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Intelligent Transport Systems (ITS);
Testing;
Conformance test specifications for GeoNetworking ITS-G5;
Part 2: Test Suite Structure and Test Purposes (TSS & TP)

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Contents

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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 Geonetworking ITS-G5 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)".

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 GeoNetworking ITS-G5 as defined in ETSI EN 302 636-4-1 [1] in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [i.4].

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.5]) are used as a basis for the test methodology.

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] ETSI EN 302 636-4-1 (V1.2.1): "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".

[2] ETSI TS 102 871-1 (V1.4.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; 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 9646-7 (1995): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

[i.5] 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 302 636-4-1 [1], ISO/IEC 9646-1 [i.2], ISO/IEC 9646-7 [i.4] and the following apply:

ItsNode: node that implements GeoAdhoc router functionality by ETSI EN 302 636-4-1 [1]

neighbour: ItsNode is in direct (single-hop) communication range

"to be in direction of X": to be a valid candidate for a forwarding algorithm to forward the packet to the destination X

NOTE: This means that the candidate ItsNode is geographically closer to X than the IUT.

to broadcast a packet: to send a packet as a link-layer broadcast frame to all surrounding neighbours

to forward a packet: to send a packet as a link-layer unicast frame to the selected node

to retransmit a packet: to forward or broadcast a received packet

3.2 Abbreviations

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

ATS	Abstract Test Suite
BAA	GeoBroadcast Advanced Algorithm
BAH	Basic Header
BC	BroadCast
BCA	GeoBroadcast CBF Algorithm
BEA	BEAcon
BI	Invalid test events for Behaviour tests
BO	Inopportune test events for Behaviour tests
BV	Valid test events for Behaviour tests
CAP	Buffer Capacities
CBF	Contention Based Forwarding
COH	Common Header
DEPV	Destination Position Vector
EN	European Norm
FDV	Formatting and Data Validity
FPB	Forwarding Packet Buffer
FSR	Forwarder, Sender, local geoadhoc Router
GAC	Geographically-scoped AnyCast
GBC	Geographically-scoped BroadCast
GEONW	GEONetWorking
GNA	GeoNetworking Address
GUC	Geographically-scoped UniCast
HST	Header SubType
HT	Header Type
ISO	International Organization for Standardization
ITS	Intelligent Transportation Systems
ITS-G5	Intelligent Transportation Systems - 5 GHz wireless communication
IUT	Implementation Under Test
LOS	LOcation Service
LOT	LOcation Table
LPV	Local Position Vector
LS	Location Service
LT	LifeTime
MAC	Medium Access Control
MHL	Maximum Hop Limit

MIB	Management Information Base
NH	Next Header
PAI	Position Accuracy Indicator
PICS	Protocol Implementation Conformance Statement
PL	Payload Length
PON	Protocol Operation
PV	Position Vector
RHL	Remaining Hop Limit
SAP	Service Access Point
SCC	Station Country Code
SCF	Store Carry & Forward
SHB	Single Hop Broadcast
SN	Sequence Number
SOPV	Source Position Vector
SQN	Sequence Number
ST	Station Type
TH	Threshold
TI	Timer tests
TIC	Transmission Interval Control
TP	Test Purposes
TS	Test Suite
TSB	Topologically-Scoped Broadcast
TSS	Test Suite Structure
TST	TimeSTamp
UC	UniCast

4 Test Configuration

4.1 Test Configuration Overview

This clause introduces the test configurations that have been used for the definition of test purposes. The test configurations cover the various scenarios of the GeoNetworking tests. The test configurations show:

-  green ItsNode: ItsNode is in the communication range of the IUT.
-  red ItsNode: ItsNode is not in the communication range of the IUT.
-  dashed rectangle: definition of a specific geographical area (see note).

NOTE: A geographical area is defined in the GeoBroadcast or GeoAnycast packet by HST field of Common Header and GeoAreaPos Latitude, GeoAreaPos Longitude, DistanceA, DistanceB and Angle fields of the Extended Header.

Seven test configurations are defined below.

4.2 Configuration 1: CF01

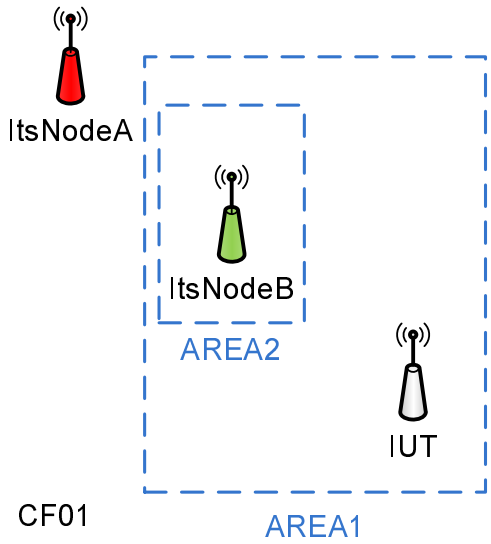

Figure 1

ItsNodeA	is not in IUT's communication range
ItsNodeB	is in IUT's communication range is in direction of ItsNodeA is in AREA1 is in AREA2
IUT	is in AREA1

4.3 Configuration 2: CF02

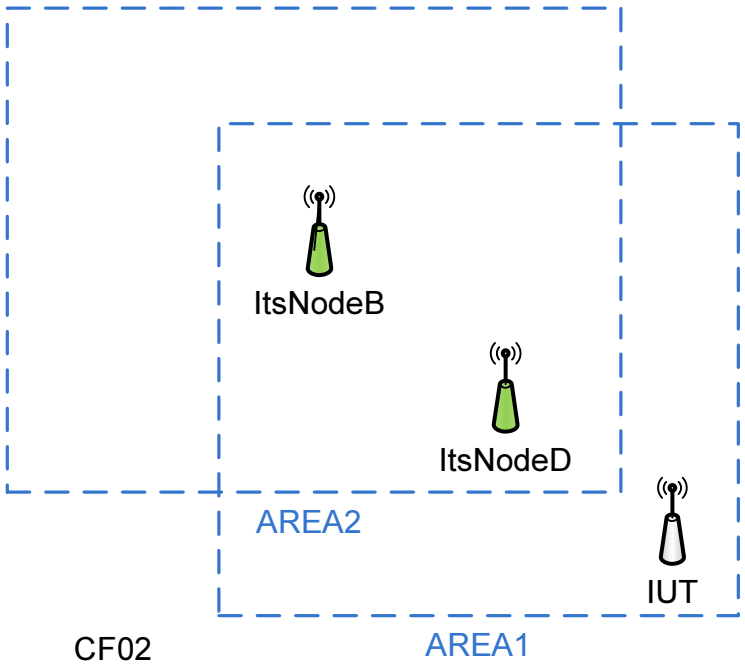

Figure 2

ItsNodeB	is in IUT's communication range is close to the centre of AREA2 is in AREA1 is in AREA2
ItsNodeD	is in IUT's communication range is in direction of ItsNodeB is in AREA1 is in AREA2
IUT	is in AREA1

4.4 Configuration 3: CF03

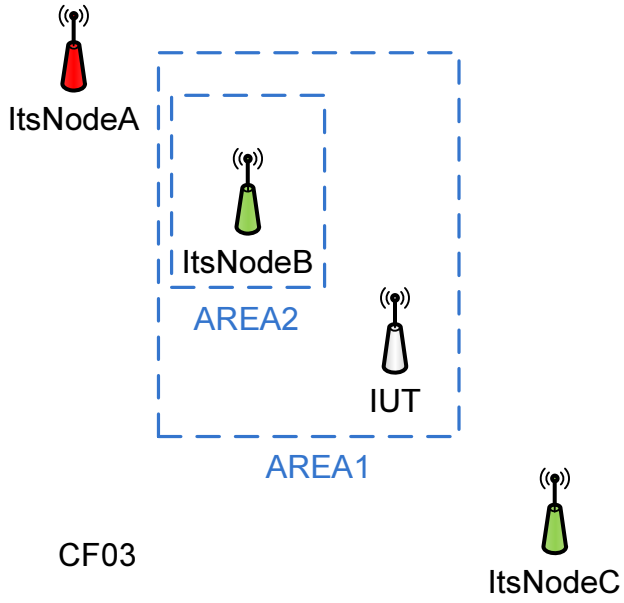

Figure 3

ItsNodeA	is not in IUT's communication range
ItsNodeB	is in IUT's communication range is in direction of ItsNodeA is in AREA1 is in AREA2
ItsNodeC	is in IUT's communication range is not in direction of ItsNodeA
IUT	is in AREA1

4.5 Configuration 4: CF04

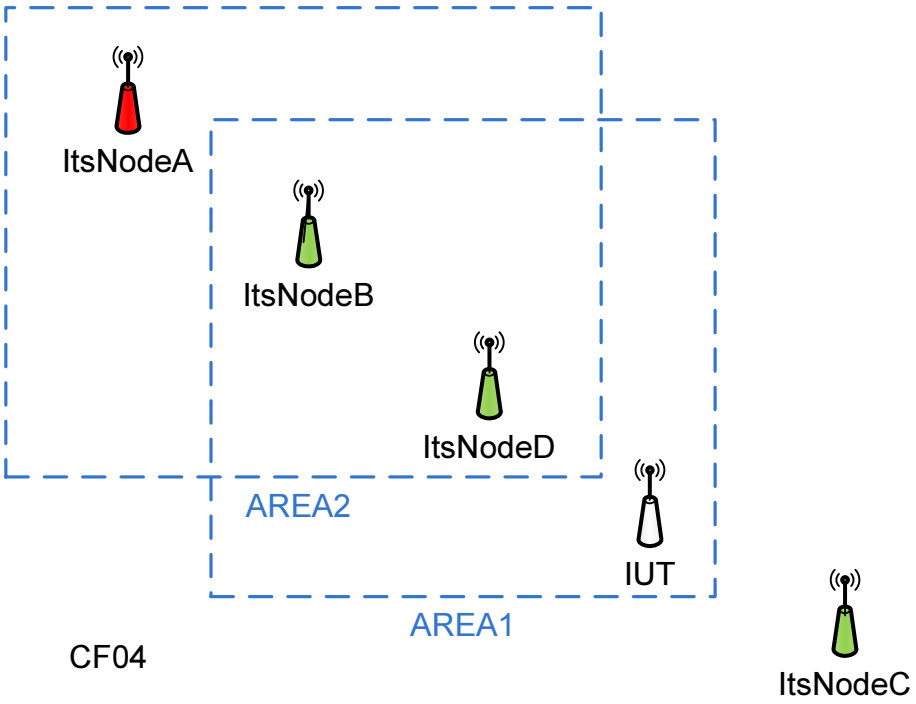

Figure 4

ItsNodeA	is not in IUT's communication range
ItsNodeB	is in IUT's communication range is in direction of ItsNodeA is closer to ItsNodeA than ItsNodeD is in AREA1 is in AREA2. is close to the centre of AREA2
ItsNodeC	is in IUT's communication range is not in direction of ItsNodeA
ItsNodeD	is in IUT's communication range is in direction of ItsNodeA is in AREA1 is in AREA2
IUT	is in AREA1

4.6 Configuration 5: CF05

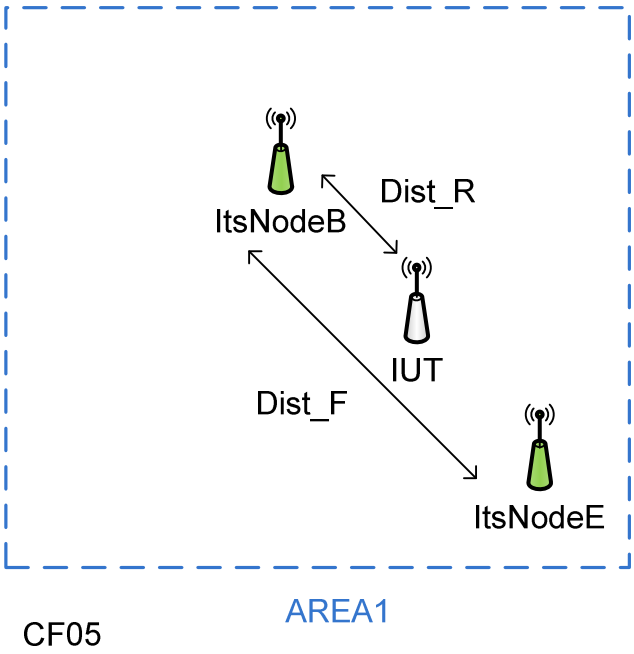

Figure 5

ItsNodeB	is in IUT's communication range is in AREA1 is close to the centre of AREA1
ItsNodeE	is in IUT's communication range is in AREA1
IUT	is in AREA1 is closer to ItsNodeB than ItsNodeE (Dist_R < Dist_F) Angle_FSR formed by ItsNodeE, ItsNodeB and IUT is less than Angle_TH

4.7 Configuration 6: CF06

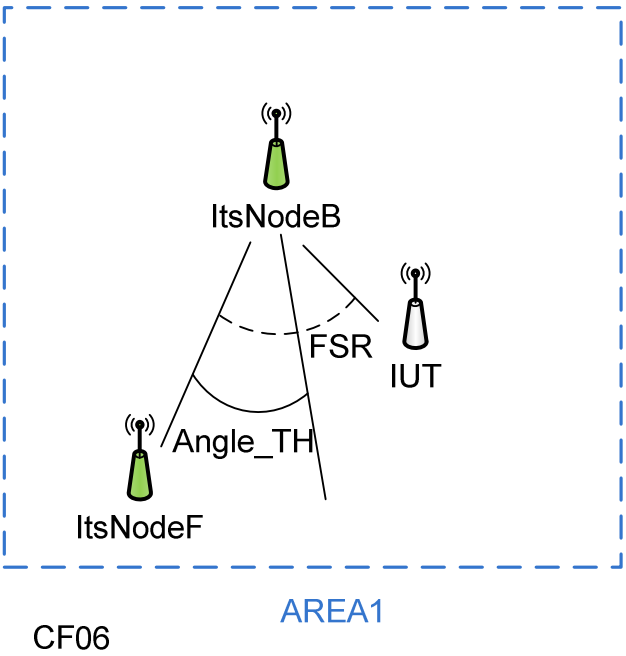

Figure 6

ItsNodeB	is in IUT's communication range is in AREA1 is close to the centre of AREA1
ItsNodeF	is in IUT's communication range is in AREA1
IUT	is in AREA1 is closer to ItsNodeB than ItsNodeE (Dist_R < Dist_F) Angle_FSR formed by ItsNodeF, ItsNodeB and IUT is greater than Angle_TH

4.8 Configuration 7: CF07

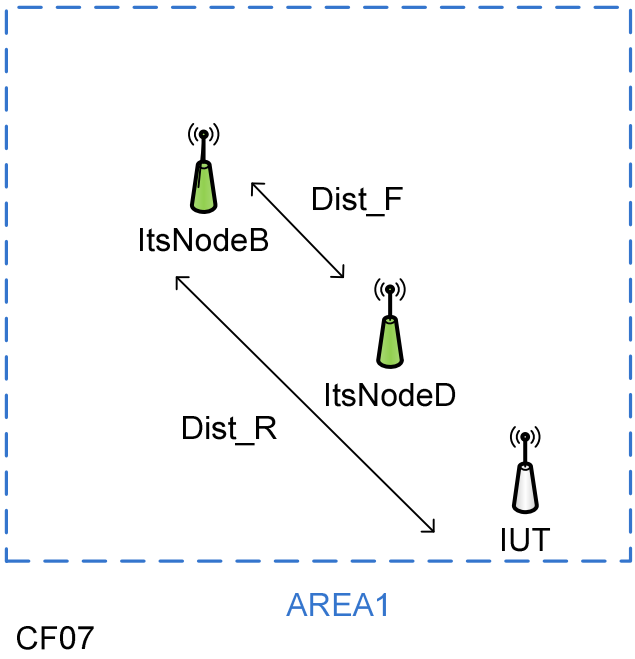

Figure 7

ItsNodeB	is in IUT's communication range is in AREA1 is close to the centre of AREA1
ItsNodeD	is in IUT's communication range is in AREA1 is closer to ItsNodeB than IUT (Dist_R > Dist_F) Angle_FSR formed by ItsNodeD, ItsNodeB and IUT is less than Angle_TH
IUT	is in AREA1

5 Test Suite Structure (TSS)

5.1 Structure for GEONW tests

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

Table 1: TSS for GEONW

Root	Group	Sub-group	Category
GEONW	Formatting and data validity	Basic Header	Valid and Invalid
		Common Header	Valid and Inopportune
		Beacon	Valid
		GeoUnicast	Valid
		GeoBroadcast	Valid
		GeoAnycast	Valid
		Single-Hop Broadcast	Valid
		Topologically Scoped Broadcast	Valid
	Protocol operation	Location Table	Valid
		Local Position Vector	Valid
		Sequence Number	Valid
		Location Service	Valid, Inopportune and Timer
		Forwarding Packet Buffer	Valid
		GeoNetworking Address	Valid
		Beacon	Valid and Timer
		GeoUnicast	Valid and Inopportune
		GeoBroadcast	Valid and Inopportune
		GeoAnycast	Valid behaviour
		Single-Hop Broadcast	Valid
		Topologically Scoped Broadcast	Valid and Inopportune
		GeoBroadcast CBF algorithm	Valid and Inopportune
		GeoBroadcast Advanced Algorithm	Valid and Inopportune
	Buffer Capacities	Location Service	Valid
		Forwarding Packet Buffer	Valid

The test suite is structured as a tree with the root defined as GEONW. The tree is of rank 3 with the first rank a Group, the second a sub-group and the third a category. The third rank is the standard ISO conformance test categories.

5.2 Test groups

5.2.1 Root

The root identifies the GeoNetworking protocol given in ETSI EN 302 636-4-1 [1].

5.2.2 Test group

This level contains three major areas identified as: tests of formatting and data validity, tests of protocol operation, tests of buffer capacities.

5.2.3 Test sub-group

This level identifies the sub categories of each Group.

5.2.4 Categories

This level contains the standard ISO conformance test categories: behaviour for valid, invalid, inopportune events and timers.

6 Test Purposes (TP)

6.1 Introduction

6.1.1 TP definition conventions

The TPs are defined by the rules shown in table 2.

Table 2: TP definition rules

TP Header	
TP ID	The TP ID is a unique identifier. It shall be specified according to the TP naming conventions defined in the above clause.
Test objective	Short description of test purpose objective according to the requirements from the base standard.
Reference	The reference indicates the sub-clauses of the reference standard specifications in which the conformance requirement is expressed.
Config Id	The Config Id references the GeoNetworking configuration selected for this TP.
PICS Selection	Reference to the PICS statement involved for selection of the TP. Contains a Boolean expression.
TP Behaviour	
Initial conditions	The initial conditions define in which initial state the IUT has to be to apply the actual TP. In the corresponding Test Case, when the execution of the initial condition does not succeed, it leads to the assignment of an Inconclusive verdict.
Expected behaviour (TP body)	Definition of the events, which are parts of the TP objective, and the IUT are expected to perform in order to conform to the base specification. In the corresponding Test Case, Pass or Fail verdicts can be assigned there.
Final conditions	Definition of the events that the IUT is expected to perform or shall not perform, according to the base standard and following the correct execution of the actions in the expected behaviour above. In the corresponding Test Case, the execution of the final conditions is evaluated for the assignment of the final verdict.

6.1.2 TP Identifier naming conventions

The identifier of the TP is built according to table 3.

Table 3: TP naming convention

Identifier:	TP/<root>/<gr>/<sgr>/<x>/<nn>		
	<root> = root	GEONW	
	<gr> = group	FDV	Formatting and Data Validity
		PON	Protocol Operation
		CAP	Buffer Capacities
	<sgr> =sub-group	BAH	Basic Header
		COH	Common Header
		BEA	Beacon
		GUC	GeoUnicast
		GBC	GeoBroadcast
		GAC	GeoAnycast
		SHB	Single-Hop Broadcast
		TSB	Topologically Scoped Broadcast
		LOT	Location Table
		LPV	Local Position Vector
		SQN	Sequence Number
		LOS	Location Service
		FPB	Forwarding Packet Buffer
		GNA	GeoNetworking Address
		LT/TIC	Transmission Interval Control
		BCA	GeoBroadcast CBF Algorithm
		BAA	GeoBroadcast Advanced Algorithm
	<x> = type of testing	BV	Behaviour tests to valid test events
		BI	Behaviour tests to invalid test events
		BO	Behaviour tests to inopportune test events
		TI	Timer tests
	<nn> = sequential number		01 to 99

6.1.3 Rules for the behaviour description

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

In the TP the following wordings are used:

- "The IUT is **requested to send**": an upper layer requests the geonetworking layer to send a packet.
- "The IUT **generates**": for internal events generation, i.e. Beacon packets.
- "The IUT **receives**": for packets coming from the network and given by the lower layer.
- "The packet is **originated by** ItsNodeX": the source of the packet is ItsNodeX.
- "The packet is received **from** ItsNodeX": the sender of the packet is ItsNodeX.
- "The packet is **addressed to** ItsNodeX": the destination of the packet is ItsNodeX.

6.1.4 Sources of TP definitions

All TPs have been specified according to ETSI EN 302 636-4-1 [1].

6.1.5 Mnemonics for PICS reference

The present document makes use of PICS mnemonics defined in ETSI TS 102 871-1 [2], table 1.

6.2 Test purposes for GEONW

6.2.1 Formatting and Data Validity

6.2.1.1 Basic Header

TP Id	TP/GEONW/FDV/BAH/BV-01
Test objective	Check defined values of default Gn parameters in the basic header
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.2, 9.6.2 and annex H
Config Id	CF01
PICS Selection	
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GBC packet
}
then {
the IUT sends a GBC packet
containing a correctly formatted Basic Header
containing version field
set to itsGnProtocolVersion MIB parameter
containing RHL field
set to itsGnDefaultHopLimit MIB parameter
}
}	

TP Id	TP/GEONW/FDV/BAH/BI-02
Test objective	Check discard of packet having incorrect version
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.3
Config Id	CF01
PICS Selection	
Initial conditions	
with { the IUT being in the "initial state" and the IUT having received a SHB packet from ItsNodeB containing a correctly formatted Basic Header containing version field set to value equal to itsGnProtocolVersion MIB parameter and the IUT having passed the received SHB packet to the Upper Layer}	
Expected behaviour	

ensure that {
when {
the IUT receives the SHB packet from ItsNodeB
containing a correctly formatted Basic Header
containing version field
set to value not equal to itsGnProtocolVersion MIB parameter
}
then {
the IUT discards the received SHB packet
}
}	

6.2.1.2 Common Header

TP Id	TP/GEONW/FDV/COH/BV-01
Test objective	Common GeoNetworking header validity test (PL field) - Beacon
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.7.4, 9.8.6 and 10.3.6
Config Id	CF01
PICS Selection	
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT generates a Beacon packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '1' (BEACON)
containing HST field
set to '0' (UNSPECIFIED)
containing PL field
set to '0'
}
}	

TP Id	TP/GEONW/FDV/COH/BV-02
Test objective	Common GeoNetworking header validity test (PL field) - SHB
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.7.4, 9.8.4, 10.3.4 and 10.3.10
Config Id	CF01
PICS Selection	
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a SHB packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '5' (TSB)
containing HST field
set to '0' (SINGLE_HOP)
containing MHL field
set to '1'
containing PL field
set to the length of the included payload
containing a payload
}
}	

TP Id	TP/GEONW/FDV/COH/BV-03
Test objective	Check defined values of default Gn parameters in the common header
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.8.5, 10.3.4 and annex H
Config Id	CF01
PICS Selection	

Initial conditions

```
with {
    the IUT being in the "initial state"
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT is requested to send a GBC packet
    }
    then {
        the IUT sends a GBC packet
            containing a correctly formatted Common Header
                containing Flags field
                    indicating value equalling the itsGnIsMobile MIB parameter
                containing MHL field
                    set to itsGnDefaultHopLimit MIB parameter
    }
}
```

TP Id	TP/GEONW/FDV/COH/BO-04
Test objective	Check that a received TSB packet is discarded if received with RHL > MHL
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.5
Config Id	CF02
PICS Selection	

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeD and
    the IUT having received Beacon information from ItsNodeB
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a TSB packet
            containing Basic Header
                containing RHL field
                    indicating HL1 higher than MHL1
            containing Common Header
                containing MHL field
                    indicating MHL1
    }
    then {
        the IUT discards the TSB packet
    }
}
```

6.2.1.3 Beacon

TP Id	TP/GEONW/FDV/BEA/BV-01
Test objective	Beacon header validity test
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.8.6 and 10.3.6
Config Id	CF01
PICS Selection	PICS_GN_BEACON_SRC
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT generates a Beacon packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '1' (BEACON)
containing HST field
set to '0' (UNSPECIFIED)
containing NH field
set to '0' (UNSPECIFIED)
containing Extended Header
containing SOPV
indicating LPV of the IUT
}
}	

TP Id	TP/GEONW/FDV/BEA/BV-02
Test objective	GeoNetworking address validity test
Reference	ETSI EN 302 636-4-1 [1], clauses 6.3 and 9.8.6.2
Config Id	CF01
PICS Selection	PICS_GN_BEACON_SRC
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT generates a Beacon packet
}
then {
the IUT sends a GeoNetworking packet
containing SOPV field
containing GN_ADDR field
containing ST field
indicating the ITS Station type
containing SCC field
indicating the ITS Station country code
}
}	

NOTE: Correct Source GeoNetworking address value:== itsGnLocalGnAddr MIB parameter value.	

TP Id	TP/GEONW/FDV/BEA/BV-03
Test objective	Local Position Vector validity test, involving position comparison against sensor input data
Reference	ETSI EN 302 636-4-1 [1], clauses 9.5.2.2 and 9.8.6.2
Config Id	CF01
PICS Selection	PICS_GN_BEACON_SRC
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT generates a Beacon packet
}
then {
the IUT sends a GeoNetworking packet
containing a correct SOPV field
indicating the latest position of the IUT
}
}	

TP Id	TP/GEONW/FDV/BEA/BV-04
Test objective	Local Position Vector validity test, involving timestamp comparison against sensor input data
Reference	ETSI EN 302 636-4-1 [1], clauses 9.5.2.2 and 9.8.6.2
Config Id	CF01
PICS Selection	PICS_GN_BEACON_SRC
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT generates a Beacon packet
}
then {
the IUT sends a GeoNetworking packet
containing a correct SOPV field
indicating the timestamp value corresponding to the sensor acquisition time of position data
}
}	

6.2.1.4 GeoUnicast

TP Id	TP/GEONW/FDV/GUC/BV-01
Test objective	GUC header validity
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.7.4, 9.8.2.2 and 10.3.8
Config Id	CF01
PICS Selection	PICS_GN_GUC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GUC packet to ItsNodeB
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '2' (GEOUNICAST)
containing HST field
set to '0' (UNSPECIFIED)
containing GUC Extended Header
containing DEPV field
indicating position of the ItsNodeB
containing SOPV field
indicating position of the IUT
}
}	

6.2.1.5 GeoBroadcast

TP Id	TP/GEONW/FDV/GBC/BV-01
Test objective	GBC header validity
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.7.4, 9.8.5.2 and 10.3.11
Config Id	CF01
PICS Selection	PICS_GN_GBC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from the ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GBC packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '4' (GEOBROADCAST)
containing GBC Extended Header
containing SOPV field
indicating position of the IUT
}
}	

6.2.1.6 GeoAnycast

TP Id	TP/GEONW/FDV/GAC/BV-01
Test objective	GAC header validity
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.7.4, 9.8.5.2 and 10.3.12
Config Id	CF01
PICS Selection	PICS_GN_GAC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from the ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GeoAnycast packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '3' (GEOANYCAST)
containing GeoAnycast Extended Header
containing SOPV field
indicating position of IUT
}
}	

6.2.1.7 Single-Hop Broadcast

TP Id	TP/GEONW/FDV/SHB/BV-01
Test objective	SHB header validity
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.7.4, 10.3.4, 9.8.4.2 and 10.3.10
Config Id	CF01
PICS Selection	PICS_GN_SHB_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from the ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a SHB packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '5' (TSB)
containing HST field
set to '0' (SINGLE_HOP)
containing MHL field
set to '1'
containing Extended Header
containing SOPV
indicating LPV of the IUT
}
}	

6.2.1.8 Topologically Scoped Broadcast

TP Id	TP/GEONW/FDV/TSB/BV-01
Test objective	TSB header validity
Reference	ETSI EN 302 636-4-1 [1], clauses 9.7.2, 9.7.4, 9.8.3.2 and 10.3.9
Config Id	CF01
PICS Selection	PICS_GN_TSB_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from the ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a TSB packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '5' (TSB)
containing HST field
set to '1' (MULTI_HOP)
containing TSB Extended Header
containing SOPV field
indicating position of the IUT
}
}	

6.2.2 Protocol Operation

6.2.2.1 Location table

TP Id	TP/GEONW/PON/LOT/BV-01
Test objective	Check insertion of new entries into location table from Beacon header
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.10.3, 10.3.6.2 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_GUC_SRC AND PICS_GN_BEACON_DST
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from the ItsNodeB and
the lifetime of the ItsNodeB Location Table entry not being expired
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GUC packet to ItsNodeB
}
then {
the IUT does not send a GeoNetworking packet
containing a LS_REQUEST
containing Request field
containing GN_ADDR
containing M_ID
indicating ItsNodeB
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '2' (GEOUNICAST)
containing GUC Extended Header
containing DEPV field
indicating same position as the SOPV value of the Beacon information received from ItsNodeB
}
}	

TP Id	TP/GEONW/PON/LOT/BV-02
Test objective	Check insertion of new entries into location table from LS Reply data
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.7.1.4, 10.3.7.1.2 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC AND PICS_GN_LS_REP_DST

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having been requested to send a first GUC packet to ItsNodeA and
    the IUT having sent a LS_REQUEST packet
        containing Request field
            containing GN_ADDR
                containing M_ID
                    indicating ItsNodeA
                containing the other bits
                    indicating value 0
    the IUT having received a LS_REPLY packet from ItsNodeA
        containing SOPV field and
    the IUT having sent the GUC packet to ItsNodeA and
    the lifetime of the ItsNodeA Location Table entry not being expired
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT is requested to send a second GUC packet to ItsNodeA
    }
    then {
        the IUT does not send a GeoNetworking packet
            containing a LS_REQUEST
                containing Request field
                    containing GN_ADDR
                        containing M_ID
                            indicating ItsNodeA
        the IUT sends a GeoNetworking packet
            containing a correctly formatted Common Header
                containing HT field
                    set to '2' (GEOUNICAST)
            containing GUC Extended Header
                containing DEPV field
                    indicating same position as the SOPV value of the LS_REPLY packet received from ItsNodeA
    }
}
```

TP Id	TP/GEONW/PON/LOT/BV-03-X
Test objective	Check insertion of new entries into location table from extended header processing (e.g. GUC header)
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.4, 10.3.12.3, 10.3.11.3, 10.3.9.3, 10.3.10.3, 10.3.7.3 and 10.3.8.2
Config Id	CF01
PICS Selection	**SELECTION**

Initial conditions

with {
the IUT being in the "initial state" and
the IUT not having received any beacon from **NODE**
the IUT having received a **MESSAGE** originated by **NODE**
}

Expected behaviour

ensure that {
when {
the IUT is requested to send a GUC packet to **NODE**
}
then {
the IUT does not send a GeoNetworking packet
containing a LS_REQUEST Extended Header
containing Request field
containing GN_ADDR
containing M_ID
indicating **NODE**
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '2' (GEOUNICAST)
containing GUC Extended Header
containing DEPV field
indicating same position as the SOPV of the **MESSAGE** received from **NODE**
}
}

Variants

#	MESSAGE	NODE	SELECTION
01	Beacon packet	ItsNodeB	PICS_GN_BEACON_DST
02	GUC packet	ItsNodeA	PICS_GN_GUC_DST
03	GAC packet	ItsNodeA	PICS_GN_GAC_DST
04	GBC packet	ItsNodeA	PICS_GN_GBC_DST
05	TSB packet	ItsNodeA	PICS_GN_TSB_DST
06	SHB packet	ItsNodeB	PICS_GN_SHB_DST
07	LS Request packet	ItsNodeA	PICS_GN_LS_REQ_DST
08	LS Reply packet	ItsNodeA	PICS_GN_LS_REP_DST

TP Id	TP/GEONW/PON/LOT/BV-04
Test objective	Check location table entry expiration
Reference	ETSI EN 302 636-4-1 [1], clauses 8.1.3, 10.3.8.2, 10.3.7.1.2 and annex H
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT not having received beacons from ItsNodeB for the duration of itsGnLifetimeLocTE parameter
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GUC packet to ItsNodeB
}
then {
the IUT sends a GeoNetworking packet
containing a LS_REQUEST
containing Request field
containing GN_ADDR
containing M_ID
indicating ItsNodeB
containing the other bits
indicating value 0
}
}	

TP Id	TP/GEONW/PON/LOT/BV-05-X
Test objective	Check update of entries in location table with most up-to-date position data extracted from common header processing (including timestamp comparison before updating)
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.4, 10.3.12.3, 10.3.11.3, 10.3.9.3, 10.3.10.3, 10.3.7.3, 10.3.8.2 and C.2
Config Id	CF01
PICS Selection	**SELECTION**

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received a MESSAGE from ItsNodeB
        containing Extended Header
            containing SOPV field
                indicating an older timestamp than the last Beacon packet and
                indicating a different position than the position of the last Beacon packet
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT is requested to send a GUC packet to ItsNodeB
    }
    then {
        the IUT does not send a GeoNetworking packet
            containing a LS_REQUEST Extended Header
                containing Request field
                    containing GN_ADDR
                        containing M_ID
                            indicating ItsNodeB
        the IUT sends a GeoNetworking packet
            containing a correctly formatted Common Header
                containing HT field
                    set to '2' (GEOUNICAST)
            containing GUC Extended Header
                containing DEPV field
                    indicating same position as the SOPV value of the Beacon information received
    }
}
```

Variants

#	MESSAGE	SELECTION
01	GUC packet	PICS_GN_GUC_DST
02	GAC packet	PICS_GN_GAC_DST
03	GBC packet	PICS_GN_GBC_DST
04	TSB packet	PICS_GN_TSB_DST
05	SHB packet	PICS_GN_SHB_DST
06	LS Request packet	PICS_GN_LS_REQ_DST
07	LS Reply packet	PICS_GN_LS_REP_DST

6.2.2.2 Local Position Vector

TP Id	TP/GEONW/PON/LPV/BV-01
Test objective	Check update of the Local position vector
Reference	ETSI EN 302 636-4-1 [1], clauses 8.2.3, 10.2.2.2, 10.3.6.1 and annex H
Config Id	CF01
PICS Selection	PICS_GN_BEACON_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having changed its position
}	

Expected behaviour	

ensure that {
when {
the IUT generates eventually a Beacon packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '1' (BEACON)
containing HST field
set to '0' (UNSPECIFIED)
containing extended header
containing SOPV field
indicating the new position
}
}	

6.2.2.3 Sequence Number

TP Id	TP/GEONW/PON/SQN/BV-01
Test objective	Check initial sequence number assignment
Reference	ETSI EN 302 636-4-1 [1], clauses 8.3.2 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_GBC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having sent any GBC and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GBC packet to AREA1
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '4' (GEOBROADCAST)
 	
containing GBC Extended Header
containing SN field
indicating value '0'
}
}	

TP Id	TP/GEONW/PON/SQN/BV-02
Test objective	Check the local sequence number incrementation
Reference	ETSI EN 302 636-4-1 [1], clauses 8.3.2 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_GBC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having sent a GBC packet to AREA1
containing the Sequence Number field
indicating value SN1
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GBC packet to AREA1
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '4' (GEOBROADCAST)
containing GBC Extended Header
containing SN field
indicating value SN1 + 1
}
}	

6.2.2.4 Location Service

TP Id	TP/GEONW/PON/LOS/BV-01
Test objective	Check first LS invocation for unknown Destination nodes
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.2, 10.2.4, 6.3 and 10.3.7.1.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GUC packet to ItsNodeA
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '6' (LS)
containing HST field
set to '0' (LS_REQUEST)
containing NH field
set to '0' (UNSPECIFIED)
containing LS_REQUEST Extended Header
containing Request field
containing GN_ADDR
containing M_ID
indicating ItsNodeA
containing the other bits
indicating value 0
}
}	

TP Id	TP/GEONW/PON/LOS/BV-02
Test objective	Check absence of LS invocation for unknown Destination nodes when LS procedure is already active
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.2, 10.2.4 and 10.3.7.1.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a first GUC packet to ItsNodeA and
the IUT having sent a GeoNetworking packet
containing a LS_REQUEST
containing Request field
containing GN_ADDR
containing M_ID
indicating ItsNodeA
containing the other bits
indicating value 0
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a new GUC packet to ItsNodeA
}
then {
the IUT does not send a second LS_REQUEST packet (see note)
}
}	

NOTE: At least not before the LS_REQUEST retransmission timer expires.	

TP Id	TP/GEONW/PON/LOS/BV-03
Test objective	Check packet buffering into LS buffer during Location service procedure, including handling of LT fields in the LT packet buffer
Reference	ETSI EN 302 636-4-1 [1], clauses 8.4.3, 10.3.7.1.4, 10.3.7.1.2,9.3.8.2 and 10.2.4
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC AND PICS_GN_LS_REP_DST
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1 and
the IUT having sent a LS_REQUEST packet
}	

Expected behaviour	

ensure that {
when {
the IUT receives the LS_REPLY packet from ItsNodeA
}
then {
the IUT sends the GUC packet addressed to ItsNodeA
containing GUC Extended Header
containing LT field
indicating value (default LT value - WaitingTime (see note))
}
}	

NOTE: WaitingTime == time difference between LS_REQUEST sending and LS_REPLY reception.	

TP Id	TP/GEONW/PON/LOS/BV-04
Test objective	Check LS buffer characteristics: FIFO type
Reference	ETSI EN 302 636-4-1 [1], clauses 8.4.3, 10.2.4, 10.3.7.1.2 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC AND PICS_GN_LS_REP_DST
Initial conditions	

```
with {
    the IUT being in the "initial state" and
    the IUT having no Location Table Entry for ItsNodeA and
    the IUT having been requested to send a GUC packet to ItsNodeA
        containing TrafficClass.SCF set to 1
        containing LT field
            indicating value LT1
        containing payload field
            indicating value PL1 and
    the IUT having sent a LS_REQUEST packet and
    the IUT having been requested to send a second GUC packet to ItsNodeA
        containing TrafficClass.SCF set to 1
        containing LT field
            indicating LT2
        containing payload field
            indicating value PL2
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the LS_REPLY packet from ItsNodeA and
        before expiry of LT1 and LT2
    }
    then {
        the IUT sends GUC packet addressed to ItsNodeA
            containing payload field
                indicating value PL1 and
        the IUT sends GUC packet addressed to ItsNodeA
            containing payload field
                indicating value PL2
    }
}
```

TP Id	TP/GEONW/PON/LOS/BV-05
Test objective	Check LS buffer characteristics: discarding upon LT expiration
Reference	ETSI EN 302 636-4-1 [1], clauses 8.4.3, 10.2.4, 10.3.7.1.2 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

```
with {
    the IUT being in the "initial state" and
    the IUT having no Location Table Entry for ItsNodeA and
    the IUT having been requested to send multiple GUC packets to ItsNodeA
        containing TrafficClass.SCF set to 1
        containing LT field
            indicating values LTx and
    the IUT having sent a LS_REQUEST packet
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the LS_REPLY packet from ItsNodeA after expiry of LTs
    }
    then {
        the IUT does not send any packet to ItsNodeA
    }
}
```

TP Id	TP/GEONW/PON/LOS/TI-06
Test objective	Check LS Request retransmission if no answer is received
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.7.1.2, 10.3.7.1.3 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_RETRANSMISSION
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1
containing LT field
indicating value LT1 higher than itsGnLocationServiceRetransmitTimer and
the IUT having sent a LS_REQUEST packet
}	

Expected behaviour	

ensure that {
when {
the IUT does not receive LS_REPLY packet from ItsNodeA and
before expiration of LT1
}
then {
the IUT retransmits the LS_REQUEST packet
upon expiry of itsGnLocationServiceRetransmitTimer
}
}	

TP Id	TP/GEONW/PON/LOS/BV-07
Test objective	Check LS Request retransmission if no answer is received
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.7.1.2, 10.3.7.1.3, 10.3.8.2 and annex H
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_RETRANSMISSION
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1
containing LT field
indicating value LT1 higher than (itsGnLocationServiceTimer * itsGnLocationServiceMaxRetrans) and
the IUT having sent a LS_REQUEST packet
}	

Expected behaviour	

ensure that {
when {
the IUT does not receive LS_REPLY packet from ItsNodeA
before expiration of LT1
}
then {
the IUT retransmits the LS_REQUEST packet itsGnLocationServiceMaxRetrans times
}
}	

TP Id	TP/GEONW/PON/LOS/BV-08
Test objective	Check LS Reply generation by destination node
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.7.3 and 10.3.5
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_DST
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a LS_REQUEST packet
containing Request field
indicating the IUT's GN_ADDR
}
then {
the IUT replies with a LS_REPLY packet
containing Common Header
containing NH field
set to '0' (UNSPECIFIED)
containing LS_REPLY Extended Header
containing DEPV field
indicating same position as the SOPV value of the received LS_REQUEST
}
}	

TP Id	TP/GEONW/PON/LOS/BO-09
Test objective	Check absence of LS Reply generation for already answered LS Request packets
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.7.3 and 10.3.5
Config Id	CF02
PICS Selection	PICS_GN_LS_REQ_DST
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received a LS_REQUEST packet generated by ItsNodeB from ItsNodeB
the IUT having sent a LS_REPLY packet to ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT receives the same LS_REQUEST packet from ItsNodeD
}
then {
the IUT does not reply with a LS_REPLY packet
}
}	

TP Id	TP/GEONW/PON/LOS/BV-10
Test objective	Check LS Request forwarding
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.7.2 and 10.3.8.3
Config Id	CF03
PICS Selection	PICS_GN_LS_FWD

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a LS_REQUEST packet from ItsNodeC
            containing Basic Header
                containing RHL field
                    indicating value greater than 1
            containing LS_REQUEST Extended Header
                containing Request field
                    containing GN_ADDR
                        containing M_ID
                            indicating value differing from the M_ID part of the GN_ADDR of the IUT'
    }
    then {
        the IUT re-broadcasts the received LS_REQUEST packet
            containing Basic Header
                containing RHL field
                    indicating value decreased by 1
    }
}
```

TP Id	TP/GEONW/PON/LOS/BV-11
Test objective	Check LS Reply forwarding
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.7.2 and 10.3.8.3
Config Id	CF03
PICS Selection	PICS_GN_LS_FWD

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a LS_REPLY packet from ItsNodeC addressed to ItsNodeB
            containing Basic Header
                containing RHL field
                    indicating value greater than 1
    }
    then {
        the IUT forwards the received LS_REPLY packet to ItsNodeB
            containing Basic Header
                containing RHL field
                    indicating value decreased by 1
    }
}
```

TP Id	TP/GEONW/PON/LOS/BV-12
Test objective	Check flushing of the LS buffer, initiated by the processing of a common header from the target destination
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.4, 10.3.7.1.2 and 8.4.3
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet ItsNodeA
containing LT field
indicating LT1 and
the IUT having sent a LS_REQUEST packet
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet addressed to it from ItsNodeA before expiry of LT1
}
then {
the IUT sends the waiting GUC packet to ItsNodeA
}
}	

TP Id	TP/GEONW/PON/LOS/BV-13
Test objective	Check LS buffer characteristics: FIFO type and Lifetime
Reference	ETSI EN 302 636-4-1 [1], clauses 8.4.3 and 10.3.7.1.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1
containing LT field
indicating value LT1
containing payload field
indicating value PL1 and
the IUT having sent a LS_REQUEST packet and
the IUT having been requested to send a second GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1
containing LT field
indicating LT2 lower than LT1
containing payload field
indicating value PL2
}	

Expected behaviour	

ensure that {
when {
the IUT receives the LS_REPLY packet from ItsNodeA
after expiry of LT2
before expiry of LT1
}
then {
the IUT sends GUC packet addressed to ItsNodeA
containing payload field
indicating value PL1
}
}	

TP Id	TP/GEONW/PON/LOS/BV-14
Test objective	Check that GeoNetworking packets in LS buffer are discarded when LS does not complete
Reference	ETSI EN 302 636-4-1 [1], clause 8.4.3
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1
containing LT field
indicating value LT1 higher than (itsGnLocationServiceTimer * itsGnLocationServiceMaxRetrans) and
the IUT having sent a LS_REQUEST packet itsGnLocationServiceMaxRetrans times
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet from ItsNodeA
before expiry of LT1
}
then {
the IUT does not send any packet to ItsNodeA (see note)
}
}	

NOTE: Stored GUC packets have been discarded upon LS failure.	

TP Id	TP/GEONW/PON/LOS/BV-15
Test objective	Check flushing of the LS buffer, initiated by the processing of a common header from the target destination
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.3, 10.3.7.1.2 and 8.4.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet ItsNodeA
containing LT field
indicating LT1 and
the IUT having sent a LS_REQUEST packet
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet addressed to ItsNodeB from ItsNodeA before expiry of LT1
}
then {
the IUT sends the waiting GUC packet to ItsNodeA
}
}	

TP Id	TP/GEONW/PON/LOS/BV-16
Test objective	Check LS Request retransmission termination when indirect response is received
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.4, 10.3.7.1.2, 10.3.7.1.3 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1
containing LT field
indicating value LT1 higher than (itsGnLocationServiceTimer * itsGnLocationServiceMaxRetrans) and
the IUT having sent a LS_REQUEST packet
the IUT having retransmitted the LS_REQUEST packet less than itsGnLocationServiceMaxRetrans
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet addressed to it from ItsNodeA before expiry of LT1
}
then {
the IUT does not retransmits the LS_REQUEST packet
}
}	

NOTE: IUT instead transmits the buffered GUC.	

TP Id	TP/GEONW/PON/LOS/BV-17
Test objective	Check LS Request retransmission termination when indirect response is received
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.3, 10.3.7.1.2, 10.3.7.1.3 and 10.3.8.2
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1
containing LT field
indicating value LT1 higher than (itsGnLocationServiceTimer * itsGnLocationServiceMaxRetrans) and
the IUT having sent a LS_REQUEST packet
the IUT having retransmitted the LS_REQUEST packet less than itsGnLocationServiceMaxRetrans
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet addressed to ItsNodeB from ItsNodeA before expiry of LT1
}
then {
the IUT does not retransmits the LS_REQUEST packet
}
}	

NOTE: IUT instead transmits the buffered GUC.	

6.2.2.5 Forwarding Packet Buffer

TP Id	TP/GEONW/PON/FPB/BV-01
Test objective	Check Source packet buffering into UC forwarding buffer for unreachable Unicast destinations (absence of a suitable next hop candidate)
Reference	ETSI EN 302 636-4-1 [1], clauses 8.5.3, 10.3.6.3, 10.3.8.2 and 10.3.8.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having received any Beacon information from ItsNodeB and
the IUT having a Location Table Entry for ItsNodeA (see note) and
the IUT having been requested to send a GUC packet addressed to ItsNodeA
containing TrafficClass.SCF set to 1
}	

Expected behaviour	

ensure that {
when {
the IUT receives a Beacon packet from ItsNodeB
}
then {
the IUT selects the ItsNodeB as the next hop and
the IUT sends the buffered GUC packet
}
}	

NOTE: Location Table Entry is created by sending any GeoNetworking packet, originated by ItsNodeA, from ItsNodeC to IUT.	

TP Id	TP/GEONW/PON/FPB/BV-02
Test objective	Check Forwarder packet buffering into UC forwarding buffer for unreachable Unicast destinations (absence of a suitable next hop candidate)
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.3, 8.5.3 and 10.3.6.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_SRC

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT not having received any Beacon information from ItsNodeB and
    the IUT having received GUC packets addressed to ItsNodeA from ItsNodeC
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing LT field
                indicating LT1
            containing RHL field
                indicating value greater than 1
        containing GUC Extended Header
            containing SN field
                indicating value SN1
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a Beacon packet from ItsNodeB
    }
    then {
        the IUT selects the ItsNodeB as the next hop and
        the IUT forwards the buffered GUC packet
            containing Basic Header
                containing RHL field
                    indicating value decreased by 1
            containing GUC extended header
                containing SN field
                    indicating value SN1
    }
}
```

TP Id	TP/GEONW/PON/FPB/BV-03
Test objective	Check UC forwarding buffer characteristics: FIFO type
Reference	ETSI EN 302 636-4-1 [1], clauses 8.5.3, 10.3.6.3 and 10.3.8.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_SRC

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT not having received any Beacon information from ItsNodeB and
    the IUT having received a GUC (GEOUNI1) packet addressed to ItsNodeA from ItsNodeC
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing LT field
                indicating value LT1 and
            containing RHL field
                indicating value greater than 1
        containing GUC Extended Header
            containing SN field
                indicating value SN1
    the IUT having received a second GUC (GEOUNI2) packet addressed to ItsNodeA from ItsNodeC
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing LT field
                indicating LT2
            containing RHL field
                indicating value greater than 1
        containing GUC Extended Header
            containing SN field
                indicating value SN2
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a Beacon packet from ItsNodeB
        before expiry of LT1 and LT2
    }
    then {
        the IUT selects ItsNodeB as the next hop and
        the IUT forwards the GEOUNI1 buffered packet
            containing GUC Extended Header
                containing SN field
                    indicating value SN1
        the IUT forwards the GEOUNI2 buffered packet
            containing GUC Extended Header
                containing SN field
                    indicating value SN2
    }
}
```

TP Id	TP/GEONW/PON/FPB/BV-04
Test objective	Check UC forwarding buffer characteristics: discarding upon LT expiration
Reference	ETSI EN 302 636-4-1 [1], clauses 8.5.3, 10.3.6.3 and 10.3.8.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having received any Beacon information from ItsNodeB and
the IUT having received a GUC packet addressed to ItsNodeA from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing LT field
indicating LT1
containing RHL field
indicating value greater than 1
}	

Expected behaviour	

ensure that {
when {
the IUT receives a Beacon packet from ItsNodeB
after expiry of LT1
}
then {
the IUT does not forward the buffered GUC packet addressed to ItsNodeA
}
}	

TP Id	TP/GEONW/PON/FPB/BV-06
Test objective	Check Source packet buffering into BC forwarding buffer for no GBC recipients
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.5, 8.5.3, 10.3.6.3 and 10.3.11.2
Config Id	CF02
PICS Selection	PICS_GN_GBC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having received Beacon information from ItsNodeD and
the IUT not having received Beacon information from ItsNodeB and
the IUT having been requested to send a GBC packet to AREA1
containing TrafficClass.SCF set to 1
}	

Expected behaviour	

ensure that {
when {
the IUT receives a Beacon packet from either ItsNodeB or ItsNodeD
}
then {
the IUT broadcasts the buffered GBC packet
}
}	

TP Id	TP/GEONW/PON/FPB/BV-07
Test objective	Check BC forwarding buffer characteristics: FIFO type
Reference	ETSI EN 302 636-4-1 [1], clauses 8.5.3, 10.3.6.3 and 10.3.11.2
Config Id	CF02
PICS Selection	PICS_GN_GBC_SRC

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT not having received Beacon information from ItsNodeD and
    the IUT not having received Beacon information from ItsNodeB and
    the IUT having been requested to send a GBC (GBC1) packet to AREA1
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing LT field
                indicating LT1
        containing GBC Extended Header
            containing SN field
                indicating value SN1
    the IUT having been requested to send a GBC (GBC2) packet to AREA1
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing LT field
                indicating LT2
        containing TSB Extended Header
            containing SN field
                indicating value SN2
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a Beacon packet from either ItsNodeD or ItsNodeB
        before expiry of LT1 and LT2
    }
    then {
        the IUT broadcasts GBC1 packet
            containing GBC Extended Header
                containing SN field
                    indicating value SN1
        the IUT broadcasts GBC2 packet
            containing GBC Extended Header
                containing SN field
                    indicating value SN2
    }
}
```

TP Id	TP/GEONW/PON/FPB/BV-08
Test objective	Check BC forwarding buffer characteristics: discarding upon LT expiration
Reference	ETSI EN 302 636-4-1 [1], clauses 8.5.3, 10.3.6.3 and 10.3.11.2
Config Id	CF02
PICS Selection	PICS_GN_GBC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having received Beacon information from ItsNodeD and
the IUT not having received Beacon information from ItsNodeB and
the IUT having been requested to send a GBC (GBC1) packet to AREA1
containing TrafficClass.SCF set to 1
containing Basic Header
containing LT field
indicating LT1
the IUT having been requested to send a GBC (GBC2) packet to AREA1
containing TrafficClass.SCF set to 1
containing Basic Header
containing LT field
indicating LT2
}	

Expected behaviour	

ensure that {
when {
the IUT receives a Beacon packet from either ItsNodeB or ItsNodeD
after expiry of LT1 and LT2
}
then {
the IUT does not broadcast any of the buffered GBC1 and GBC2
}
}	

TP Id	TP/GEONW/PON/FPB/BV-09
Test objective	Check Source packet buffering into UC forwarding buffer for handling of LT fields in absence of a suitable next hop candidate
Reference	ETSI EN 302 636-4-1 [1], clauses 8.5.3, 10.3.6.3 and 10.3.8.2
Config Id	CF03
PICS Selection	PICS_GN_GUC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having received any Beacon information from ItsNodeB and
the IUT having a Location Table Entry for ItsNodeA and
the IUT having been requested to send a GUC packet addressed to ItsNodeA
containing TrafficClass.SCF set to 1
}	

Expected behaviour	

ensure that {
when {
the IUT receives a Beacon packet from ItsNodeB
}
then {
the IUT selects the ItsNodeB as the next hop and
the IUT sends the buffered GUC packet
containing GUC Extended Header
containing LT field
indicating (default LT value - WaitingTime (see note))
}
}	

NOTE: WaitingTime == time difference between Upper layer packet generation and the neighbour Beacon reception.	

TP Id	TP/GEONW/PON/FPB/BV-10
Test objective	Check Source packet buffering into BC forwarding buffer for handling of LT fields for no recipients
Reference	ETSI EN 302 636-4-1 [1], clauses 8.5.3, 10.3.6.3 and 10.3.11.2
Config Id	CF02
PICS Selection	PICS_GN_GBC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having received Beacon information from ItsNodeD and
the IUT not having received Beacon information from ItsNodeB and
the IUT having been requested to send a GBC packet to AREA1
containing TrafficClass.SCF set to 1
}	

Expected behaviour	

ensure that {
when {
the IUT receives a Beacon packet from either ItsNodeB or ItsNodeD
}
then {
the IUT broadcasts the buffered GBC packet
containing GBC Extended Header
containing LT field
indicating (default LT value - WaitingTime (see note))
}
}	

NOTE: WaitingTime == time difference between Upper layer packet generation and the Beacon reception.	

TP Id	TP/GEONW/PON/FPB/BV-11-X
Test objective	Check immediate broadcasting in absence of a suitable next hop candidate when SCF is disabled - Source operation
Reference	ETSI EN 302 636-4-1 [1], clause D.2
Config Id	CF03
PICS Selection	**SELECTION**
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having received any Beacon information from ItsNodeB and
the IUT having a Location Table Entry for ItsNodeA (see note)
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a **MESSAGE**
containing TrafficClass.SCF set to 0
}
then {
the IUT broadcast the **MESSAGE** immediately
}
}	

NOTE: Location Table Entry is created by sending any GeoNetworking packet, originated by ItsNodeA, from ItsNodeC to IUT.	

Variants		
#	MESSAGE	SELECTION
01	GUC packet addressed to ItsNodeA	PICS_GN_GUC_SRC
02	GAC packet containing DestinationArea indicating AREA2	PICS_GN_GAC_SRC
03	GBC packet containing DestinationArea indicating AREA2	PICS_GN_GBC_SRC
04	TSB packet	PICS_GN_TSB_SRC
05	SHB packet	PICS_GN_SHB_SRC

TP Id	TP/GEONW/PON/FPB/BV-12-X
Test objective	Check immediate broadcasting in absence of a suitable next hop candidate when SCF is disabled - Forwarder operation
Reference	ETSI EN 302 636-4-1 [1], clause D.2
Config Id	CF03
PICS Selection	**SELECTION**
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT not having received any Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT receives a **MESSAGE**
containing TrafficClass.SCF set to 0
}
then {
the IUT broadcast the **MESSAGE** immediately
}
}	

Variants		
#	MESSAGE	SELECTION
01	GUC packet addressed to ItsNodeA	PICS_GN_GUC_SRC
02	GAC packet containing DestinationArea indicating AREA2	PICS_GN_GAC_SRC
03	GBC packet containing DestinationArea indicating AREA2	PICS_GN_GBC_SRC
04	TSB packet	PICS_GN_TSB_SRC

6.2.2.6 GeoNetworking Address

TP Id	TP/GEONW/PON/GNA/BV-01
Test objective	Check the initial GeoNetworking address assignment by IUT with auto-address configuration
Reference	ETSI EN 302 636-4-1 [1], clauses 10.2.1.2 and 10.3.6.2
Config Id	CF01
PICS Selection	PICS_GN_ADDR_AUTO
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT's itsGnLocalAddrConfMethod MIB parameter is set to AUTO (0)
}	

Expected behaviour	

ensure that {
when {
the IUT generates a Beacon packet
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '1' (BEACON)
containing HST field
set to '0' (UNSPECIFIED)
containing Beacon Extended Header
containing SOPV field
containing GN_ADDR field
indicating itsGnLocalGnAddr MIB parameter
}
}	

TP Id	TP/GEONW/PON/GNA/BV-02
Test objective	Check the proper functioning of duplicate address detection mechanism
Reference	ETSI EN 302 636-4-1 [1], clause 10.2.1.5
Config Id	CF01
PICS Selection	PICS_GN_DAD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a SHB packet
}	

Expected behaviour	

ensure that {
when {
the IUT receives a SHB packet from ItsNodeB
containing SHB Extended Header
containing SOPV field
containing GN_ADDR field
indicating same GN_ADDR as the GN_ADDR field in the last SHB packet originated by the IUT
}
then {
the IUT sends subsequent SHBpacket
containing SHBExtended Header
containing SOPV field
containing GN_ADDR field
indicating different GN_ADDR as the previous used GN_ADDR
}
}	

6.2.2.7 Beaconing

TP Id	TP/GEONW/PON/BEA/TI-01
Test objective	Check that the IUT transmits Beacons at prescribed periodicity in the absence of other originated packets
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.6.2
Config Id	CF01
PICS Selection	PICS_GN_BEACON_SRC
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT generates Beacon packets
}
then {
the IUT sends each Beacon packet
after expiry of itsGnBeaconServiceRetransmitTimer
and before expiry of itsGnBeaconServiceRetransmitTimer + itsGnBeaconServiceMaxJitter
}
}	

TP Id	TP/GEONW/PON/BEA/BV-02
Test objective	Check that the IUT resets its timer for next Beacon transmission when originating other packets
Reference	ETSI EN 302 636-4-1 [1], clauses 10.2.3 and 10.3.10.2
Config Id	CF01
PICS Selection	PICS_GN_BEACON_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a SHB packet
}
then {
the IUT broadcasts a SHB packet and
the IUT sends the next Beacon packet
after expiry of itsGnBeaconServiceRetransmitTimer
and before expiry of itsGnBeaconServiceRetransmitTimer + itsGnBeaconServiceMaxJitter
}
}	

6.2.2.8 GeoUnicast

6.2.2.8.1 All forwading algorithms

TP Id	TP/GEONW/PON/GUC/ALL/BV-03
Test objective	Check that the protocol header fields (RHL, PV) are correctly updated at each forwarding step
Config Id	CF03
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.8.3
PICS Selection	PICS_GN_GUC_FWD

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC and
    the IUT having received a GUC packet (GEOUNI1) originated by ItsNodeA
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GUC packet (GEOUNI2) addressed to ItsNodeA from ItsNodeC
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating value greater than 1
            containing Common Header
                containing MHL field
                    indicating value MHL1
            containing GUC Extended Header
                containing DEPV field
                    indicating position different from the SOPV value of GEOUNI1
                containing TST field
                    indicating older value than the TimeStamp value of GEOUNI1
    }
    then {
        the IUT retransmits GEOUNI2
            containing Basic Header
                containing RHL field
                    indicating value decreased by 1 from the incoming value
            containing Common Header
                containing MHL field
                    indicating value MHL1
            containing GUC Extended Header
                containing DEPV field
                    indicating same position as the SOPV value of GEOUNI1
    }
}
```

TP Id	TP/GEONW/PON/GUC/ALL/BO-04
Test objective	Check that the RHL restriction is correctly handled at a forwarding step
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.8.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet addressed to ItsNodeA from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating 1
}
then {
the IUT does not retransmit the GUC packet
}
}	

TP Id	TP/GEONW/PON/GUC/ALL/BV-05
Test objective	Check that a received GUC packet is passed over the Gn SAP to the correct upper protocol if the Destination address matches the IUT address
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.8.4
Config Id	CF01
PICS Selection	PICS_GN_GUC_DST
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet addressed to it
}
then {
the IUT passes the received GUC packet to the correct Upper Layer
}
}	

TP Id	TP/GEONW/PON/GUC/ALL/BV-06
Test objective	Check that a received GUC packet is not passed over the Gn SAP if the Destination address does not match the IUT address
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.8.4
Config Id	CF01
PICS Selection	PICS_GN_GUC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet addressed to ItsNodeB from ItsNodeC
}
then {
the IUT does not pass the received GUC packet to any Upper Layer
}
}	

TP Id	TP/GEONW/PON/GUC/ALL/BO-08
Test objective	Check that a received GUC packet is not passed over the Gn SAP to the correct upper protocol when the Destination address matches the IUT address if received twice or more
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.9.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_DST
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeC and
the IUT having received Beacon information from ItsNodeB and
the IUT having received a GUC packet addressed to IUT from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value greater than 1
}	

Expected behaviour	

ensure that {
when {
the IUT receives the same GUC packet from ItsNodeB
containing Basic Header
containing RHL field
indicating HL1 - 1
}
then {
the IUT does not pass the received GUC packet to any Upper Layer
}
}	

6.2.2.8.2 Greedy forwarding

TP Id	TP/GEONW/PON/GUC/GRD/BV-01
Test objective	Check that a GUC request over upper Gn SAP triggers the origination of a GUC packet
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.2 and E.2
Config Id	CF01
PICS Selection	PICS_GN_GUC_SRC AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GUC packet to ItsNodeB
}
then {
the IUT sends a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '2' (GEOUNICAST)
containing GUC Extended Header
containing DEPV field
indicating same position as the SOPV value of the received Beacon information
}
}	

TP Id	TP/GEONW/PON/GUC/GRD/BV-02
Test objective	Check that a received GUC packet is routed to the correct next hop neighbour according to the greedy forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.3 and E.2
Config Id	CF04
PICS Selection	PICS_GN_GUC_FWD AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GUC packet addressed to ItsNodeA from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value greater than 1
}
then {
the IUT selects ItsNodeB as the next hop and
the IUT forwards the GUC packet
}
}	

TP Id	TP/GEONW/PON/GUC/GRD/BO-07
Test objective	Check that a received GUC packet is not triggering forwarding if received twice or more
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.9.3 and E.2
Config Id	CF03
PICS Selection	PICS_GN_GUC_FWD AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeC and
the IUT having received Beacon information from ItsNodeB and
the IUT having received a GUC packet addressed to ItsNodeA from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value greater than 1 and
the IUT having forwarded the GUC packet
}	

Expected behaviour	

ensure that {
when {
the IUT receives the same GUC packet from ItsNodeB
containing Basic Header
containing RHL field
indicating HL1 - 1
}
then {
the IUT does not forward the packet
}
}	

6.2.2.8.3 Contention-based forwarding

TP Id	TP/GEONW/PON/GUC/CBF/BV-01
Test objective	Check that a GUC request over upper Gn SAP triggers the origination of a GUC packet
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.2, 10.3.6.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_SRC AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GUC packet to ItsNodeB
}
then {
the IUT broadcasts a GeoNetworking packet
containing a correctly formatted Common Header
containing HT field
set to '2' (GEOUNICAST)
containing GUC Extended Header
containing DEPV field
indicating same position as the SOPV value of the received Beacon information
}
}	

TP Id	TP/GEONW/PON/GUC/CBF/BV-02
Test objective	Check that a received GUC packet is forwarded at the correct time according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC and
    the distance between IUT and ItsNodeA being
        less than itsGnDefaultMaxCommunicationRange MIB attribute
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GUC packet addressed to ItsNodeA from ItsNodeC
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating value greater than 1
    }
    then {
        the IUT re-broadcasts the received GUC packet
            upon expiry of calculated CBF delay (see note)
    }
}
```

NOTE: The CBF delay timer value is calculated from the itsGnDefaultMaxCommunicationRange, itsGnCbfMinTime, and itsGnCbfMaxTime MIB attributes, and the distance value between IUT and ItsNodeC.

TP Id	TP/GEONW/PON/GUC/CBF/BV-07
Test objective	Check that GUC packet forwarding correctly avoids packet duplication according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC and
    the distance between IUT and ItsNodeA being
        less than the itsGnDefaultMaxCommunicationRange MIB attribute and
    the IUT having received a GUC packet addressed to ItsNodeA from ItsNodeC
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing RHL field
                indicating value greater than 1 and
    the IUT having started a CBF timer for this packet (see note)
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GUC packet from ItsNodeB
            before expiration of the CBF timer
    }
    then {
        the IUT does not re-broadcast the GUC packet
    }
}
```

NOTE: The CBF delay timer value is calculated from the itsGnDefaultMaxCommunicationRange, itsGnCbfMinTime, and itsGnCbfMaxTime MIB attributes, and the distance value between IUT and ItsNodeC.

TP Id	TP/GEONW/PON/GUC/CBF/BV-20
Test objective	Check that a received GUC packet forwarding is correctly handling the minimum delay value according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC and
    the distance between IUT and ItsNodeC being
        larger than the itsGnDefaultMaxCommunicationRange MIB attribute
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GUC packet addressed to ItsNodeA from ItsNodeC
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating value greater than 1
    }
    then {
        the IUT re-broadcasts the received GUC packet
            upon expiry of itsGnCbfMinTime delay
    }
}
```

TP Id	TP/GEONW/PON/GUC/CBF/BV-21
Test objective	Check that a received GUC packet is forwarded at the correct time according to the contention based forwarding rules when the sender is unknown
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.8.3 and E.3
Config Id	CF04
PICS Selection	PICS_GN_GUC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC and
    the IUT not having received any message from ItsNodeD and
    the distance between IUT and ItsNodeA being
        less than itsGnDefaultMaxCommunicationRange MIB attribute
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GUC packet addressed to ItsNodeA generated by ItsNodeC from ItsNodeD
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating value greater than 1
    }
    then {
        the IUT re-broadcasts the received GUC packet
            upon expiry of CBF_MAX
    }
}
```

TP Id	TP/GEONW/PON/GUC/CBF/BV-22
Test objective	Check that a received GUC packet is forwarded at the correct time according to the contention based forwarding rules when the sender is known sender with an uncertain position (PAI = 0)
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.8.3 and E.3
Config Id	CF04
PICS Selection	PICS_GN_GUC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeD
        containing Beacon ExtendedHeader
            containing SOPV field
                containing PAI
                    set to '0'
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GUC packet addressed to ItsNodeA generated by ItsNodeC from ItsNodeD
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating value greater than 1
    }
    then {
        the IUT re-broadcasts the GUC packet
            upon expiry of CBF_MAX
    }
}
```

6.2.2.9 GeoBroadcast

6.2.2.9.1 Non-Area Forwarding

6.2.2.9.1.1 All forwarding algorithms

TP Id	TP/GEONW/PON/GBC/NONAREA/ALL/BV-03
Test objective	Check that the protocol header fields (RHL) are correctly updated during a GBC forwarding step
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.3
Config Id	CF03
PICS Selection	PICS_GN_GBC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value HL1 higher than 1
containing Common Header
containing MHL field
indicating value MHL1
containing DestinationArea
indicating AREA2
}
then {
the IUT retransmits the GBC packet
containing Basic Header
containing RHL field
indicating value (HL1 - 1)
containing Common Header
containing MHL field
indicating value MHL1
containing DestinationArea
indicating AREA2
}
}	

TP Id	TP/GEONW/PON/GBC/NONAREA/ALL/BV-04
Test objective	Check that the RHL restriction is correctly handled at a GBC forwarding step
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.3
Config Id	CF03
PICS Selection	PICS_GN_GBC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating 1
containing GBC Extended Header
containing DestinationArea
indicating AREA2
}
then {
the IUT does not retransmit the GBC packet
}
}	

TP Id	TP/GEONW/PON/GBC/NONAREA/ALL/BV-06
Test objective	Check that a received GBC packet is not passed over the Gn SAP if it is received for the first time outside the GBC destination area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.3
Config Id	CF01
PICS Selection	PICS_GN_GBC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA2
}
then {
the IUT does not pass the received GBC packet to any Upper Layer
}
}	

TP Id	TP/GEONW/PON/GBC/NONAREA/ALL/BO-09
Test objective	Check that a received GBC packet is discarded when indicating a too big GeoArea
Reference	ETSI EN 302 636-4-1 [1], clause B.3
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeD
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet from ItsNodeC
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating a geoArea bigger than itsGnMaxGeoAreaSize
}
then {
the IUT does not retransmit the received GBC packet
}
}	

TP Id	TP/GEONW/PON/GBC/NONAREA/ALL/BO-10
Test objective	Check that a received GBC packet from inside the destination area is discarded if received for the first time from a known sender when IUT is outside the destination area
Reference	ETSI EN 302 636-4-1 [1], annex D
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeC and
the IUT having received Beacon information from ItsNodeD
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet from ItsNodeD
containing TrafficClass.SCF set to 1
containing GBC Extended Header
containing DestinationArea
indicating AREA2
}
then {
the IUT discards the received GBC packet
}
}	

6.2.2.9.1.2 Greedy forwarding

TP Id	TP/GEONW/PON/GBC/NONAREA/GRD/BV-01
Test objective	Check that GBC request over upper Gn SAP triggersline forwarding if the IUT is outside the Destination Area
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.11.2 and E.2
Config Id	CF02
PICS Selection	PICS_GN_GBC_SRC AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GBC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA2
}
then {
the IUT selects ItsNodeB as the next hop and
the IUT sends the GBC packet (see note)
}
}	

NOTE: Next hop ITS Station being identified by the MAC layer address of ItsNodeB.	

TP Id	TP/GEONW/PON/GBC/NONAREA/GRD/BV-02
Test objective	Check that a received GBC packet is triggering line forwarding if received out of its destination area for the first time from a known ITS-Station
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.11.3 and E.2
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeDand
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet generated by ItsNodeC
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA2
}
then {
the IUT selects ItsNodeB as the next hop and
the IUT forwards the GBC packet (see note)
}
}	

NOTE: Next hop ITS Station being identified by the MAC layer address of ItsNodeB.	

TP Id	TP/GEONW/PON/GBC/NONAREA/GRD/BO-07
Test objective	Check that a received GBC packet is not triggering line forwarding if received out of its destination area twice or more
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.3
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeD
    the IUT having received a GBC packet from ItsNodeC
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing RHL field
                indicating value HL1 higher than 1
        containing GBC Extended Header
            containing SN field
                indicating value SN1
            containing DestinationArea
                indicating AREA2
    the IUT having forwarded the received GBC packet
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GBC packet from ItsNodeD
            containing Basic Header
                containing RHL field
                    indicating value lower than HL1
            containing GBC Extended Header
                containing SN field
                    indicating value SN1
    }
    then {
        the IUT does not forward the received GBC packet
    }
}
```

6.2.2.9.1.3 Contention-based forwarding

TP Id	TP/GEONW/PON/GBC/NONAREA/CBF/BV-01
Test objective	Check that a GBC request over upper Gn SAP triggers broadcasting of a GBC packet if the IUT is outside the Destination Area
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.11.2 and E.3
Config Id	CF02
PICS Selection	PICS_GN_GBC_SRC AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GBC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA2
}
then {
the IUT broadcasts immediately the GBC packet
}
}	

TP Id	TP/GEONW/PON/GBC/NONAREA/CBF/BV-02
Test objective	Check that a received GBC packet is forwarded at the correct time according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.11.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeC and
the distance between IUT and ItsNodeA being
less than itsGnDefaultMaxCommunicationRange MIB attribute
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet addressed to ItsNodeA from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value greater than 1
}
then {
the IUT re-broadcasts the received GBC packet
upon expiry of calculated CBF delay (see note)
}
}	

NOTE: The CBF delay timer value is calculated from the itsGnDefaultMaxCommunicationRange, itsGnGeoCbfMinTime, and itsGnGeoCbfMaxTime MIB attributes, and the distance value between IUT and ItsNodeC.	

TP Id	TP/GEONW/PON/GBC/NONAREA/CBF/BV-07
Test objective	Check that GBC packet forwarding correctly avoids packet duplication according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.11.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeC and
the distance between IUT and ItsNodeA being
less than the itsGnDefaultMaxCommunicationRange MIB attribute and
the IUT having received a GBC packet addressed to ItsNodeA from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value greater than 1 and
the IUT having started a CBF timer for this packet (see note)
}	

Expected behaviour	

ensure that {
when {
the IUT receives the same GBC packet from ItsNodeB
before expiration of the CBF timer
}
then {
the IUT does not re-broadcast the GBC packet
}
}	

NOTE: The CBF delay timer value is calculated from the itsGnDefaultMaxCommunicationRange, itsGnGeoCbfMinTime, and itsGnGeoCbfMaxTime MIB attributes, and the distance value between IUT and ItsNodeC.	

TP Id	TP/GEONW/PON/GBC/NONAREA/CBF/BV-20
Test objective	Check that a received GBC packet forwarding is correctly handling the minimum delay value according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.11.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeC and
the distance between IUT and ItsNodeC being
larger than the itsGnDefaultMaxCommunicationRange MIB attribute
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet addressed to ItsNodeA from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value greater than 1
}
then {
the IUT re-broadcasts the received GBC packet
upon expiry of itsGnGeoCbfMinTime delay
}
}	

TP Id	TP/GEONW/PON/GBC/NONAREA/CBF/BV-21
Test objective	Check that a received GBC packet is forwarded at the correct time according to the contention based forwarding rules if received for the first time when IUT is outside of the destination area from an unknown sender
Reference	ETSI EN 302 636-4-1 [1], clause E.3
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT not having received any message from ItsNodeD
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet generated by ItsNodeC from ItsNodeD
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA2
    }
    then {
        the IUT re-broadcasts the GBC packet
            upon expiry of CBF_MAX
    }
}
```

TP Id	TP/GEONW/PON/GBC/NONAREA/CBF/BV-22
Test objective	Check that a received GBC packet is forwarded at the correct time according to the contention based forwarding rules if received for the first time when IUT is outside of the destination area from a known sender having an uncertain position (PAI = 0)
Reference	ETSI EN 302 636-4-1 [1], clause E.3
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeD
        containing Beacon ExtendedHeader
            containing SOPV field
                containing PAI
                    set to '0'
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet generated by ItsNodeC from ItsNodeD
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA2
    }
    then {
        the IUT re-broadcasts the GBC packet
            upon expiry of CBF_MAX
    }
}
```

6.2.2.9.2 Area Forwarding

6.2.2.9.2.1 All forwarding algorithms

TP Id	TP/GEONW/PON/GBC/AREA/ALL/BV-01
Test objective	Check that a GBC request over upper Gn SAP triggers broadcasting of a GBC packet if the IUT is within the Destination Area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.2
Config Id	CF02
PICS Selection	PICS_GN_GBC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GBC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA1
}
then {
the IUT broadcasts immediately the GBC packet
containing DestinationArea
indicating AREA1
}
}	

TP Id	TP/GEONW/PON/GBC/AREA/ALL/BV-03
Test objective	Check that the protocol header fields (RHL) are correctly updated during a GBC retransmition inside area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.3
Config Id	CF02
PICS Selection	PICS_GN_GBC_FWD

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeD and
    the IUT having received Beacon information from ItsNodeB
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating value HL1 higher than 1
            containing Common Header
                containing MHL field
                    indicating value MHL1
            containing DestinationArea
                indicating AREA1
    }
    then {
        the IUT retransmitsthe GBC packet
            containing Basic Header
                containing RHL field
                    indicating value (HL1 -1)
            containing Common Header
                containing MHL field
                    indicating value MHL1
    }
}
```

TP Id	TP/GEONW/PON/GBC/AREA/ALL/BV-04
Test objective	Check that the RHL restriction is correctly handled at a GBC re-broadcasting step
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.3
Config Id	CF02
PICS Selection	PICS_GN_GBC_FWD

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeD and
    the IUT having received Beacon information from ItsNodeB
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA1
    }
    then {
        the IUT does not retransmits the GBC packet
    }
}
```

TP Id	TP/GEONW/PON/GBC/AREA/ALL/BV-05
Test objective	Check that a received GBC packet is passed over the Gn SAP to the correct upper protocol if it is received for the first time within the GBC destination area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.3
Config Id	CF01
PICS Selection	PICS_GN_GBC_DST
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA1
}
then {
the IUT passes the received GBC packet to the correct Upper Layer
}
}	

TP Id	TP/GEONW/PON/GBC/AREA/ALL/BO-08
Test objective	Check that a received GBC packet is not passed over the Gn SAP if it is received twice or more
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.11.3
Config Id	CF02
PICS Selection	PICS_GN_GBC_DST
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB and
the IUT having received a GBC packet from ItsNodeB
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating HL1
containing GBC Extended Header
containing SN field
indicating value SN1
containing DestinationArea
indicating AREA1 and
the IUT having passed the received GBC packet to the correct Upper Layer
}	

Expected behaviour	

ensure that {
when {
the IUT receives the same GBC packet from ItsNodeD
containing Basic Header
containing RHL field
indicating value lower than HL1
containing GBC Extended Header
containing SN field
indicating value SN1
}
then {
the IUT does not pass the received GBC packet to any Upper Layer
}
}	

6.2.2.9.2.2 Simple forwarding

TP Id	TP/GEONW/PON/GBC/AREA/SMP/BV-02
Test objective	Check that a received GBC packet is triggering immediately re-broadcasting if received for the first time within its destination area
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.11.3 and E.2
Config Id	CF02
PICS Selection	PICS_GN_GBC_FWD AND (PICS_GN_AREA_FORWARDING_ALGORITHM == 'SIMPLE' OR PICS_GN_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')
Initial conditions	

with {
the IUT being in the "initial state" and the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA1
}
then {
the IUT re-broadcasts immediately the GBC packet
}
}	

TP Id	TP/GEONW/PON/GBC/AREA/SMP/BO-07
Test objective	Check that a received GBC packet is not triggering re-broadcasting if received twice or more (duplicate packet detection)
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.11.3 and A.2
Config Id	CF02
PICS Selection	PICS_GN_GBC_FWD AND (PICS_GN_AREA_FORWARDING_ALGORITHM == 'SIMPLE' OR PICS_GN_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeD and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received a GBC packet from ItsNodeB
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing RHL field
                indicating value HL1 higher than 1
        containing GBC Extended Header
            containing SN field
                indicating value SN1
            containing DestinationArea
                indicating AREA1 and
    the IUT having re-broadcast the GBC packet
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GBC packet from ItsNodeD
            containing Basic Header
                containing RHL field
                    indicating value lower than HL1
            containing GBC Extended Header
                containing SN field
                    indicating value SN1
    }
    then {
        the IUT does not re-broadcast the GBC packet
    }
}
```

6.2.2.9.2.3 Contention-based forwarding

TP Id	TP/GEONW/PON/GBC/AREA/CBF/BV-02
Test objective	Check that a received GBC packet is triggering contention if received for the first time from a known sender when inside of the destination area
Reference	ETSI EN 302 636-4-1 [1], clause E.3
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GBC packet from ItsNodeC
containing TrafficClass.SCF set to 1
containing GBC Extended Header
containing DestinationArea
indicating AREA1
}
then {
the IUT saves the GBC packet into the CBF buffer and
the IUT starts the contention timer and
the IUT re-broadcasts the received GBC packet
upon expiry of the contention timer
}
}	

TP Id	TP/GEONW/PON/GBC/AREA/CBF/BV-07
Test objective	Check that a received GBC packet is discarded if received twice or more
Reference	ETSI EN 302 636-4-1 [1], clause E.3
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeD
the IUT having received a GBC packet from ItsNodeC
containing TrafficClass.SCF set to 1
containing GBC Extended Header
containing DestinationArea
indicating AREA1
the IUT having saved the packet into CBF buffer
}	

Expected behaviour	

ensure that {
when {
the IUT receives the same GBC packet from ItsNodeD
}
then {
the IUT removes the GBC packet from the CBF buffer
the IUT discards the new received GBC packet
}
}	

TP Id	TP/GEONW/PON/GBC/AREA/CBF/BV-21
Test objective	Check that a received GBC packet is triggering contention if received for the first time when IUT is inside of the destination area from an unknown sender
Reference	ETSI EN 302 636-4-1 [1], clause E.3
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

```
with {
    the IUT being in the "initial state" and
    the IUT is using the CBF algorithm
    the IUT having received Beacon information from ItsNodeB and
    the IUT not having received any message from ItsNodeD
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet generated by ItsNodeC from ItsNodeD
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA1
    }
    then {
        the IUT saves the GBC packet into the CBF buffer and
        the IUT starts the contention timer set to CBF_MAX and
        the IUT broadcasts the received GBC packet
            upon expiry of the contention timer
    }
}
```

TP Id	TP/GEONW/PON/GBC/AREA/CBF/BV-22
Test objective	Check that a received GBC packet is triggering contention if received for the first time when IUT is inside of the destination area from a known sender having an uncertain position (PAI = 0)
Reference	ETSI EN 302 636-4-1 [1], clause E.3
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

```
with {
    the IUT being in the "initial state" and
    the IUT is using the CBF algorithm
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeD
        containing Beacon ExtendedHeader
            containing SOPV field
                containing PAI
                    set to '0'
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet generated by ItsNodeC from ItsNodeD
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA1
    }
    then {
        the IUT saves the GBC packet into the CBF buffer and
        the IUT starts the contention timer set to CBF_MAX and
        the IUT re-broadcasts the received GBC packet
            upon expiry of the contention timer
    }
}
```

6.2.2.9.2.4 Advanced forwarding

TP Id	TP/GEONW/PON/GBC/AREA/ADV/BV-21
Test objective	Check that a received GBC packet with Broadcast MAC destination is triggering contention if received for the first time from an unknown sender when IUT is inside the destination area
Reference	ETSI EN 302 636-4-1 [1], clause F.4
Config Id	CF05
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'ADVANCED'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT not having received any message from ItsNodeE
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet from ItsNodeE
            addressed to link-layer broadcast address
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA1
    }
    then {
        the IUT saves the GBC packet into the CBF buffer and
        the IUT starts the contention timer set to CBF_MAX and
        the IUT re-broadcasts the received GBC packet
            upon expiry of the contention timer
    }
}
```

TP Id	TP/GEONW/PON/GBC/AREA/ADV/BV-23
Test objective	Check that a received GBC packet is discarded if received more than MAX_COUNTER times when IUT is inside the destination area
Reference	ETSI EN 302 636-4-1 [1], clause F.4
Config Id	CF06
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'ADVANCED'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeF and
    the IUT having received a GBC packet GBC1 from ItsNodeF
        containing TrafficClass.SCF set to 1
        containing GBC Extended Header
            containing DestinationArea
                indicating AREA1
    the IUT having saved the packet into CBF buffer
    the IUT having received MAX_COUNTER - 1 times the GBC1 packet
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GBC packet GBC1
    }
    then {
        the IUT removes GBC1 from the CBF buffer
        the IUT discards the new received GBC packet
    }
}
```

TP Id	TP/GEONW/PON/GBC/AREA/ADV/BV-24
Test objective	Check that a received GBC packet is discarded if received more than once when IUT is inside the destination area and inside the sectorial area of the GBC packet Sender
Reference	ETSI EN 302 636-4-1 [1], clause F.4
Config Id	CF05
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'ADVANCED'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeE and
    the IUT having received a GBC packet GBC1 from ItsNodeB
        containing TrafficClass.SCF set to 1
        containing GBC Extended Header
            containing DestinationArea
                indicating AREA1
    the IUT having saved the packet into CBF buffer
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GBC packet GBC1 from ItsNodeE
        the IUT is inside the sectorial area of ItsNodeB
    }
    then {
        the IUT removes GBC1 from the CBF buffer
        the IUT discards the new received GBC packet
    }
}
```

TP Id	TP/GEONW/PON/GBC/AREA/ADV/BV-25
Test objective	Check that a received GBC packet is triggering contention if received more than once when IUT is inside the destination area and outside the sectorial area of the GBC packet Sender (Angle_FSR > Angle_TH)
Reference	ETSI EN 302 636-4-1 [1], clause F.4
Config Id	CF06
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'ADVANCED'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeF and
    the IUT having received a GBC packet GBC1 from ItsNodeB
        containing TrafficClass.SCF set to 1
        containing GBC Extended Header
            containing DestinationArea
                indicating AREA1
    the IUT having saved the packet into CBF buffer
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GBC packet GBC1 from ItsNodeF
        the IUT is outside the sectorial area of ItsNodeB
    }
    then {
        the IUT saves the GBC packet into the CBF buffer and
        the IUT starts the contention timer and
        the IUT re-broadcasts the received GBC packet
            upon expiry of the contention timer
    }
}
```

NOTE: In this configuration IUT is outside sectorial area of ItsNodeB because of the Angle_FSR.

TP Id	TP/GEONW/PON/GBC/AREA/ADV/BV-26
Test objective	Check that a received GBC packet is triggering contention if received more than once when IUT is inside the destination area and outside the sectorial area of the GBC packet Sender (Dist_R > Dist_F)
Reference	ETSI EN 302 636-4-1 [1], clause F.4
Config Id	CF07
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'ADVANCED'
Initial conditions	

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeD and
    the IUT having received a GBC packet GBC1 from ItsNodeB
        containing TrafficClass.SCF set to 1
        containing GBC Extended Header
            containing DestinationArea
                indicating AREA1
    the IUT having saved the packet into CBF buffer
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GBC packet GBC1 from ItsNodeD
        the IUT is outside the sectorial area of ItsNodeB
    }
    then {
        the IUT saves the GBC packet into the CBF buffer and
        the IUT starts the contention timer and
        the IUT re-broadcasts the received GBC packet
            upon expiry of the contention timer
    }
}
```

NOTE: In this configuration IUT is outside sectorial area of ItsNodeB because of dist_R > dist_F.

TP Id	TP/GEONW/PON/GBC/AREA/ADV/BV-27
Test objective	Check that a received GBC packet with Unicast MAC destination is triggering line forwarding if received for the first time when IUT is inside the destination area
Reference	ETSI EN 302 636-4-1 [1], clause F.4
Config Id	CF05
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'ADVANCED'
Initial conditions	

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeE
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet from ItsNodeE addressed to IUT's link-layer address
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA1
    }
    then {
        the IUT selects ItsNodeB as the next hop ITS station and
        the IUT forwards the GBC packet
    }
}
```

TP Id	TP/GEONW/PON/GBC/AREA/ADV/BV-28
Test objective	Check that a received GBC packet with Unicast MAC destination is triggering rebroadcast if received for the first time when IUT is inside the destination area
Reference	ETSI EN 302 636-4-1 [1], clause F.4
Config Id	CF05
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'ADVANCED'
Initial conditions	

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeE
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet from ItsNodeE addressed to IUT's link-layer address
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA1
    }
    then {
        the IUT saves the GBC packet into the CBF buffer and
        the IUT starts the contention timer set to CBF_MAX and
        the IUT re-broadcasts the received GBC packet
            upon expiry of the contention timer
    }
}
```

TP Id	TP/GEONW/PON/GBC/AREA/ADV/BV-29
Test objective	Check that a received GBC packet with Broadcast destination is triggering contention if received for the first time from known sender when IUT is inside the destination area
Reference	ETSI EN 302 636-4-1 [1], clause F.4
Config Id	CF05
PICS Selection	PICS_GN_GBC_FWD AND PICS_GN_AREA_FORWARDING_ALGORITHM == 'ADVANCED'
Initial conditions	

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeE
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet from ItsNodeB
            addressed to broadcast link-layer address
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing DestinationArea
                    indicating AREA1
    }
    then {
        the IUT calculates and starts the contention timer and
        the IUT re-broadcasts the received GBC packet
            upon expiry of the contention timer
    }
}
```

6.2.2.10 Topologically Scoped Broadcast

TP Id	TP/GEONW/PON/TSB/BV-01
Test objective	Check that a TSB request over upper Gn SAP triggers the origination of a TSB packet
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.9.2
Config Id	CF02
PICS Selection	PICS_GN_TSB_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeD
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a TSB packet
}
then {
the IUT broadcasts a TSB packet
}
}	

TP Id	TP/GEONW/PON/TSB/BV-02
Test objective	Check that a received TSB packet is triggering re-broadcasting if received for the first time
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.9.3
Config Id	CF02
PICS Selection	PICS_GN_TSB_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT receives a TSB packet
containing Basic Header
containing RHL field
indicating HL1 higher than 1
}
then {
the IUT re-broadcasts the TSB packet
}
}	

TP Id	TP/GEONW/PON/TSB/BV-03
Test objective	Check that the protocol header fields (RHL) are correctly updated during a TSB re-broadcasting step
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.9.3
Config Id	CF02
PICS Selection	PICS_GN_TSB_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT receives a TSB packet
containing Basic Header
containing RHL field
indicating HL1
containing Common Header
containing MHL field
indicating value MHL1
}
then {
the IUT re-broadcasts the TSB packet
containing Basic Header
containing RHL field
indicating value (HL1 -1)
containing Common Header
containing MHL field
indicating value MHL1
}
}	

TP Id	TP/GEONW/PON/TSB/BO-04
Test objective	Check that the RHL restriction is correctly handled at a TSB re-broadcasting step
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.9.3
Config Id	CF02
PICS Selection	PICS_GN_TSB_FWD
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a TSB packet
containing Basic Header
containing RHL field
indicating 1
}
then {
the IUT does not re-broadcast the TSB packet
}
}	

TP Id	TP/GEONW/PON/TSB/BV-05
Test objective	Check that a received TSB packet is passed over the Gn SAP to the correct upper protocol if it is received for the first time
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.9.3
Config Id	CF01
PICS Selection	PICS_GN_TSB_DST
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a TSB packet
}
then {
the IUT passes the received TSB packet to the correct Upper Layer
}
}	

TP Id	TP/GEONW/PON/TSB/BO-07
Test objective	Check that a received TSB packet is not triggering re-broadcasting if received twice or more
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.9.3
Config Id	CF02
PICS Selection	PICS_GN_TSB_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB and
the IUT having received a TSB packet from ItsNodeB
containing Basic Header
containing RHL field
indicating HL1 higher than 1
containing TSB Extended Header
containing SN field
indicating value SN1 and
the IUT having re-broadcast the TSB packet
}	

Expected behaviour	

ensure that {
when {
the IUT receives the same TSB packet from ItsNodeD
containing Basic Header
containing RHL field
indicating HL1 - 1
containing TSB Extended Header
containing SN field
indicating value SN1
}
then {
the IUT does not re-broadcast the TSB packet
}
}	

TP Id	TP/GEONW/PON/TSB/BO-08
Test objective	Check that a received TSB packet is not passed over the Gn SAP if it is received twice or more
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.9.3
Config Id	CF02
PICS Selection	PICS_GN_TSB_DST
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received a TSB packet from ItsNodeB
containing Basic Header
containing RHL field
indicating HL1 higher than 1
containing TSB Extended Header
containing SN field
indicating value SN1 and
the IUT having passed the received TSB packet to the correct Upper Layer
}	

Expected behaviour	

ensure that {
when {
the IUT receives the same TSB packet from ItsNodeD
containing Basic Header
containing RHL field
indicating HL1 - 1
containing TSB Extended Header
containing SN field
indicating value SN1
}
then {
the IUT does not pass the received TSB packet to any Upper Layer
}
}	

6.2.2.11 Single-Hop Broadcast

TP Id	TP/GEONW/PON/SHB/BV-01
Test objective	Check that a SHB request over upper Gn SAP triggers the origination of a SHB packet
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.10.2
Config Id	CF02
PICS Selection	PICS_GN_SHB_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a SHB packet
}
then {
the IUT broadcasts the SHB packet
}
}	

TP Id	TP/GEONW/PON/SHB/BV-05
Test objective	Check that a received SHB packet is passed over the Gn SAP to the correct upper protocol if it is received for the first time
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.10.3
Config Id	CF01
PICS Selection	PICS_GN_SHB_DST
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a SHB packet
}
then {
the IUT passes the received SHB packet to the Upper Layer
}
}	

6.2.2.12 GeoAnycast

6.2.2.12.1 Non-Area Forwarding

6.2.2.12.1.1 All forwarding algorithms

TP Id	TP/GEONW/PON/GAC/NONAREA/ALL/BV-03
Test objective	Check that the protocol header fields (RHL) are correctly updated during a GAC forwarding step
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.6.3 and 10.3.12.3
Config Id	CF03
PICS Selection	PICS_GN_GAC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GAC packet from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value HL1 higher than 1
containing Common Header
containing MHL field
indicating value MHL1
containing DestinationArea
indicating AREA2
}
then {
the IUT retransmits the GAC packet
containing Basic Header
containing RHL field
indicating value (HL1 - 1)
containing Common Header
containing MHL field
indicating value MHL1
containing DestinationArea
indicating AREA2
}
}	

TP Id	TP/GEONW/PON/GAC/NONAREA/ALL/BO-04
Test objective	Check that the RHL restriction is correctly handled at a GAC forwarding step
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.12.3
Config Id	CF03
PICS Selection	PICS_GN_GAC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB
the IUT having received Beacon information from ItsNodeC
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GAC packet from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating 1
containing GAC Extended Header
containing DestinationArea
indicating AREA2
}
then {
the IUT does not retransmit the GAC packet
}
}	

TP Id	TP/GEONW/PON/GAC/NONAREA/ALL/BV-06
Test objective	Check that a received GAC packet is not passed over the Gn SAP if it is received for the first time outside the GAC destination area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.12.3
Config Id	CF01
PICS Selection	PICS_GN_GAC_FWD
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GAC packet from ItsNodeB
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA2
}
then {
the IUT does not pass the received GAC packet to any Upper Layer
}
}	

TP Id	TP/GEONW/PON/GAC/NONAREA/ALL/BO-09
Test objective	Check that a received GAC packet is discarded when indicating a too big GeoArea
Reference	ETSI EN 302 636-4-1 [1], clause B.3
Config Id	CF04
PICS Selection	PICS_GN_GAC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeD
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GAC packet from ItsNodeC
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating a geoArea bigger than itsGnMaxGeoAreaSize
}
then {
the IUT does not retransmit the received GAC packet
}
}	

TP Id	TP/GEONW/PON/GAC/NONAREA/ALL/BV-10
Test objective	Check that a received GAC packet from inside the destination area is discarded if received for the first time from a known sender when IUT is outside the destination area
Reference	ETSI EN 302 636-4-1 [1], annex D
Config Id	CF04
PICS Selection	PICS_GN_GBC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeC and
the IUT having received Beacon information from ItsNodeD
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GAC packet from ItsNodeD
containing TrafficClass.SCF set to 1
containing GAC Extended Header
containing DestinationArea
indicating AREA2
}
then {
the IUT discards the received GAC packet
}
}	

6.2.2.12.1.2 Greedy forwarding

TP Id	TP/GEONW/PON/GAC/NONAREA/GRD/BV-01
Test objective	Check that a GAC request over upper Gn SAP triggers line forwarding if the IUT is outside the Destination Area
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.12.2 and E.2
Config Id	CF02
PICS Selection	PICS_GN_GAC_SRC AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeD and
    the IUT having received Beacon information from ItsNodeB
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT is requested to send a GAC packet
            containing TrafficClass.SCF set to 1
            containing DestinationArea
                indicating AREA2
    }
    then {
        the IUT selects ItsNodeB as the next hop and
        the IUT sends the GAC packet (see note)
            containing DestinationArea
                indicating AREA2
    }
}
```

NOTE: Next hop ITS Station being identified by the MAC layer address of ItsNodeB.

TP Id	TP/GEONW/PON/GAC/NONAREA/GRD/BV-02
Test objective	Check that a received GAC packet is triggering line forwarding if received out of its destination area for the first time
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.12.3 and E.2
Config Id	CF04
PICS Selection	PICS_GN_GAC_FWD AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB
    the IUT having received Beacon information from ItsNodeD
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GAC packet from ItsNodeC
            containing TrafficClass.SCF set to 1
            containing DestinationArea
                indicating AREA2
    }
    then {
        the IUT selects ItsNodeB as the next hop and
        the IUT forwards the GAC packet (see note)
    }
}
```

NOTE: Next hop ITS Station being identified by the MAC layer address of ItsNodeB.

TP Id	TP/GEONW/PON/GAC/NONAREA/GRD/BO-07
Test objective	Check that a received GAC packet is not triggering line forwarding if received out of its destination area twice or more
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.12.3 and E.2
Config Id	CF04
PICS Selection	PICS_GN_GAC_FWD AND (PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'GREEDY' OR PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'UNSPECIFIED')

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB
    the IUT having received Beacon information from ItsNodeD
    the IUT having received a GAC packet from ItsNodeC
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing RHL field
                indicating value HL1 higher than 1
        containing GAC Extended Header
            containing SN field
                indicating value SN1 and
            containing DestinationArea
                indicating AREA2
    the IUT having forwarded the GAC packet
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GAC packet from other neighbour
            containing Basic Header
                containing RHL field
                    indicating value lower than HL1
            containing GAC Extended Header
                containing SN field
                    indicating value SN1
    }
    then {
        the IUT does not forward the received GAC packet
    }
}
```

6.2.2.12.1.3 Contention-based forwarding

TP Id	TP/GEONW/PON/GAC/NONAREA/CBF/BV-01
Test objective	Check that a GAC request over upper Gn SAP triggers immediate broadcasting of a GAC packet if the IUT is outside the Destination Area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.12.2
Config Id	CF02
PICS Selection	PICS_GN_GAC_SRC AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GAC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA2
}
then {
the IUT broadcasts immediately the GAC packet
}
}	

TP Id	TP/GEONW/PON/GAC/NONAREA/CBF/BV-02
Test objective	Check that a received GAC packet is forwarded at the correct time according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.12.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GAC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeB and
the IUT having received Beacon information from ItsNodeC and
the distance between IUT and ItsNodeA being
less than itsGnDefaultMaxCommunicationRange MIB attribute
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GAC packet addressed to ItsNodeA from ItsNodeC
containing TrafficClass.SCF set to 1
containing Basic Header
containing RHL field
indicating value greater than 1
}
then {
the IUT re-broadcasts the received GAC packet
upon expiry of calculated CBF delay (see note)
}
}	

NOTE: The CBF delay timer value is calculated from the itsGnDefaultMaxCommunicationRange, itsGnCbfMinTime, and itsGnCbfMaxTime MIB attributes, and the distance value between IUT and ItsNodeC.	

TP Id	TP/GEONW/PON/GAC/NONAREA/CBF/BV-07
Test objective	Check that GAC packet forwarding correctly avoids packet duplication according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.12.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GAC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC and
    the distance between IUT and ItsNodeA being
        less than the itsGnDefaultMaxCommunicationRange MIB attribute and
    the IUT having received a GAC packet addressed to ItsNodeA from ItsNodeC
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing RHL field
                indicating value greater than 1 and
    the IUT having started a CBF timer for this packet (see note)
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GAC packet from ItsNodeB
            before expiration of the CBF timer
    }
    then {
        the IUT does not re-broadcast the GAC packet
    }
}
```

NOTE: The CBF delay timer value is calculated from the itsGnDefaultMaxCommunicationRange, itsGnCbfMinTime, and itsGnCbfMaxTime MIB attributes, and the distance value between IUT and ItsNodeC.

TP Id	TP/GEONW/PON/GAC/NONAREA/CBF/BV-20
Test objective	Check that a received GAC packet forwarding is correctly handling the minimum delay value according to the contention based forwarding rules
Reference	ETSI EN 302 636-4-1 [1], clauses 10.3.12.3 and E.3
Config Id	CF03
PICS Selection	PICS_GN_GAC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeC and
    the distance between IUT and ItsNodeC being
        larger than the itsGnDefaultMaxCommunicationRange MIB attribute
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GAC packet addressed to ItsNodeA from ItsNodeC
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating value greater than 1
    }
    then {
        the IUT re-broadcasts the received GAC packet
            upon expiry of itsGnCbfMinTime delay
    }
}
```

TP Id	TP/GEONW/PON/GAC/NONAREA/CBF/BV-21
Test objective	Check that a received GAC packet is forwarded at the correct time according to the contention based forwarding rules if received for the first time when IUT is outside of the destination area from an unknown sender
Reference	ETSI EN 302 636-4-1 [1], clause E.3
Config Id	CF04
PICS Selection	PICS_GN_GAC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT not having received any message from ItsNodeD
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GAC packet generated by ItsNodeC from ItsNodeD
            containing TrafficClass.SCF set to 1
            containing GAC Extended Header
                containing DestinationArea
                    indicating AREA2
    }
    then {
        the IUT re-broadcasts the GAC packet
            upon expiry of CBF_MAX
    }
}
```

TP Id	TP/GEONW/PON/GAC/NONAREA/CBF/BV-22
Test objective	Check that a received GAC packet is forwarded at the correct time according to the contention based forwarding rules if received for the first time when IUT is outside of the destination area from a known sender having an uncertain position (PAI = 0)
Reference	ETSI EN 302 636-4-1 [1], clause E.3
Config Id	CF04
PICS Selection	PICS_GN_GAC_FWD AND PICS_GN_NON_AREA_FORWARDING_ALGORITHM == 'CBF'

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received Beacon information from ItsNodeB and
    the IUT having received Beacon information from ItsNodeD
        containing Beacon ExtendedHeader
            containing SOPV field
                containing PAI
                    set to '0'
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GAC packet generated by ItsNodeC from ItsNodeD
            containing TrafficClass.SCF set to 1
            containing GAC Extended Header
                containing DestinationArea
                    indicating AREA2
    }
    then {
        the IUT re-broadcasts the GAC packet
            upon expiry of CBF_MAX
    }
}
```

6.2.2.12.2 Area Forwarding

TP Id	TP/GEONW/PON/GAC/AREA/ALL/BV-01
Test objective	Check that indication GAC request over upper Gn SAP triggers broadcasting of a GAC packet if the IUT is within the Destination Area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.12.2
Config Id	CF02
PICS Selection	PICS_GN_GAC_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GAC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA1
}
then {
the IUT broadcasts immediately the GAC packet
containing DestinationArea
indicating AREA1
}
}	

TP Id	TP/GEONW/PON/GAC/AREA/ALL/BV-02
Test objective	Check that a received GAC packet is not triggering forwarding or re-broadcasting if the IUT is within the Destination Area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.12.3
Config Id	CF02
PICS Selection	PICS_GN_GAC_FWD
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having received Beacon information from ItsNodeD and
the IUT having received Beacon information from ItsNodeB
}	

Expected behaviour	

ensure that {
when {
the IUT receives a GAC packet
containing TrafficClass.SCF set to 1
containing DestinationArea
indicating AREA1
}
then {
the IUT does not retransmit the received GAC packet
}
}	

TP Id	TP/GEONW/PON/GAC/AREA/ALL/BV-05
Test objective	Check that a received GAC packet is passed over the Gn SAP to the correct upper protocol if it is received for the first time within the GAC destination area
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.12.3
Config Id	CF01
PICS Selection	PICS_GN_GAC_DST

Initial conditions

```
with {
    the IUT being in the "initial state"
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GAC packet from ItsNodeB
            containing TrafficClass.SCF set to 1
            containing DestinationArea
                indicating AREA1
    }
    then {
        the IUT passes the received GAC packet to the correct Upper Layer
    }
}
```

TP Id	TP/GEONW/PON/GAC/AREA/ALL/BO-08
Test objective	Check that a received GAC packet is not passed over the Gn SAP if it is received twice or more
Reference	ETSI EN 302 636-4-1 [1], clause 10.3.12.3
Config Id	CF02
PICS Selection	PICS_GN_GAC_DST

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having received a GAC packet from ItsNodeD
        containing TrafficClass.SCF set to 1
        containing Basic Header
            containing RHL field
                indicating HL1
            containing GAC Extended Header
            containing SN field
                indicating value SN1 and
            containing DestinationArea
                indicating AREA1 and
    the IUT having passed the received GAC packet to the correct Upper Layer
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives the same GAC packet from ItsNodeB
            containing Basic Header
                containing RHL field
                    indicating value lower than HL1
            containing GAC Extended Header
                containing SN field
                    indicating value SN1
    }
    then {
        the IUT does not pass the received GAC packet to any Upper Layer
    }
}
```

6.2.3 Buffer Capacities

6.2.3.1 Location Service

TP Id	TP/GEONW/CAP/LOS/BV-01
Test objective	Check of LS buffer capacity according to itsGnLocationServicePacketBufferSize parameter and the overflow handling procedure
Reference	ETSI EN 302 636-4-1 [1], clause 8.4.3
Config Id	CF01
PICS Selection	PICS_GN_LS_REQ_SRC
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having no Location Table Entry for ItsNodeA and
the IUT having received Beacon information from ItsNodeB and
the IUT having been requested to send multiple GUC packets to ItsNodeA
containing TrafficClass.SCF set to 1 and
the IUT having sent a LS_REQUEST packet and
the IUT not having received a LS_REPLY packet
}	

Expected behaviour	

ensure that {
when {
the IUT is requested to send a GUC packet to ItsNodeA
containing TrafficClass.SCF set to 1 and
the location service buffer capacity exceeded (see note 1)
}
then {
the IUT removes the older packet(s) in the location service buffer and,
the IUT inserts the new received packet at the end of the location service buffer (see note 2)
}
}	

NOTE 1: The amount of stored data exceeds Location Service buffer capacity defined by the itsGnLocationServicePacketBufferSize MIB parameter. NOTE 2: Buffered packets will be delivered upon reception of LS_REPLY message.	

6.2.3.2 Forwarding Packet Buffer

TP Id	TP/GEONW/CAP/FPB/BV-01
Test objective	Check of UC forwarding buffer capacity according to itsGnUcForwardingPacketBufferSize parameter and the overflow handling procedure
Reference	ETSI EN 302 636-4-1 [1], clause 8.5.3
Config Id	CF03
PICS Selection	PICS_GN_GUC_FWD

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having no Location Table Entry for ItsNodeB and
    the IUT having received multiple GUC packets addressed to ItsNodeA from ItsNodeC
        containing TrafficClass.SCF set to 1
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GUC packet addressed to ItsNodeA from ItsNodeC
            containing TrafficClass.SCF set to 1
            containing Basic Header
                containing RHL field
                    indicating HL1 higher than 1
        the UC forwarding packet buffer capacity exceeded (see note 1)
    }
    then {
        the IUT removes the older packet(s) in the UC forwarding packet buffer and,
        the IUT inserts the new received GUC packet at the end of the UC forwarding packet buffer (see note 2)
    }
}
```

NOTE 1: The amount of stored data exceeds UC forwarding packet capacity defined by the itsGnUcForwardingPacketBufferSize MIB parameter.
NOTE 2: Buffered packets will be delivered upon reception of Beacon message from ItsNodeB.

TP Id	TP/GEONW/CAP/FPB/BV-02
Test objective	Check of BC forwarding buffer capacity according to itsGnBcForwardingPacketBufferSize parameter and the overflow handling procedure
Reference	ETSI EN 302 636-4-1 [1], clause 8.5.3
Config Id	CF03
PICS Selection	PICS_GN_GBC_FWD

Initial conditions

```
with {
    the IUT being in the "initial state" and
    the IUT having no Location Table Entry for ItsNodeB
    the IUT having received multiple GBC packets
        containing TrafficClass.SCF set to 1
        containing GBC Extended Header
            containing GBC Destination Area
                indicating AREA2
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GBC packet
            containing TrafficClass.SCF set to 1
            containing GBC Extended Header
                containing GBC Destination Area
                    indicating AREA2 and
        the BC forwarding packet buffer capacity exceeded (see note 1)
    }
    then {
        the IUT removes the older packet(s) in the BC forwarding packet buffer and,
        the IUT inserts the new received GBC packet at the end of the BC forwarding packet buffer (see note 2)
    }
}
```

NOTE 1: The amount of stored data exceeds BC forwarding buffer capacity defined by the itsGnBcForwardingPacketBufferSize MIB parameter.
NOTE 2: Buffered packets will be delivered upon reception of Beacon message from ItsNodeB.

History

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