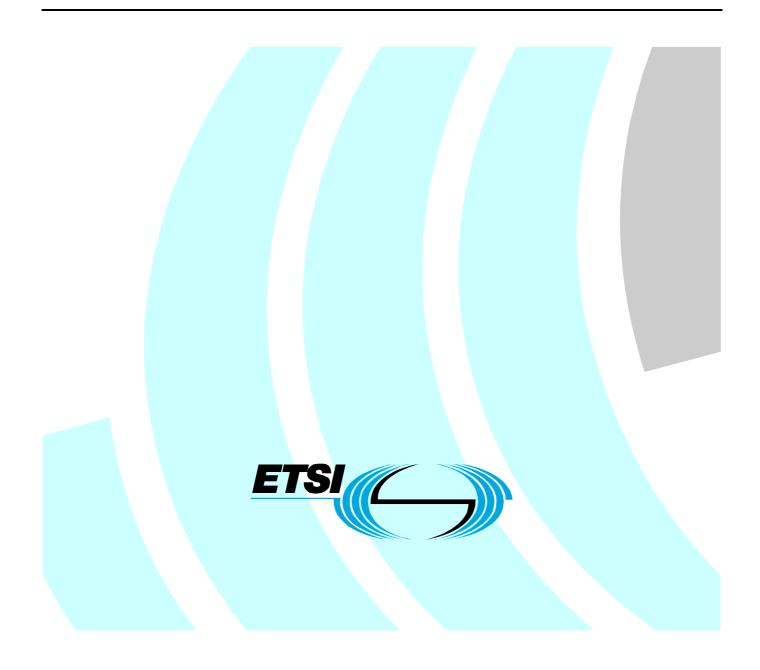# ETSI TS 102 859-2 V1.1.1 (2011-03)

Technical Specification

**Intelligent Transport Systems (ITS);
Testing;
Conformance test specifications for Transmission of
IP packets over GeoNetworking;
Part 2: Test Suite Structure and Test Purposes (TSS&TP)**

ETSI

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

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

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport System (ITS).

The present document is part 2 of a multi-part deliverable covering Conformance test specifications for Transmission of IP packets over GeoNetworking as identified below:

Part 1: "Test requirements and Protocol Implementation Conformance Statement (PICS) proforma";

Part 2: "Test Suite Structure and Test Purposes (TSS&TP)";

Part 3: "Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

1 Scope

The present document provides the Test Suite Structure and Test Purposes (TSS&TP) for Transmission of IP packets over Geonetworking as defined in TS 102 636-6-1 [1] in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [5].

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

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

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

2.1 Normative references

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

[1] ETSI TS 102 636-6-1 (V1.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 6: Internet Integration; Sub-part 1: Transmission of IPv6 Packets over GeoNetworking Protocols".

[2] ISO/IEC 9646-1 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[3] ISO/IEC 9646-2 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite specification".

[4] ISO/IEC 9646-6 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 6: Protocol profile test specification".

[5] ISO/IEC 9646-7 (1995): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

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

[7] IEEE 802.3:2005: "IEEE Standard for Information Technology - Telecommunications and information exchange between systems-Local and metropolitan area networks - Specific requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI EG 202 798: "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

- terms given in TS 102 636-6-1 [1];

- terms given in ISO/IEC 9646-6 [4] and in ISO/IEC 9646-7 [5].

3.2 Abbreviations

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

BI	Invalid Behaviour
BV	Valid Behaviour
EVI	Expired virtual interfaces
GVL	Geographical Virtual Link
HT	Header Type
IPv6	Internet Protocol version 6
ITS	Intelligent Transportation Systems
IUT	Implementation Under Test
LT	Lifetime
MG	Message Generation
MR	Message Reception
NH	Next Header
NVI	New virtual interfaces
RA	Router Advertisment
SAP	Service Access Point
TP	Test Purposes
TSS	Test Suite Structure
TVL	Topological Virtual Link
VM	Virtual Interface Management

4 Test Suite Structure (TSS)

4.1 Structure for IPV6overGEONET tests

Table 1 shows the IPV6overGEONET Test Suite Structure (TSS) including its subgroups defined for conformance testing.

Table 1: TSS for IPV6overGEONET

Root	Group		category
IPv6GEO	Message Generation	GVL	Valid behaviour
		TVL	Valid behaviour
	Message Reception	GVL	Valid behaviour
		TVL	Valid behaviour
	Virtual Interface Management	New virtual interfaces	Valid behaviour
		Expired virtual interfaces	Valid behaviour

The test suite is structured as a tree with the root defined as IPv6GEO. 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.

4.2 Test groups

4.2.1 Root

The root identify the Transmission of **IP packets** over Geonetworking given in TS 102 636-6-1 [1].

4.2.2 Groups

This level contains three functional areas identified as: Message Generation, Message Reception, and Virtual Interface Management.

4.2.3 Sub-groups

This level contains four sub-functional areas identified as: GVL, TVL, New virtual interfaces , and Expired virtual interfaces.

4.2.4 Categories

This level contains the standard ISO conformance test categories limited to the valid behaviour.

5 Test Purposes (TP)

5.1 Introduction

5.1.1 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 clause 5.1.2.
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.
PICS Selection	Reference to the PICS statement involved for selection of the TP. Contains a Boolean expression.
TP Behaviour	
Initial conditions	The initial conditions defines 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.

5.1.2   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	IPv6GEO	IPv6 over Geonetworking
	<gr> = group	MG	Message Generation
		MR	Message Reception
		VM	Virtual Interface Management
	<sgr> = subgroup	GVL	GVL
		TVL	TVL
		NVI	New virtual interfaces
		EVI	Expired virtual interfaces
	<x> = type of testing	BV	Valid Behavior tests
		BI	Invalid Syntax or Behavior Tests
	<nn> = sequential number		01 to 99

5.1.3   Rules for the behaviour description

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

5.1.4   Sources of TP definitions

All TPs are specified according to TS 102 636-6-1 [1].

5.2   Test purposes for IPV6overGEONET

5.2.1   Message Generation

5.2.1.1   GVL

TP Id	TP/IPv6GEO/MG/GVL/BV/01
Test objective	Checks that an IPv6 multicast message is carried out over a GeoBroadcast message into the correct geographical area, with a GVL manually configured
Reference	TS 102 636-6-1 [1], clauses 5.2.2, 5.3.3.1, 8.2.1 and 9.1.2
PICS Selection	PICS_GVL and PICS_Ethernet and PICS_MIB_ManualAssigned
Initial conditions	

with {
    the IUT having a manually configured GVL (GVL1) and,
    the IUT's Upper Layer being manually configured to use the virtual interface associated with GVL1
}	

Expected behaviour	

ensure that {
    when {
        the IUT receives an IPV6 packet from the Upper Layer
            containing destination address
                indicating a multicast IPv6 address
    }
    then {
        the IUT sends a valid GeoNetworking GeoBroadcast message
        containing the geographical Destination area corresponding to GVL1
        containing NH field
            indicating value '2'
        containing HT field
            indicating value'4'
        containing LT field
            indicating value '0'
        containing TC field
            indicating a value derived from the IPv6 packet's Priority field (see note)
        carrying the IPv6 packet received from Upper Layer as payload
    }
}	

NOTE: See table 1 of TS 102 636-6-1 [1] for derivation mapping.	

TP Id	TP/IPv6GEO/MG/GVL/BV/02
Test objective	Checks that an IPv6 multicast message is carried out over a GeoBroadcast message into the correct geographical area, with a GVL derived from a RA message
Reference	TS 102 636-6-1 [1], clauses 5.2.2, 5.3.3.1, 8.2.1 and 9.1.2
PICS Selection	PICS_GVL and PICS_Ethernet and PICS_MIB_RAAssigned
Initial conditions	
with { the IUT having received a GeoBroadcast message containing an ICMPv6 Router Advertisment (RA) message the IUT having automatically configured a GVL (GVL1) derived from the received RA and, the IUT's Upper Layer being automatically configured to use the virtual interface associated with GVL1 }	
Expected behaviour	
ensure that { when { the IUT receives an IPV6 packet from the Upper Layer containing destination address indicating a multicast IPv6 address } then { the IUT sends a valid GeoNetworking GeoBroadcast message containing the geographical Destination area corresponding to GVL1 containing NH field indicating value '2' containing HT field indicating value'4' containing LT field indicating value '0' containing TC field indicating a value derived from the IPv6 packet's Priority field (see note) carrying the IPv6 packet received from Upper Layer as payload } }	
NOTE: See table 1 of TS 102 636-6-1 [1] for derivation mapping.	

TP Id	TP/IPv6GEO/MG/GVL/BV/03
Test objective	Checks that an IPv6 anycast message is carried out over a GeoAnycast message into the correct geographical area, with a GVL link manually configured
Reference	TS 102 636-6-1 [1], clauses 5.2.2, 5.3.3.1, 8.2.1 and 9.1.2
PICS Selection	PICS_GVL and PICS_Ethernet and PICS_MIB_ManualAssigned
Initial conditions	
with { the IUT having a manually configured GVL (GVL1) and, the IUT's Upper Layer being manually configured to use the virtual interface associated with GVL1 }	
Expected behaviour	
ensure that { when { the IUT receives an IPV6 packet from the Upper Layer containing destination address indicating a anycast IPv6 address } then { the IUT sends a valid GeoNetworking GeoAnycast message containing the geographical Destination area corresponding to GVL1 containing NH field indicating value '2' containing HT field indicating value'3' containing LT field indicating value '0' containing TC field indicating a value derived from the IPv6 packet's Priority field (see note) carrying the IPv6 packet received from Upper Layer as payload } }	
NOTE: See table 1 of TS 102 636-6-1 [1] for derivation mapping.	

TP Id	TP/IPv6GEO/MG/GVL/BV/04
Test objective	Checks that an IPv6 anycast message is carried out over a GeoAnycast message into the correct geographical area, with a GVL link derived from a RA message
Reference	TS 102 636-6-1 [1], clauses 5.2.2, 5.3.3.1, 8.2.1 and 9.1.2
PICS Selection	PICS_GVL and PICS_Ethernet and PICS_MIB_RAAssigned
Initial conditions	

```
with {
    the IUT having received a GeoBroadcast message
        containing an ICMPv6 Router Advertisment (RA) message
    the IUT having automatically configured a GVL (GVL1) derived from the received RA and,
    the IUT's Upper Layer being automatically configured to use the virtual interface associated with GVL1
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives an IPV6 packet from the Upper Layer
            containing destination address
                indicating a anycast IPv6 address
    }
    then {
        the IUT sends a valid GeoNetworking GeoAnycast message
            containing the geographical Destination area corresponding to GVL1
            containing NH field
                indicating value '2'
            containing HT field
                indicating value'3'
            containing LT field
                indicating value '0'
            containing TC field
                indicating a value derived from the IPv6 packet's Priority field (see note)
            carrying the IPv6 packet received from Upper Layer as payload
    }
}
```

NOTE:	See table 1 of TS 102 636-6-1 [1] for derivation mapping.

TP Id	TP/IPv6GEO/MG/GVL/BV/05
Test objective	Checks that an IPv6 unicast message is carried out over a GeoUnicast when using a GVL associated to an Ethernet V2.0/IEEE 802.3 LAN type virtual interface with address resolution
Reference	TS 102 636-6-1 [1], clauses 5.2.2, 5.3.3.1, 8.2.1 and 9.1.2
PICS Selection	PICS_GVLand PICS_Ethernet
Initial conditions	
with { the IUT having a configured GVL (GVL1) and, the IUT's Upper Layer being configured to use the virtual interface associated with GVL1 the IUT being configured with MIB attribute *itsgn6asIVIResolAddr* set to true }	
Expected behaviour	
ensure that { when { the IUT receives an IPV6 packet from the Upper Layer containing destination address indicating unicast IPv6 address of the Tester } then { the IUT sends a valid GeoUnicast message containing DEPV field containing GN_ADDR field indicating value derived from the unicast IPv6 address IID containing NH field indicating value '2' containing HT field indicating value'2' containing LT field indicating value '0' containing TC field indicating a value derived from the IPv6 packet's Priority field (see note) carrying the IPv6 packet received from Upper Layer as payload } }	
NOTE: See table 1 of TS 102 636-6-1 [1] for derivation mapping.	

TP Id	TP/IPv6GEO/MG/GVL/BV/06
Test objective	Checks that an IPv6 unicast message is carried out over a GeoUnicast when using a GVL associated to an Ethernet V2.0/IEEE 802.3 [7] LAN type virtual interface without address resolution
Reference	TS 102 636-6-1 [1], clauses 5.2.3, 5.3.3.2 and 8.2.1
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
    the IUT having a configured GVL (GVL1) and,
    the IUT's Upper Layer being configured to use the virtual interface associated with GVL1
    the IUT being configured with MIB attribute *itsgn6asIVIResolAddr* set to false
}

Expected behaviour

ensure that {
    when {
        the IUT receives an IPV6 packet from the Upper Layer
            containing destination address
                indicating unicast IPv6 address of the Tester
    }
    then {
        the IUT sends a valid GeoUnicast message
            containing DEPV field
                containing GN_ADDR field
                    indicating value derived from the GN6_SAP destination parameter
            containing NH field
                indicating value '2'
            containing HT field
                indicating value'2'
            containing LT field
                indicating value '0'
            containing TC field
                indicating a value derived from the IPv6 packet's Priority field
            carrying the IPv6 packet received from Upper Layer as payload
    }
}

5.2.1.2   TVL

TP Id	TP/IPv6GEO/MG/TVL/BV/01
Test objective	Checks that an IPv6 unicast message is carried out over a GeoUnicast when using a TVL associated to an NBMA type virtual interface with address resolution
Reference	TS 102 636-6-1 [1], clauses 5.2.3, 5.3.3.2 and 8.2.1
PICS Selection	PICS_NBMA
Initial conditions	
with { the IUT having a configured NBMA TVL (TVL1) and, the IUT's Upper Layer being configured to use the virtual interface associated with TVL1 the IUT being configured with MIB attribute *itsgn6as/VIResolAddr* set to true }	
Expected behaviour	
ensure that { when { the IUT receives an IPV6 packet from the Upper Layer containing destination address indicating unicast IPv6 address of the Tester } then { the IUT sends a valid GeoUnicast message containing DEPV field containing GN_ADDR field indicating value derived from the unicast IPv6 address IID containing NH field indicating value '2' containing HT field indicating value'2' containing LT field indicating value '0' containing TC field indicating a value derived from the IPv6 packet's Priority field (see note) carrying the IPv6 packet received from Upper Layer as payload } }	
NOTE: See table 1 of TS 102 636-6-1 [1] for derivation mapping.	

TP Id	TP/IPv6GEO/MG/TVL/BV/02
Test objective	Checks that an IPv6 unicast message is carried out over a GeoUnicast when using a TVL associated to an NBMA type virtual interface without address resolution
Reference	TS 102 636-6-1 [1], clauses 5.2.3, 5.3.3.2 and 8.2.1
PICS Selection	PICS_NBMA
Initial conditions	
with { the IUT having a configured NBMA TVL (TVL1) and, the IUT's Upper Layer being configured to use the virtual interface associated with TVL1 the IUT being configured with MIB attribute *itsgn6asIVIResolAddr* set to false }	
Expected behaviour	
ensure that { when { the IUT receives an IPV6 packet from the Upper Layer containing destination address indicating unicast IPv6 address of the Tester } then { the IUT sends a valid GeoUnicast message containing DEPV field containing GN_ADDR field indicating value derived from the GN6_SAP destination parameter containing NH field indicating value '2' containing HT field indicating value'2' containing LT field indicating value '0' containing TC field indicating a value derived from the IPv6 packet's Priority field carrying the IPv6 packet received from Upper Layer as payload } }	

TP Id	TP/IPv6GEO/MG/TVL/BV/03
Test objective	Checks that an IPv6 unicast message is carried out over a GeoUnicast when using a TVL associated to a Point-to-point type virtual interface with address resolution
Reference	TS 102 636-6-1 [1], clauses 5.2.3, 5.3.3.3 and 8.2.1
PICS Selection	PICS_Point-to-Point
Initial conditions	
with { the IUT having a configured point to point TVL (TVL1) and, the IUT's Upper Layer being configured to use the virtual interface associated with TVL1 the IUT being configured with MIB attribute *itsgn6asIVIResolAddr* set to true }	
Expected behaviour	
ensure that { when { the IUT receives an IPV6 packet from the Upper Layer containing destination address indicating unicast IPv6 address of the Tester } then { the IUT sends a valid GeoUnicast message containing DEPV field containing GN_ADDR field indicating value derived from the unicast IPv6 address IID containing NH field indicating value '2' containing HT field indicating value'2' containing LT field indicating value '0' containing TC field indicating a value derived from the IPv6 packet's Priority field (see note) carrying the IPv6 packet received from Upper Layer as payload } }	
NOTE: See table 1 of TS 102 636-6-1 [1] for derivation mapping.	

TP Id	TP/IPv6GEO/MG/TVL/BV/04
Test objective	Checks that an IPv6 unicast message is carried out over a GeoUnicast when using a TVL associated to a Point-to-point type virtual interface without address resolution
Reference	TS 102 636-6-1 [1], clauses 5.2.3, 5.3.3.3 and 8.2.1
PICS Selection	PICS_Point-to-Point
Initial conditions	

with {
    the IUT having a configured point to point TVL (TVL1) and,
    the IUT's Upper Layer being configured to use the virtual interface associated with TVL1
    the IUT being configured with MIB attribute *itsgn6asIVIResolAddr* set to false
}	

Expected behaviour	

ensure that {
    when {
        the IUT receives an IPV6 packet from the Upper Layer
            containing destination address
                indicating unicast IPv6 address of the Tester
    }
    then {
        the IUT sends a valid GeoUnicast message
            containing DEPV field
                containing GN_ADDR field
                    indicating value derived from the unicast IPv6 address IID
            containing NH field
                indicating value '2'
            containing HT field
                indicating value'2'
            containing LT field
                indicating value '0'
            containing TC field
                indicating a value derived from the IPv6 packet's Priority field (see note)
            carrying the IPv6 packet received from Upper Layer as payload
    }
}	

NOTE: See table 1 of TS 102 636-6-1 [1] for derivation mapping.	

5.2.2   Message Reception

5.2.2.1   GVL

TP Id	TP/IPv6GEO/MR/GVL/BV/01
Test objective	Checks handling of a received IPv6 Multicast message, which has destination area corresponding to an existing GVL associated to an Ethernet V2.0/IEEE 802.3 [7] LAN type virtual interface of the IUT
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
   the IUT having received a GeoBroadcast message
     containing an ICMPv6 Router Advertisment (RA) message
   the IUT having automatically configured a GVL (GVL1) derived from the received RA and,
   the IUT having received several GeoBroadcast messages
     containing different destination area from each others
     containing an ICMPv6 Router Advertisement (RA) message
   the IUT having automatically configured GVLs (GVL2 .. GVLx) derived from each received RA
   the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}	

Expected behaviour	

ensure that {
   when {
     the IUT receives a GeoBroadcast message
      containing Destination Area parameters corresponding to GVL1 and
      containing payload
       indicating an IPv6 multicast packet
   }
   then {
     the IUT transmits on the virtual interface associated to GVL1 an Ethernet packet
      containing Destination MAC address
       indicating the broadcast value
      containing Source MAC address
       indicating a value derived from Source GN_ADDR field (see note)
      containing Ether Type value
       indicating IPv6
      containing IPv6 payload
   }
}	

NOTE: Reverse EUI-64 generation procedure.	

TP Id	TP/IPv6GEO/MR/GVL/BV/02
Test objective	Checks handling of a received IPv6 Multicast message, which has destination area not corresponding to any existing GVL of the IUT
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
   the IUT having received several GeoBroadcast messages
      containing different destination area from each others
      containing an ICMPv6 Router Advertisment (RA) message
   the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
   the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}

Expected behaviour

ensure that {
   when {
      the IUT receives a GeoBroadcast message
         containing Destination Area parameters not corresponding to any GVLs and
         containing payload
            indicating an IPv6 multicast packet
   }
   then {
      the IUT does not pass the received IPv6 message to the Upper Layer through any virtual interface
   }
}

TP Id	TP/IPv6GEO/MR/GVL/BV/03
Test objective	Checks handling of a received IPv6 Anycast message, which has destination area corresponding to an existing GVL associated to an Ethernet V2.0/IEEE 802.3 LAN type virtual interface of the IUT
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
   the IUT having received several GeoBroadcast messages
      containing different destination area from each others
      containing an ICMPv6 Router Advertisment (RA) message
   the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
   the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}

Expected behaviour

ensure that {
   when {
      the IUT receives a GeoAnycast message
         containing Destination Area parameters corresponding to GVL1 and
         containing payload
            indicating an IPv6 anycast packet
   }
   then {
      the IUT transmits on the virtual interface associated to GVL1 an Ethernet packet
         containing Destination MAC address
            indicating the multicast value corresponding to the IPv6 destination address
         containing Source MAC address
            indicating a value derived from Source GN_ADDR field (see note)
         containing Ether Type value
            indicating IPv6
         containing IPv6 payload
   }
}
NOTE: Reverse EUI-64 generation procedure.

TP Id	TP/IPv6GEO/MR/GVL/BV/04
Test objective	Checks handling of a received IPv6 Anycast message, which has destination area not corresponding to any existing GVL of the IUT
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
    the IUT having received several GeoBroadcast messages
        containing different destination area from each others
        containing an ICMPv6 Router Advertisment (RA) message
    the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
    the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}

Expected behaviour

ensure that {
    when {
        the IUT receives a GeoAnycast message
            containing Destination Area parameters not corresponding to any GVLs and
            containing payload
                indicating an IPv6 multicast packet
    }
    then {
        the IUT does not pass the received IPv6 message to the Upper Layer through any virtual interface
    }
}

TP Id	TP/IPv6GEO/MR/GVL/BV/05
Test objective	Checks handling of a received Router Advertisement message, which has destination area corresponding to an existing GVL associated to an Ethernet V2.0/IEEE 802.3 [7] LAN type virtual interface of the IUT
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
    the IUT having received several GeoBroadcast messages
        containing different destination area from each others
        containing an ICMPv6 Router Advertisment (RA) message
    the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
    the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}

Expected behaviour

ensure that {
    when {
        the IUT receives a GeoBroadcast message
            containing Destination Area parameters corresponding to GVL1
            containing payload
                indicating an ICMPv6 RA packet
    }
    then {
        the IUT transmits on the virtual interface associated to GVL1 an Ethernet packet
            containing Destination MAC address
                indicating '33:33:00:00:00:01'
            containing Source MAC address
                indicating a value derived from Source GN_ADDR field (see note)
            containing Ether Type value
                indicating ICMPv6
            containing ICMPv6 RA payload
    }
}
NOTE: Reverse EUI-64 generation procedure.

TP Id	TP/IPv6GEO/MR/GVL/BV/06
Test objective	Checks handling of a received Router Advertisement message, which has destination area not corresponding to any existing GVL of the IUT of the IUT
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
    the IUT having received several GeoBroadcast messages
        containing different destination area from each others
        containing an ICMPv6 Router Advertisment (RA) message
    the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
    the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}	

Expected behaviour	

ensure that {
    when {
        the IUT receives a GeoBroadcast message
            containing Destination Area parameters not corresponding to any GVLs
            containing payload
                indicating an ICMPv6 RA packet
    }
    then {
        the IUT creates a new GVL and a new virtual interface associated to it
        the IUT transmits on the virtual interface associated to the new GVL an Ethernet packet
            containing Destination MAC address
                indicating '33:33:00:00:00:01'
            containing Source MAC address
                indicating a value derived from Source GN_ADDR field (see note)
            containing Ether Type value
                indicating ICMPv6
            containing ICMPv6 RA payload
    }
}	

NOTE: Reverse EUI-64 generation procedure.	

TP Id	TP/IPv6GEO/MR/GVL/BV/07
Test objective	Checks handling of a received IPv6 Unicast message, which has source position and destination address prefix corresponding to an existing GVL associated to an Ethernet V2.0/IEEE 802.3 LAN type virtual interface of the IUT
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

```
with {
    the IUT having received several GeoBroadcast messages
        containing different destination area from each others with some destination area overlaps
        containing different advertised address prefixes from each others
        containing an ICMPv6 Router Advertisment (RA) message
    the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
    the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GeoUnicast message
            containing Source position coordinates contained in several GVL areas
            containing an IPv6 unicast payload
                containing a wider-scope destination address
                containing a destination address prefix matching the address prefix associated to one GVL (GVLy)
    }
    then {
        the IUT transmits on the virtual interface associated to GVLy an Ethernet packet
            containing Destination MAC address
                indicating a value derived from the IUT's GN_ADDR field (see note)
            containing Source MAC address
                indicating a value derived from Source GN_ADDR field (see note)
            containing Ether Type value
                indicating IPv6
            containing IPv6 unicast payload
    }
}
```

NOTE:	Reverse EUI-64 generation procedure.

TP Id	TP/IPv6GEO/MR/GVL/BV/08
Test objective	Checks handling of a received IPv6 Unicast message, which has source position corresponding to an existing GVL, but has different destination address prefix
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

```
with {
    the IUT having received several GeoBroadcast messages
        containing different destination area from each others with some destination area overlaps
        containing different advertised address prefixes from each others
        containing an ICMPv6 Router Advertisment (RA) message
    the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
    the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GeoUnicast message
            containing Source position coordinates contained in several GVL areas
            containing an IPv6 unicast payload
                containing a wider-scope destination address
                containing a destination address prefix not matching the address prefix associated to any GVL
    }
    then {
        the IUT does not pass the received IPv6 message to the Upper Layer through any virtual interface
    }
}
```

TP Id	TP/IPv6GEO/MR/GVL/BV/09
Test objective	Checks handling of a received IPv6 Unicast message, which has destination address prefix corresponding to an existing GVL, but has a source position outside of the associated GVL area
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

```
with {
    the IUT having received several GeoBroadcast messages
        containing different destination area from each others
        containing different advertised address prefixes from each others
        containing an ICMPv6 Router Advertisment (RA) message
    the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
    the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GeoUnicast message
            containing an IPv6 unicast payload
                containing a wider-scope destination address
                containing a destination address prefix matching the address prefix associated to one GVL (GVLy)
            containing Source position coordinates outside the GVLy area
    }
    then {
        the IUT does not pass the received IPv6 message to the Upper Layer through any virtual interface
    }
}
```

5.2.2.2   TVL

TP Id	TP/IPv6GEO/MR/TVL/BV/01
Test objective	Checks handling of a received link-local IPv6 Unicast message, when using a TVL associated to an NBMA type virtual interface
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_TLV and PICS_NBMA
Initial conditions	

```
with {
    the IUT having a configured NBMA TVL (TVL1) and,
    the IUT's Upper Layer being configured to use the virtual interface associated with TVL1
}
```

Expected behaviour

```
ensure that {
    when {
        the IUT receives a GeoUnicast message
            containing an IPv6 unicast payload
                containing a source address
                    indicating a link-local unicast address (FE80::<IID>/10)
    }
    then {    the IUT transmits on the virtual interface associated to TVL1 an Ethernet packet
            containing Destination MAC address
                indicating a value derived from the IUT's GN_ADDR field (see note)
            containing Source MAC address
                indicating a value derived from Source GN_ADDR field (see note)
            containing Ether Type value
                indicating IPv6
            containing IPv6 unicast payload
    }
}
```

NOTE: Reverse EUI-64 generation procedure.

TP Id	TP/IPv6GEO/MR/TVL/BV/02
Test objective	Checks handling of a received link-local IPv6 Unicast message, when using a TVL associated to an Point-to-Point type virtual interface
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_TLV and PICS_Point-to-Point
Initial conditions	

with {
    the IUT having a configured Point-to-Point TVL (TVL1) and,
    the IUT's Upper Layer being configured to use the virtual interface associated with TVL1
}	

Expected behaviour	

ensure that {
    when {
        the IUT receives a GeoUnicast message
            containing an IPv6 unicast payload
                containing a source address
                    indicating a link-local unicast address (FE80::<IID>/10)
    }
    then {
        the IUT transmits on the virtual interface associated to TVL1 an IPv6 packet
    }
}	

5.2.3   Virtual Interface Management

5.2.3.1   New virtual interfaces

TP Id	TP/IPv6GEO/VM/NVI/BV/01
Test objective	Checks the Router Advertisement-triggered creation of a new GVL associated to an Ethernet V2.0/IEEE 802.3 [7] LAN type virtual interface
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
    the IUT having received several GeoBroadcast messages
        containing different destination area from each others
        containing different advertised address prefixes from each others
        containing an ICMPv6 Router Advertisment (RA) message
    the IUT having automatically configured GVLs (GVL1 .. GVLx) derived from each received RA
    the IUT's Upper Layer being automatically configured to use the virtual interface associated with each GVLs
}	

Expected behaviour	

ensure that {
    when {
        the IUT receives a GeoBroadcast message
            containing Destination Area parameters not corresponding to any GVLs
            containing an ICMPv6 RA payload
    }
    then {
        the IUT creates a new GVL and associates to it a new virtual interface (VI1)
            having a MAC address
                indicating a value derived from the IUT's GN_ADDR (see note)
    }
}	

NOTE: Reverse EUI-64 generation procedure.	

5.2.3.2   Expired virtual interfaces

TP Id	TP/IPv6GEO/VM/EVI/BV/01
Test objective	Checks the removal of an expired GVL and its associated virtual interface
Reference	TS 102 636-6-1 [1], clause 8.2.2
PICS Selection	PICS_GVL and PICS_Ethernet
Initial conditions	

with {
     the IUT having received a GeoBroadcast message
         containing several Prefix List entries (see note)
         containing an ICMPv6 Router Advertisment (RA) message
     the IUT having automatically configured a GVL (GVL1) derived from the received RA and
     the IUT's Upper Layer being automatically configured to use the virtual interface (VI1) associated with GVL1
 }	

Expected behaviour	

ensure that {
     when {
         every prefix entry associated to GVL1 has expired
     }
     then {
         the IUT removes the expired GVL1
         the IUT removes the associated virtual interface VI1
     }
 }	

NOTE: Each Prefix List entry has an expiration time.	

Annex A (informative):
Bibliography

- ETSI TS 102 636-1: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 1: Requirements".

- ETSI TS 102 636-2: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 2: Scenarios".

- ETSI TS 102 636-3: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network architecture".

- ETSI TS 102 859-1: "Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma".

- "GeoNet STREP N 216269 - D2.2 Final GeoNet Specification".

History

Document history		
V1.1.1	March 2011	Publication