applicability.

**Table 3: Mnemonics for PICS reference**

Mnemonic	PICS item
PICS_DENM_GENERATION	A.2/1
PICS_DENM_UPDATE	A.2/2
PICS_DENM_REPETITION	A.2/3
PICS_DENM_CANCELLATION	A.2/4
PICS_DENM_NEGATION	A.2/5
PICS_DENM_RECEPTION	A.1/2
PICS_DENM_KAF	A.2/7
PICS_IMPACT_REDUCTION	A.2.8
PICS_IS_IUT_SECURED	A.3/1



## 5.2 Test purposes for DEN

### 5.2.1 Message Transmission

#### 5.2.1.1 Message Format

<b>TP Id</b>	<b>TP/DEN/ MSGF/BV-01</b>
<b>Test objective</b>	Check that protocolVersion is set to 1 and messageID is set to 1
<b>Reference</b>	ETSI EN 302 637-3 [1], clause B.1
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives an AppDENM_Trigger request from the application layer } then { the IUT sends a valid DENM containing ITS PDU header containing protocolVersion indicating value 1 and containing messageID indicating value 1 }	

<b>TP Id</b>	<b>TP/DEN/ MSGF/BV-02</b>
<b>Test objective</b>	Check that sent DENM contains at least one 'trace' DE
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.3.2
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives an AppDENM_Trigger request from the application layer } then { the IUT sends a valid DENM containing location container containing at least one 'trace' }	

## 5.2.1.2 Event Generation

<b>TP Id</b>	<b>TP/DEN/EVGN/BV-01</b>
<b>Test objective</b>	Check that DEN Basic Service generates a new DENM on reception of a valid AppDENM_Trigger request
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.2.1
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives an AppDENM_Trigger request from the application layer } then { the IUT sends a valid DENM } }	

<b>TP Id</b>	<b>TP/DEN/EVGN/BV-02</b>
<b>Test objective</b>	Check that a new ActionID value is assigned for each newly generated DENM
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.1.1
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having generated several events }	
<b>Expected behaviour</b>	
ensure that { when { the IUT is requested to generate a new event } then { the IUT sends a valid DENM containing management container containing actionID indicating an unused value } }	

<b>TP Id</b>	<b>TP/DEN/EVGN/BV-03</b>
<b>Test objective</b>	Check that a newly created ActionID contains the StationID of the originating ITS-S that detected the event
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.1.1
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
ensure that { when { the IUT is requested to generate a new event } then { the IUT sends a valid DENM containing management container containing actionID containing originatingStationID indicating its own StationID } }	

<b>TP Id</b>	<b>TP/DEN/EVGN/BV-04</b>
<b>Test objective</b>	Check that cause and subcause values included in DENM as provided by application
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 7.1.4, B.17
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives an AppDENM_trigger request from the application layer containing situation container containing eventType containing causeCode indicating Value1 containing subCauseCode indicating Value2 } then { the IUT sends a valid DENM containing situation container containing eventType containing causeCode indicating Value1 containing subCauseCode indicating Value2 } }	

<b>TP Id</b>	<b>TP/DEN/EVGN/BV-05</b>
<b>Test objective</b>	Check that referenceTime is set to the current time when generating a DENM for a new event
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.1.3
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having generated several events }	
<b>Expected behaviour</b>	
ensure that { when { the IUT is requested to generate a new event } then { the IUT sends a valid DENM containing management container containing referenceTime indicating CLT } }	

<b>TP Id</b>	<b>TP/DEN/EVGN/BV-07</b>
<b>Test objective</b>	Check that sequenceNumber is set to a next unused value each time an event is detected
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 6.1.1.1 and 8.2.1.2
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having generated several events and the IUT having generated its last DENM containing management container containing actionID containing sequenceNumber indicating SEQ1 and no active event being associated with sequenceNumber SEQ1 + 1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT is requested to generate a new event } then { the IUT sends a valid DENM containing management container containing actionID containing sequenceNumber indicating SEQ1 + 1 } }	

<b>TP Id</b>	<b>TP/DEN/EVGN/BV-08</b>
<b>Test objective</b>	Check that sequenceNumber is set to a next unused value each time an event is detected (Sequence number wrap around)
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 6.1.1.1 and 8.2.1.2
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having generated several events   and the IUT having generated its last DENM     containing management container     containing actionID     containing sequenceNumber     indicating SEQ1   and an active event being associated with sequenceNumber SEQ1 + 1   and no active event being associated with sequenceNumber SEQ1 + 2 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT is requested to generate a new event   }   then {     the IUT sends a valid DENM     containing management container     containing actionID     containing sequenceNumber     indicating SEQ1 + 2   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/EVGN/BV-10</b>
<b>Test objective</b>	Check that actionID are generated using newly assigned stationID when a pseudonym change occurs
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.1.2
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having generated several events     containing management container     containing actionID     containing originatingStationID     indicating STATION_ID_1   and the IUT having changed its StationID }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT is requested to generate a new event   }   then {     the IUT sends a valid DENM     containing management container     containing actionID     containing originatingStationID     indicating its new StationID   } }</pre>	

## 5.2.1.3 Event Update

<b>TP Id</b>	<b>TP/DEN/EVUP/BV-01</b>
<b>Test objective</b>	Check that DEN Basic Service generates an update DENM on reception of a valid AppDENM_update request
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.2.2
<b>PICS Selection</b>	PICS_DENM_UPDATE
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having generated an event }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives an AppDENM_update request from the application layer } then { the IUT sends a valid DENM } }	

<b>TP Id</b>	<b>TP/DEN/EVUP/BV-02</b>
<b>Test objective</b>	Check that the actionID is not changed by DENM update, as long as the stationID of the originating ITS-S remains unchanged
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 6.1.2.2 and 8.2.1.2
<b>PICS Selection</b>	PICS_DENM_UPDATE
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having generated an event containing management container containing actionID indicating ACTION_ID1 and the IUT not having changed its stationID }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives an AppDENM_update request associated with ACTION_ID1 from the application layer } then { the IUT sends a valid DENM containing management container containing actionID indicating ACTION_ID1 } }	

<b>TP Id</b>	<b>TP/DEN/EVUP/BV-03</b>
<b>Test objective</b>	Check that referenceTime is set to the current time when generating a DENM for an updated event
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.2.2
<b>PICS Selection</b>	PICS_DENM_UPDATE
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having generated an event     containing management container       containing actionID         indicating ACTION_ID1     containing referenceTime       indicating REFERENCETIME1 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT receives an AppDENM_update request associated with ACTION_ID1 from the application layer   }   then {     the IUT sends a valid DENM       containing management container         containing actionID           indicating ACTION_ID1       and containing referenceTime         indicating CLT &gt; REFERENCETIME1   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/EVUP/BO-04</b>
<b>Test objective</b>	Check that DEN Basic Service does not send any update DENM if actionID is not in originating ITS-S message table
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.1.2
<b>PICS Selection</b>	PICS_DENM_UPDATE
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having generated an event   and the IUT not having sent an event being associated with actionID ACTION_ID1     containing originatingStationID       indicating its own stationID     and containing sequenceNumber       indicating SEQ1 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT is requested to update an event associated to actionID ACTION_ID1   }   then {     the IUT does not send any DENM for this event   } }</pre>	

## 5.2.1.4 Event Termination

<b>TP Id</b>	<b>TP/DEN/EVTR/BV-01</b>
<b>Test objective</b>	Check that DEN Basic Service generates a cancellation DENM when application indicates the premature termination of an event for which it is the originator
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 6.1.2.4 and 8.2.1.3
<b>PICS Selection</b>	PICS_DENM_CANCELLATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having generated an event containing management container containing actionID indicating ACTION_ID1 and containing validityDuration indicating DURATION_1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives an <i>AppDENM_termination</i> request associated to ACTION_ID1 from the application layer } then { the IUT sends a valid DENM containing management container containing actionID indicating ACTION_ID1 and containing termination indicating value isCancellation } }	

<b>TP Id</b>	<b>TP/DEN/EVTR/BV-02</b>
<b>Test objective</b>	Check that DEN Basic Service generates a negation DENM when application indicates the premature termination of an event for which it is not the originator
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.2.4
<b>PICS Selection</b>	PICS_DENM_NEGATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having received an event containing management container containing actionID indicating ACTION_ID1 containing originatingStationID indicating stationID different from its own stationID }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives an <i>AppDENM_termination</i> request associated to ACTION_ID1 from the application layer } then { the IUT sends a valid DENM containing management container containing actionID indicating ACTION_ID1 and containing termination indicating value isNegation } }	



<b>TP Id</b>	<b>TP/DEN/EVTR/BV-03</b>
<b>Test objective</b>	Check that referenceTime is set to the latest value received for this event in negation DENM
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 6.1.2.4 and 8.2.1.3
<b>PICS Selection</b>	PICS_DENM_NEGATION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an event     containing management container       containing actionID         indicating ACTION_ID1           containing originatingStationID             indicating stationID different from its own stationID         and containing referenceTime           indicating REFERENCETIME1   and the IUT having received an event     containing management container       containing actionID         indicating ACTION_ID1         and containing referenceTime           indicating REFERENCETIME2 &gt; REFERENCETIME1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT receives an <i>AppDENM_termination</i> request associated to ACTION_ID1 from the application layer   }   then {     the IUT sends a valid DENM       containing management container         containing actionID           indicating ACTION_ID1         and containing referenceTime           indicating value REFERENCETIME2         and containing termination           indicating value isNegation   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/EVTR/BV-04</b>
<b>Test objective</b>	Check that situation container, location container and a la carte container are not present in a cancellation DENM
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 7.1.1
<b>PICS Selection</b>	PICS_DENM_CANCELLATION
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having generated an event     containing management container     containing actionID     indicating ACTION_ID1 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT receives an <i>AppDENM_termination</i> request associated to ACTION_ID1 from the application layer   }   then {     the IUT sends a valid DENM       containing management container       containing actionID       indicating ACTION_ID1       and containing termination       indicating value isCancellation       and not containing situation container       and not containing location container       and not containing a la carte container   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/EVTR/BV-05</b>
<b>Test objective</b>	Check that situation container, location container and a la carte container are not present in a negation DENM
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 7.1.1
<b>PICS Selection</b>	PICS_DENM_NEGATION
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having received an event     containing management container     containing actionID     indicating ACTION_ID1     containing originatingStationID     indicating stationID different from its own stationID }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT receives an <i>AppDENM_termination</i> request associated to ACTION_ID1 from the application layer   }   then {     the IUT sends a valid DENM       containing management container       containing actionID       indicating ACTION_ID1       and containing termination       indicating value isNegation       and not containing situation container       and not containing location container       and not containing a la carte container   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/EVTR/BO-06</b>
<b>Test objective</b>	Check that DEN Basic Service does not send any termination DENM if actionID is not in originating ITS-S message table or receiving ITS-S message table (IUT stationID)
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.2
<b>PICS Selection</b>	PICS_DENM_NEGATION OR PICS_DENM_CANCELLATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having generated several events and the IUT not having sent event being associated with ACTION_ID1 containing originatingStationID indicating its own stationID and containing sequenceNumber indicating SEQ1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT is requested to terminate an event associated to ACTION_ID1 containing originatingStationID indicating its own stationID and containing sequenceNumber indicating SEQ1 } then { the IUT does not send any termination DENM for this event } }	
NOTE: Event associated to ACTION_ID1 cannot be present in receiving ITS-S message table as its stationID is IUT's stationID (see TP/DEN/EVTR/BV-07).	

<b>TP Id</b>	<b>TP/DEN/EVTR/BO-07</b>
<b>Test objective</b>	Check that DEN Basic Service does not send any termination DENM if actionID is not in originating ITS-S message table or receiving ITS-S message table (non-IUT stationID)
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.2
<b>PICS Selection</b>	PICS_DENM_NEGATION OR PICS_DENM_CANCELLATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having received several events and the IUT not having received event being associated with ACTION_ID1 containing originatingStationID indicating STATION_ID1 different from its own stationID and containing sequenceNumber indicating SEQ1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT is requested to terminate an event associated to ACTION_ID1 containing originatingStationID indicating STATION_ID1 and containing sequenceNumber indicating SEQ1 } then { the IUT does not send any termination DENM for this event } }	
NOTE: Event associated to ACTION_ID1 cannot be present in originating ITS-S message table as its stationID is not IUT's stationID (see TP/DEN/EVTR/BV-06).	

<b>TP Id</b>	<b>TP/DEN/EVTR/BV-08</b>
<b>Test objective</b>	Check that referenceTime is set to the current time when generating a cancellation DENM
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.1.3
<b>PICS Selection</b>	PICS_DENM_CANCELLATION
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having generated an event     containing management container       containing actionID         indicating ACTION_ID1     and containing validityDuration       indicating DURATION_1     and containing referenceTime       indicating REFERENCETIME1 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT receives an AppDENM_termination request associated to ACTION_ID1 from the application layer   }   then {     the IUT sends a valid DENM       containing management container         containing actionID           indicating ACTION_ID1       and containing termination         indicating value isCancellation       and containing referenceTime         indicating CLT   } }</pre>	

### 5.2.1.5 Message Repetition

<b>TP Id</b>	<b>TP/DEN/EVRP/TI-01</b>
<b>Test objective</b>	Check that DEN Basic Service repeats DENM transmission according to repetitionInterval parameter provided by application
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 6.1.2.3, 8.2.2 and 5.4.1.2
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having received an AppDENM_trigger request from the application layer     containing repetitionInterval       indicating INTERVAL_1     and containing repetitionDuration       indicating DURATION_1     and containing validityDuration       indicating DURATION_2 &gt; DURATION_1   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID1 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT is alerted of expiration of the time associated with INTERVAL_1   }   then {     the IUT repeats the transmission of the valid DENM associated with ACTION_ID1   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/EVRP/BV-02</b>
<b>Test objective</b>	Check that the repeated DENM is always the most up-to-date message
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 6.1.2.3 and 8.2.2
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having received an AppDENM_trigger request from the application layer     containing repetitionInterval       indicating INTERVAL_1     and containing repetitionDuration       indicating DURATION_1     and containing validityDuration       indicating DURATION_2 &gt; DURATION_1   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID1    and the IUT having generated an update of the event associated with ACTION_ID1 modifying partly the event }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT is alerted of expiration of the time associated with INTERVAL_1   }   then {     the IUT repeats the transmission of the most up-to-date valid DENM associated with ACTION_ID1   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/EVRP/BV-03</b>
<b>Test objective</b>	Check that DEN Basic Service stops retransmitting DENM after event's validityDuration expiration
<b>Reference</b>	ETSI EN 302 637-3 [1], clauses 6.1.2.4 and 8.2.2
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having received an AppDENM_trigger request from application layer     containing repetitionInterval       indicating INTERVAL_1     and containing repetitionDuration       indicating DURATION_1     and containing validityDuration       indicating DURATION_2 &gt; DURATION_1   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID1     and containing validityDuration       indicating DURATION_2 and the IUT having repeated (one or more times) the transmission of the valid DENM associated with ACTION_ID1 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the IUT is alerted of expiration of the time associated with DURATION_2   }   then {     the IUT stops the retransmission of the DENM associated with ACTION_ID1   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/EVRP/BV-04</b>
<b>Test objective</b>	Check that DEN Basic Service stops retransmitting DENM after event's repetitionDuration expiration
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.2
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an <i>AppDENM_trigger</i> request from application layer     containing repetitionInterval       indicating INTERVAL_1     and containing repetitionDuration       indicating DURATION_1     and containing validityDuration       indicating DURATION_2 &gt; DURATION_1   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID1       and containing validityDuration         indicating DURATION_2 and the IUT having repeated (one or more times) the transmission of the valid DENM associated with ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT is alerted of expiration of the time associated with DURATION_1   }   then {     the IUT stops the retransmission of the DENM associated with ACTION_ID1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/EVRP/BV-05</b>
<b>Test objective</b>	Check that DEN Basic Service does not repeat transmission of DENM if repetitionInterval is not provided by application
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.1.5
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an <i>AppDENM_trigger</i> request from application layer     not containing repetitionInterval   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT has detected that repetitionInterval is not provided for the event associated with ACTION_ID1   }   then {     the IUT does not repeat the transmission of the valid DENM associated with ACTION_ID1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/EVRP/BV-06</b>
<b>Test objective</b>	Check that DEN Basic Service does not repeat transmission of DENM if repetitionDuration is not provided by application
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.1.2
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an AppDENM_trigger request from application layer     not containing repetitionDuration   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT has detected that repetitionDuration is not provided for the event associated with ACTION_ID1   }   then {     the IUT does not repeat the transmission of the valid DENM associated with ACTION_ID1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/EVRP/BV-08</b>
<b>Test objective</b>	Check that existing actionID in originating ITS-S are updated when stationID is modified
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 6.1.1.2
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an AppDENM_trigger request from application layer     containing repetitionInterval       indicating INTERVAL_1     and containing repetitionDuration       indicating DURATION_1     and containing validityDuration       indicating DURATION_2 &gt; DURATION_1   and the IUT having generated the corresponding event     containing management container       containing actionID         containing originatingStationID           indicating STATION_ID_1         and containing validityDuration           indicating DURATION_1 and the IUT having changed its StationID } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT changes its StationID and is alerted of expiration of the time associated with INTERVAL_1   }   then {     the IUT repeats the transmission of the valid DENM       containing management container         containing actionID           containing originatingStationID             indicating its new StationID   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/EVRP/BV-09</b>
<b>Test objective</b>	Check that actionID is not modified in repetitions of DENM if stationID is not modified
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.1.2
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an <i>AppDENM_trigger</i> request from application layer     containing repetitionInterval       indicating INTERVAL_1     and containing repetitionDuration       indicating DURATION_1     and containing validityDuration       indicating DURATION_2 &gt; DURATION_1   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID_1       and containing validityDuration         indicating DURATION_2   and the IUT not having changed its StationID } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT is alerted of expiration of the time associated with INTERVAL_1   }   then {     the IUT repeats the transmission of the valid DENM       containing management container         containing actionID           indicating its ACTION_ID_1   } } </pre>	



<b>TP Id</b>	<b>TP/DEN/EVRP/BV-10</b>
<b>Test objective</b>	Check that ReferenceTime is not modified in repetitions of DENM
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.1.1.1
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an AppDENM_trigger request from application layer     containing repetitionInterval       indicating INTERVAL_1     and containing repetitionDuration       indicating DURATION_1     and containing validityDuration       indicating DURATION_2 &gt; DURATION_1   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID_1       and containing validityDuration         indicating DURATION_2       and containing referenceTime         indicating REFERENCE_TIME_1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT is alerted of expiration of the time associated with INTERVAL_1   }   then {     the IUT repeats the transmission of the valid DENM       containing management container         containing actionID           indicating its ACTION_ID_1         and containing referenceTime           indicating REFERENCE_TIME_1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/EVRP/BV-11</b>
<b>Test objective</b>	Check that DEN Basic Service stops repeating DENM after event's default validityDuration expiration, when validityDuration was not provided
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.2.1.5
<b>PICS Selection</b>	PICS_DENM_REPETITION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an AppDENM_trigger request from application layer     containing repetitionInterval       indicating INTERVAL_1 &gt; defaultValidityDuration     and containing repetitionDuration       indicating DURATION_1     and not containing validityDuration   and the IUT having generated the corresponding event     containing management container       containing actionID         indicating ACTION_ID_1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT is alerted of expiration of the defaultValidityDuration   }   then {     the IUT stops the repetition of the DENM associated with ACTION_ID1   } } </pre>	

## 5.2.1.6 Lower-layer parameters

<b>TP Id</b>	TP/DEN/PAR/BV-01
<b>Test objective</b>	Check that DENM is encapsulated in BTP type B packet
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 5.4.2.2
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
ensure that { when { a DENM is generated } then { the IUT sends a DENM encapsulated in a BTP-B packet } }	

<b>TP Id</b>	TP/DEN/PAR/BV-02
<b>Test objective</b>	Check that DENM is encapsulated in GBC packet
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 5.4.2.2
<b>PICS Selection</b>	PICS_DENM_GENERATION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
ensure that { when { a DENM is generated } then { the IUT sends a DENM encapsulated in a GBC packet } }	

## 5.2.1.7 Service specific permissions

<b>TP Id</b>	TP/DEN/SSP/BV-01-X			
<b>Test objective</b>	Check that IUT does not send a DENM if it is not permitted by signing certificate			
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2			
<b>PICS Selection</b>	PICS_DENM_GENERATION AND PICS_IS_IUT_SECURED			
<b>Initial conditions</b>				
with { the IUT being in the "initial state" the IUT is authorized to sign DENMs with the certificate CERTIFICATE_X containing DENM SSP indicating bit at position SSP_BIT_X set to 0 }				
<b>Expected behaviour</b>				
ensure that { when { the IUT receives an AppDENM_trigger request from the application layer containing situation container containing eventType containing causeCode indicating CAUSE_CODE_X } then { the IUT does not send this DENM } }				
<b>Variants</b>				
X	CERTIFICATE_X	SSP_BIT_X		CAUSE_CODE_X
		Octet Position	Bit Position	
01	CERT_IUT_DENM_01	1	0 (80h)	trafficCondition(1)
02	CERT_IUT_DENM_02	1	1 (40h)	accident(2)
03	CERT_IUT_DENM_03	1	2 (20h)	roadworks(3)
04	CERT_IUT_DENM_04	1	3 (10h)	adverseWeatherCondition-Adhesion(6)
05	CERT_IUT_DENM_05	1	4 (08h)	hazardousLocation-SurfaceCondition(9)
06	CERT_IUT_DENM_06	1	5 (04h)	hazardousLocation-ObstacleOnTheRoad(10)
07	CERT_IUT_DENM_07	1	6 (02h)	hazardousLocation-AnimalOnTheRoad(11)
08	CERT_IUT_DENM_08	1	7 (01h)	humanPresenceOnTheRoad(12)
09	CERT_IUT_DENM_09	2	0 (80h)	wrongWayDriving(14)
10	CERT_IUT_DENM_10	2	1 (40h)	rescueAndRecoveryWorkInProgress(15)
11	CERT_IUT_DENM_11	2	2 (20h)	adverseWeatherCondition-ExtremeWeatherCondition(17)
12	CERT_IUT_DENM_12	2	3 (10h)	adverseWeatherCondition-Visibility(18)
13	CERT_IUT_DENM_13	2	4 (08h)	adverseWeatherCondition-Precipitation(19)
14	CERT_IUT_DENM_14	2	5 (04h)	slowVehicle(26)
15	CERT_IUT_DENM_15	2	6 (02h)	dangerousEndOfQueue(27)
16	CERT_IUT_DENM_16	2	7 (01h)	vehicleBreakdown(91)
17	CERT_IUT_DENM_17	3	0 (80h)	postCrash(92)
18	CERT_IUT_DENM_18	3	1 (40h)	humanProblem(93)
19	CERT_IUT_DENM_19	3	2 (20h)	stationaryVehicle(94)
20	CERT_IUT_DENM_20	3	3 (10h)	emergencyVehicleApproaching(95)
21	CERT_IUT_DENM_21	3	4 (08h)	hazardousLocation-DangerousCurve(96)
22	CERT_IUT_DENM_22	3	5 (04h)	collisionRisk(97)
23	CERT_IUT_DENM_23	3	6 (02h)	signalViolation(98)
24	CERT_IUT_DENM_24	3	7 (01h)	dangerousSituation(99)

## 5.2.2 Message Reception

<b>TP Id</b>	<b>TP/DEN/MSRV/BV-01</b>
<b>Test objective</b>	Check that receiving ITS-S transmits DENM to application if it concerns an unknown ActionID and if it is not a termination DENM
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2
<b>PICS Selection</b>	PICS_DENM_RECEPTION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" having sent    and the IUT not having received DENM containing management container containing actionID indicating ACTION_ID1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives a DENM that is not a termination containing management container containing actionID indicating ACTION_ID1 } then { the IUT transmits the DENM content to upper layer } }	

<b>TP Id</b>	<b>TP/DEN/MSRV/BV-02</b>
<b>Test objective</b>	Check that receiving ITS-S transmits DENM to application if it concerns a known ActionID and referenceTime is greater than highest value received for this ActionID
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2
<b>PICS Selection</b>	PICS_DENM_RECEPTION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having received DENM containing management container containing actionID indicating ACTION_ID1 and containing referenceTime indicating REFERENCETIME_1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives a DENM containing management container containing actionID indicating ACTION_ID1 and containing referenceTime indicating REFERENCETIME_2 greater than REFERENCETIME_1 } then { the IUT transmits the DENM content to upper layer } }	

<b>TP Id</b>	<b>TP/DEN/MSRV/BO-03</b>
<b>Test objective</b>	Check that receiving ITS-S discards termination DENM if it concerns an unknown ActionID (IUT stationId and unknown SequenceNumber)
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2
<b>PICS Selection</b>	PICS_DENM_RECEPTION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having sent several events and the IUT not having sent DENM containing actionID indicating ACTION_ID1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives a termination DENM containing actionID indicating ACTION_ID1 } then { the IUT discards the DENM and the IUT does not forward the DENM content to upper layer } }	

<b>TP Id</b>	<b>TP/DEN/MSRV/BO-04</b>
<b>Test objective</b>	Check that receiving ITS-S discards termination DENM if it concerns an unknown ActionID (non-IUT stationId and unknown SequenceNumber)
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2
<b>PICS Selection</b>	PICS_DENM_RECEPTION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having received several events and the IUT not having received DENM containing actionID indicating ACTION_ID1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives a termination DENM containing actionID indicating ACTION_ID1 } then { the IUT discards the DENM and the IUT does not forward the DENM content to upper layer } }	

<b>TP Id</b>	<b>TP/DEN/MSRV/BO-05</b>
<b>Test objective</b>	Check that receiving ITS-S discards DENM if referenceTime is less than highest value received for this ActionID
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.2
<b>PICS Selection</b>	PICS_DENM_RECEPTION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having received DENM containing management container containing actionID indicating ACTION_ID1 and containing referenceTime indicating REFERENCETIME_1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives a DENM containing management container containing actionID indicating ACTION_ID1 and containing referenceTime indicating REFERENCETIME_2 less than REFERENCETIME_1 } then { the IUT discards the DENM and the IUT does not forward the DENM content to upper layer } }	

<b>TP Id</b>	<b>TP/DEN/MSRV/BO-06</b>
<b>Test objective</b>	Check that receiving ITS-S discards DENM if detectionTime is less than highest value received for this ActionID
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2
<b>PICS Selection</b>	PICS_DENM_RECEPTION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" and the IUT having received DENM containing management container containing actionID indicating ACTION_ID1 and containing referenceTime indicating REFERENCETIME_1 and containing detectionTime indicating TIME_1 }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives a DENM containing management container containing actionID indicating ACTION_ID1 and containing referenceTime indicating REFERENCETIME_1 and containing detectionTime indicating TIME_2 less than TIME_1 } then { the IUT discards the DENM and the IUT does not forward the DENM content to upper layer } }	

<b>TP Id</b>	<b>TP/DEN/MSRV/BV-07</b>
<b>Test objective</b>	Check that receiving ITS-S transmits DENM to application if it concerns a known ActionID and referenceTime is equal to highest received value and detectionTime is greater than highest received value
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2
<b>PICS Selection</b>	PICS_DENM_RECEPTION
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received DENM     containing management container       containing actionID         indicating ACTION_ID1       and containing referenceTime         indicating REFERENCETIME_1       and containing detectionTime         indicating TIME_1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT receives a DENM       containing management container         containing actionID           indicating ACTION_ID1         and containing referenceTime           indicating REFERENCETIME_1         and containing detectionTime           indicating TIME_2 greater than TIME_1     }   then {     the IUT transmits the DENM content to upper layer   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/MSRV/BO-08-X</b>		
<b>Test objective</b>	Check that receiving ITS-S discards DENM for new event if SSP value of the signing certificate is not consistent with the causeCode		
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2		
<b>PICS Selection</b>	PICS_DENM_RECEPTION AND PICS_IS_IUT_SECURED		
<b>Initial conditions</b>			
with { the IUT being in the "initial state" }			
<b>Expected behaviour</b>			
ensure that { when { the IUT receives a secured DENM containing management container containing actionID indicating ACTION_ID1 containing situation container containing eventType containing causeCode indicating CAUSE_CODE_X containing signing certificate containing SSP not indicating SSP_BIT_X } then { the IUT discards the DENM and the IUT does not forward the DENM content to upper layer } }			
<b>Variants</b>			
X	SSP_BIT_X		CAUSE_CODE_X
	Octet Position	Bit Position	
01	1	0 (80h)	trafficCondition(1)
02	1	1 (40h)	accident(2)
03	1	2 (20h)	roadworks(3)
04	1	3 (10h)	adverseWeatherCondition-Adhesion(6)
05	1	4 (08h)	hazardousLocation-SurfaceCondition(9)
06	1	5 (04h)	hazardousLocation-ObstacleOnTheRoad(10)
07	1	6 (02h)	hazardousLocation-AnimalOnTheRoad(11)
08	1	7 (01h)	humanPresenceOnTheRoad(12)
09	2	0 (80h)	wrongWayDriving(14)
10	2	1 (40h)	rescueAndRecoveryWorkInProgress(15)
11	2	2 (20h)	adverseWeatherCondition-ExtremeWeatherCondition(17)
12	2	3 (10h)	adverseWeatherCondition-Visibility(18)
13	2	4 (08h)	adverseWeatherCondition-Precipitation(19)
14	2	5 (04h)	slowVehicle(26)
15	2	6 (02h)	dangerousEndOfQueue(27)
16	2	7 (01h)	vehicleBreakdown(91)
17	3	0 (80h)	postCrash(92)
18	3	1 (40h)	humanProblem(93)
19	3	2 (20h)	stationaryVehicle(94)
20	3	3 (10h)	emergencyVehicleApproaching(95)
21	3	4 (08h)	hazardousLocation-DangerousCurve(96)
22	3	5 (04h)	collisionRisk(97)
23	3	6 (02h)	signalViolation(98)
24	3	7 (01h)	dangerousSituation(99)



<b>TP Id</b>	<b>TP/DEN/MSRV/BO-09-X</b>		
<b>Test objective</b>	Check that receiving ITS-S discards DENM for existing event if SSP value of the signing certificate is not consistent with the causeCode		
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.4.2		
<b>PICS Selection</b>	PICS_DENM_RECEPTION AND PICS_IS_IUT_SECURED		
<b>Initial conditions</b>			
with { the IUT being in the "initial state" and the IUT having received a secured DENM containing management container containing actionID indicating ACTION_ID1 containing situation container containing eventType containing causeCode indicating CAUSE_CODE_X containing signing certificate containing SSP indicating SSP_BIT_X }			
<b>Expected behaviour</b>			
ensure that { when { the IUT receives a secured DENM containing management container containing actionID indicating ACTION_ID1 containing situation container containing eventType containing causeCode indicating CAUSE_CODE_X containing signing certificate containing SSP not indicating SSP_BIT_X } then { the IUT discards the DENM and the IUT does not forward the DENM content to upper layer } }			
<b>Variants</b>			
X	SSP_BIT_X		CAUSE_CODE_X
	Octet Position	Bit Position	
01	1	0 (80h)	trafficCondition(1)
02	1	1 (40h)	accident(2)
03	1	2 (20h)	roadworks(3)
04	1	3 (10h)	adverseWeatherCondition-Adhesion(6)
05	1	4 (08h)	hazardousLocation-SurfaceCondition(9)
06	1	5 (04h)	hazardousLocation-ObstacleOnTheRoad(10)
07	1	6 (02h)	hazardousLocation-AnimalOnTheRoad(11)
08	1	7 (01h)	humanPresenceOnTheRoad(12)
09	2	0 (80h)	wrongWayDriving(14)
10	2	1 (40h)	rescueAndRecoveryWorkInProgress(15)
11	2	2 (20h)	adverseWeatherCondition-ExtremeWeatherCondition(17)
12	2	3 (10h)	adverseWeatherCondition-Visibility(18)
13	2	4 (08h)	adverseWeatherCondition-Precipitation(19)
14	2	5 (04h)	slowVehicle(26)
15	2	6 (02h)	dangerousEndOfQueue(27)
16	2	7 (01h)	vehicleBreakdown(91)

Variants			
X	SSP_BIT_X		CAUSE_CODE_X
	Octet Position	Bit Position	
17	3	0 (80h)	postCrash(92)
18	3	1 (40h)	humanProblem(93)
19	3	2 (20h)	stationaryVehicle(94)
20	3	3 (10h)	emergencyVehicleApproaching(95)
21	3	4 (08h)	hazardousLocation-DangerousCurve(96)
22	3	5 (04h)	collisionRisk(97)
23	3	6 (02h)	signalViolation(98)
24	3	7 (01h)	dangerousSituation(99)

TP Id	TP/DEN/MSRV/BV-10
<b>Test objective</b>	Check that receiving ITS-S replies to requestResponseIndication
<b>Reference</b>	ETSI EN 302 637-3 [1], clause B.40
<b>PICS Selection</b>	PICS_DENM_RECEPTION AND PICS_IMPACT_REDUCTION
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT receives a DENM     containing management container     containing actionID     indicating ACTION_ID1     containing a la carte container     containing ImpactReductionContainer     containing requestResponseIndication     indicating 0   }   then {     the IUT sends a DENM     containing management container     containing actionID     indicating ACTION_ID2     containing a la carte container     containing ImpactReductionContainer     containing requestResponseIndication     indicating 1   } } </pre>	

### 5.2.3 Keep-Alive Forwarding

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-01</b>
<b>Test objective</b>	Check that forwarding ITS-S forwards DENM if no DENM with same ActionId has been received during forwarding delay
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.3
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received a DENM     containing actionID       indicating ACTION_ID1     and containing transmissionInterval       indicating TRANS_INTERVAL1     and containing validityDuration       indicating value more than 3 times greater than TRANS_INTERVAL1   and the IUT having starting timer T_Forwarding for this DENM   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the timer T_Forwarding expires   }   then {     the IUT reconstructs and sends the DENM associated to ACTION_ID1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-02</b>
<b>Test objective</b>	Check that forwarding ITS-S forwards DENM if no DENM with same ActionId and referenceTime greater or equal to the last received DENM has been received during forwarding delay
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.3
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received a DENM     containing actionID       indicating ACTION_ID1     and containing transmissionInterval       indicating TRANS_INTERVAL1     and containing referenceTime       indicating REFERENCETIME_1     and containing validityDuration       indicating value more than 3 times greater than TRANS_INTERVAL1   and the IUT having starting timer T_Forwarding for this DENM   and the IUT having received DENM     containing actionID       indicating ACTION_ID1     and containing referenceTime       indicating value REFERENCETIME_2 &lt; REFERENCETIME_1   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1     and containing referenceTime       indicating value REFERENCETIME_3 &gt; REFERENCETIME_1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the timer T_Forwarding expires   }   then {     the IUT reconstructs and sends the DENM associated to ACTION_ID1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/TI-03</b>
<b>Test objective</b>	Check that forwarding delay is set to min (2 x transmissionInterval + rnd(0, 150 ms), validityDuration)
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.2.5
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received a DENM     containing actionID       indicating ACTION_ID1     and containing transmissionInterval       indicating TRANS_INTERVAL1     and containing validityDuration       indicating value DURATION_1 more than 3 times greater than TRANS_INTERVAL1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the timer T_Forwarding expires   }   then {     the IUT reconstructs and sends the DENM associated to ACTION_ID1 at a point of time corresponding to     min (2 x transmissionInterval + rnd (0, 150 ms), validityDuration)   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-04</b>
<b>Test objective</b>	Check that Forwarding ITS-S replaces the ITS PDU header of forwarded DENMs
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.2.7
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having received a DENM     containing actionID       indicating ACTION_ID1     and containing transmissionInterval       indicating TRANS_INTERVAL1     and containing validityDuration       indicating value more than 3 times greater than TRANS_INTERVAL1   and the IUT having starting timer T_Forwarding for this DENM   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the timer T_Forwarding expires   }   then {     the IUT reconstructs and sends the DENM associated to ACTION_ID1       containing ITS PDU header       containing StationID       indicating its own stationID   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-05</b>
<b>Test objective</b>	Check that forwarding ITS-S does not change actionID
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.2.2
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre>with {   the IUT being in the "initial state"   and the IUT having received a DENM     containing actionID       indicating ACTION_ID1     and containing transmissionInterval       indicating TRANS_INTERVAL1     and containing validityDuration       indicating value more than 3 times greater than TRANS_INTERVAL1   and the IUT having starting timer T_Forwarding for this DENM   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1 }</pre>	
<b>Expected behaviour</b>	
<pre>ensure that {   when {     the timer T_Forwarding expires   }   then {     the IUT reconstructs and sends the DENM       containing management container       containing actionID       indicating ACTION_ID1   } }</pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-06</b>
<b>Test objective</b>	Check that forwarding ITS-S does not change referenceTime
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.2.3
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received a DENM     containing actionID       indicating ACTION_ID1     and containing transmissionInterval       indicating TRANS_INTERVAL1     and containing validityDuration       indicating value DURATION_1 more than 3 times greater than TRANS_INTERVAL1     and containing referenceTime       indicating REFERENCETIME_1   and the IUT having starting timer T_Forwarding for this DENM   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the timer T_Forwarding expires   }   then {     the IUT reconstructs and sends the DENM associated to ACTION_ID1       containing management container       containing referenceTime       indicating REFERENCETIME_1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-07</b>
<b>Test objective</b>	Check that forwarding ITS-S does not change termination
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.2.4
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received a DENM     containing actionID       indicating ACTION_ID1   and containing transmissionInterval     indicating TRANS_INTERVAL1   and containing validityDuration     indicating value DURATION_1 more than 3 times greater than TRANS_INTERVAL1   and containing termination     indicating isNegation   and the IUT having starting timer T_Forwarding for this DENM   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the timer T_Forwarding expires   }   then {     the IUT reconstructs and sends the DENM associated to ACTION_ID1       containing management container       containing termination       indicating isNegation   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-08</b>
<b>Test objective</b>	Check that Forwarding ITS-S does not modify management, situation, location and alacarte containers when forwarding a DENM
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.2.7
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received a DENM     containing management container       indicating MANAGEMENTCONTAINER_1   and containing situation container     indicating SITUATION_1   and containing location container     indicating LOCATION_1   and containing alacarte container     indicating ALACARTE_1   and containing transmissionInterval     indicating TRANS_INTERVAL1   and the IUT having starting timer T_Forwarding for this DENM   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the timer T_Forwarding expires   }   then {     the IUT reconstructs and sends the DENM associated to ACTION_ID1       containing management container         indicating MANACEMENTCONTAINER_1       and containing situation container         indicating SITUATION_1       and containing location container         indicating LOCATION_1       and containing alacarte container         indicating ALACARTE_1   } } </pre>	



<b>TP Id</b>	<b>TP/DEN/KAFW/BV-09</b>
<b>Test objective</b>	Check that forwarding ITS-S stops forwarding DENM after validity expiration
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.3
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an event     containing management container       containing actionID         indicating ACTION_ID1       and containing validityDuration         indicating DURATION_1     and containing transmissionInterval       indicating TRANS_INTERVAL1   and the IUT having starting timer T_Forwarding for this DENM   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT is alerted of expiration of the time associated with DURATION_1   }   then {     the IUT stops to reconstruct and to send the DENM associated with ACTION_ID1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-10</b>
<b>Test objective</b>	Check that forwarding ITS-S stops forwarding DENM if it is outside relevance area
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.3
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
<pre> with {   the IUT being in the "initial state"   and the IUT having received an event     containing management container       containing actionID         indicating ACTION_ID1       and containing transmissionInterval         indicating TRANS_INTERVAL1   and the IUT having starting timer T_Forwarding for this DENM   and the IUT not having received further DENM     containing actionID       indicating ACTION_ID1 } </pre>	
<b>Expected behaviour</b>	
<pre> ensure that {   when {     the IUT is alerted that its position is now outside of the relevance area associated with ACTION_ID1   }   then {     the IUT stops to reconstruct and to send the DENM associated with ACTION_ID1   } } </pre>	

<b>TP Id</b>	<b>TP/DEN/KAFW/BV-11</b>
<b>Test objective</b>	Check that forwarding ITS-S does not forward DENM is transmissionInterval is not present
<b>Reference</b>	ETSI EN 302 637-3 [1], clause 8.3.2.5
<b>PICS Selection</b>	PICS_DENM_KAF
<b>Initial conditions</b>	
with { the IUT being in the "initial state" }	
<b>Expected behaviour</b>	
ensure that { when { the IUT receives a DENM containing actionID indicating ACTION_ID1 and not containing transmissionInterval } then { the IUT does not reconstruct and to send the DENM associated with ACTION_ID1 } }	

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## Annex A (informative): Bibliography

- ETSI TS 102 894-2 (V1.2.1): "Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary".

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## History

<b>Document history</b>		
V1.1.1	March 2011	Publication
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