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Technical Specification

Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT): IPv6 Core Protocol; Conformance Test Suite Structure and Test Purposes (TSS&TP)

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Methods for Testing and Specification (MTS).

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1 Scope

The purpose of the present document is to provide Test Suite Structure and Test Purposes (TSS&TP) for conformance tests of the core IPv6 protocol based on the requirements defined in the IPv6 requirements catalogue (TS 102 514 [2]) and written according to the guidelines of TS 102 351 [1], ISO/IEC 9646-2 [4] and ETS 300 406 [5].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
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 - for informative references.

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI TS 102 351: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); IPv6 Testing: Methodology and Framework".
- [2] ETSI TS 102 514: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); IPv6 Core Protocol; Requirements Catalogue".
- [3] ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".
- [4] ISO/IEC 9646-2: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite specification".
- [5] ETSI ETS 300 406: "Methods for Testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".
- [6] IETF RFC 1981: "Path MTU Discovery for IP version 6".
- [7] IETF RFC 2460: "Internet Protocol, Version 6 (IPv6) Specification".
- [8] IETF RFC 2461: "Neighbor Discovery for IP Version 6 (IPv6)".

- [9] IETF RFC 2463: "Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification".
- [10] IETF RFC 2675: "IPv6 Jumbograms".
- [11] IETF RFC 3513: "Internet Protocol Version 6 (IPv6) Addressing Architecture".

2.2 Informative references

- [12] IETF RFC 2374: "An IPv6 Aggregatable Global Unicast Address Format".
- [13] IETF RFC 2462: "IPv6 Stateless Address Autoconfiguration".
- [14] IETF RFC 2711: "IPv6 Router Alert Option".
- [15] IETF RFC 2894: "Router Renumbering for IPv6".
- [16] IETF RFC 3484: "Default Address Selection for Internet Protocol version 6 (IPv6)".

3 Definitions and abbreviations

3.1 Definitions

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

abstract test case: Refer to ISO/IEC 9646-1 [3].

Abstract Test Method (ATM): Refer to ISO/IEC 9646-1 [3].

Abstract Test Suite (ATS): Refer to ISO/IEC 9646-1 [3].

Implementation Under Test (IUT): Refer to ISO/IEC 9646-1 [3].

Lower Tester (LT): Refer to ISO/IEC 9646-1 [3].

Test Purpose (TP): Refer to ISO/IEC 9646-1 [3].

3.2 Abbreviations

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

ATS	Abstract Test Suite
IETF	Internet Engineering Task Force
IPv6	Internet Protocol version 6
IUT	Implementation Under Test
RC	Requirements Catalogue
RQ	Requirement
TP	Test Purpose
TSS	Test Suite Structure
UDP	User Datagram Protocol

4 Test Suite Structure (TSS)

Test Purposes have been written for IPv6 nodes, hosts and routers according to the requirements (RQ) of the requirements catalogue (RC) in TS 102 514 [2]. Test purposes have been written for behaviours requested with "MUST" or "SHOULD", optional behaviour described with "MAY" or similar wording indicating an option has not been turned into test purposes.

The test purposes have been divided into three groups:

Group 1: Node tests (all sub-groups)

Group 2: Host tests (only sub-groups that carry test purposes)

Group 3: Router tests (only sub-groups that carry test purposes)

The sub-grouping of these three groups follows the structure of the RC. Some of the sub-groups of the RC contained no testable requirement. Headings for those sub-groups are in this test purpose document in the node group to give a full view on the relation between RQ and TSS&TP.

Group 1	"Node tests (NT)"
Group 1.1	"Generate IPv6 packets (GIP)"
Group 1.1.1	"Generate Extension Header (GEH)"
Group 1.1.1.1	"Generate Destination Options Header (GDOH)"
Group 1.1.1.2	"Generate Routing Header (GRH)"
Group 1.1.1.3	"Generate Hop by Hop Header (GHHH)"
Group 1.1.2	"Generate IPv6 Header (GIH)"
Group 1.1.3	"Discover PMTU (DPMTU)"
Group 1.1.3.1	"Multicast PMTU Discovery (MPMTUD)"
Group 1.2	"Process IPv6 packets (PIP)"
Group 1.2.1	"Process Extension Headers (PEH)"
Group 1.2.1.1	"Process Fragment Packets (PFP)"
Group 1.2.1.2	"Process Routing Header (PRH)"
Group 1.2.1.3	"Process Hop-By-Hop Header (PHBHH)"
Group 1.2.1.4	"Process Extension Header Options (PEHO)"
Group 1.2.2	"Process IPv6 Header (PIP6)"
Group 1.2.2.1	"Process Hop Limit (PHL)"
Group 1.2.2.2	"Process Traffic Class (PTC)"
Group 1.2.2.3	"Process Flow Label (PHL)"
Group 1.2.2.4	"Process Checksum (PSC)"
Group 1.3	"Initialize (INI)"
Group 1.3.1	"Determine Default MTU (DDMTU)"
Group 1.3.2	"Configure Address (CA)"
Group 1.3.2.1	"Manual Address Configuration (MAC)"

Group 1.3.2.2	"Stateless Autoconfiguration (SLAC)"
Group 1.3.2.2.1	"Form Link-local Address (LLA)"
Group 1.3.2.2.2	"Process Invalid SA Syntax (PISAS)"
Group 1.3.2.3	"Stateful Autoconfiguration (SFAC)"
Group 1.3.2.4	"Simultaneous Stateless and Stateful Autoconfiguration (SSSAC)"
Group 1.3.2.5	"Detect Duplicate Address (DAD)"
Group 1.3.2.5.1	"Duplicate Address Detection Timers and Counters (DADTMR)"
Group 1.3.2.6	"Assign Global Address (GA)"
Group 1.3.2.6.1	"Use of M-Bit (UMB)"
Group 1.3.2.6.2	"Use of O-Bit (UOB)"
Group 1.3.2.6.3	"Process the Prefix Information Option (PPIO)"
Group 1.4	"Address use (AU)"
Group 1.5	"ICMPv6 Functions (ICF)"
Group 1.5.1	"Protect ICMP Messages from Attacks (PIMA)"
Group 1.5.2	"Process ICMPv6 Messages (PIM)"
Group 1.5.2.1	"Process ICMPv6 Information Messages (PIIM)"
Group 1.5.2.1.1	"Process Echo Reply Message (PERPM)"
Group 1.5.2.1.2	"Process Echo Request Message (PERQM)"
Group 1.5.2.2	"Process ICMPv6 Error Messages (PEM)"
Group 1.5.2.2.1	"Process Parameter Problem Message (PPPM)"
Group 1.5.2.2.2	"Process Time Exceeded Message (PTM)"
Group 1.5.2.2.3	"Process Packet Too Big Message (PPTBM)"
Group 1.5.2.2.4	"Process Destination Unreachable Message (PDUM)"
Group 1.5.3	"Generate ICMPv6 Messages (GIM)"
Group 1.5.3.1	"Generate ICMPv6 Information Messages (GIIM)"
Group 1.5.3.1.1	"Generate Echo Request Message (GERQM)"
Group 1.5.3.2	"Generate ICMPv6 Error Messages (GIEM)"
Group 1.5.3.2.1	"Generate Parameter Problem Message (GPPM)"
Group 1.5.3.2.2	"Generate Time Exceeded Message (GTEM)"
Group 1.5.3.2.3	"Generate Message Too Big Message (GMTBM)"
Group 1.5.3.2.4	"Generate Destination Unreachable Message (GDEM)"
Group 1.5.3.2.4.1	"Destination Unreachable Code Field Value (DUCFV)"
Group 1.5.3.2.5	"Limit ICMP Bandwidth and Forwarding Costs (LIBFC)"
Group 1.5.3.3	"Determine ICMPv6 Message Source Address (DIMSA)"
Group 1.6	"Neighbour Discovery (ND)"

Group 1.6.1	"ND Protocol Constants and Default Values (NDPCDV)"
Group 1.6.2	"Address Resolution (AR)"
Group 1.6.2.1	"Address Resolution Behavior (ARB)"
Group 1.6.2.2	"Address Resolution Data Queue Handling (ARDQH)"
Group 1.6.3	"Neighbor Unreachability Detection (NUD)"
Group 1.6.3.1	"Neighbour Reachability Process (NRP)"
Group 1.6.3.1.1	"Start Neighbor Reachability Determination (SNRD)"
Group 1.6.3.1.2	"Determine Neighbor Reachability (DNR)"
Group 1.6.3.1.3	"Invalid Reachability Indications (IRI)"
Group 1.6.3.2	"Neighbor Reachability Probing (NRP)"
Group 1.6.4	"Next Hop Determination (NHD)"
Group 1.6.5	"Using Options in Neighbor Discovery Messages (UONDM)"
Group 1.6.6	"Process Neighbor Discovery Messages (PND)"
Group 1.6.6.1	"Process Neighbor Solicitation (PNS)"
Group 1.6.6.1.1	"Discover Neighbor by NS (DNNS)"
Group 1.6.6.1.2	"Process Proxy NS (PPNS)"
Group 1.6.6.1.3	"Process Anycast NS (PANS)"
Group 1.6.6.1.4	"Process NS for Address Resolution (PNSAR)"
Group 1.6.6.1.5	"Process Field Anomalies in NS (NSFA)"
Group 1.6.6.1.6	"Process Option Anomalies in NS (NSOA)"
Group 1.6.6.2	"Process Neighbor Advertisement (PNA)"
Group 1.6.6.2.1	"Process Solicited Neighbor Advertisement (PSNA)"
Group 1.6.6.2.2	"Process Unsolicited Neighbor Advertisement (PUNA)"
Group 1.6.6.2.3	"Discover Neighbor by NA (DNNA)"
Group 1.6.6.2.4	"Process Field Anomalies in NA (PFANA)"
Group 1.6.6.2.5	"Process Option Anomalies in NA (POANA)"
Group 1.6.6.3	"Process Router Solicitation (PRA)"
Group 1.6.6.3.1	"Discover Neighbor by RS (DNRS)"
Group 1.6.6.3.2	"Router Processing of RS (RPRS)"
Group 1.6.6.3.3	"Host Processing of RS (HPRS)"
Group 1.6.6.3.4	"Process Field Anomalies in RS (PFARS)"
Group 1.6.6.3.5	"Process Option Anomalies in RS (POARS)"
Group 1.6.6.4	"Process Router Advertisement (PRA)"
Group 1.6.6.4.1	"Discover Neighbor by RA (DNRA)"
Group 1.6.6.4.2	"Router Processing of RA (RPRA)"

Group 1.6.6.4.3	"Host Processing of RA (HPRA)"
Group 1.6.6.4.4	"Process Field Anomalies in RA (PFARA)"
Group 1.6.6.4.5	"Process Option Anomalies in RA (PAORA)"
Group 1.6.6.5	"Process Redirect Message (PRM)"
Group 1.6.6.5.1	"Discover Neighbor by Redirect Message (DNRM)"
Group 1.6.6.5.2	"Router Processing of Redirect Message (RPRM)"
Group 1.6.6.5.3	"Host Processing of Redirect Message (HPRM)"
Group 1.6.6.5.4	"Process Field Anomalies in Redirect Message (PFARM)"
Group 1.6.6.5.5	"Process Option Anomalies in Redirect Message (POARM)"
Group 1.6.7	"Generate Neighbor Discovery Messages (GNDM)"
Group 1.6.7.1	"Generate Neighbor Solicitation (GNS)"
Group 1.6.7.1.1	"Generate Neighbor Solicitation Header (GNSH)"
Group 1.6.7.1.2	"Generate Neighbor Solicitation Option (GNSO)"
Group 1.6.7.1.3	"Generate NS for Address Resolution (GNSAR)"
Group 1.6.7.2	"Generate Neighbor Advertisement (GNA)"
Group 1.6.7.2.1	"Generate Unsolicited Neighbor Advertisement (GUNA)"
Group 1.6.7.2.1.1	"Form Unsolicited NA Header (FUNAH)"
Group 1.6.7.2.1.2	"Generate Unsolicited Proxy NA (GUPNA)"
Group 1.6.7.2.1.3	"Generate Unsolicited Anycast NA (GUANA)"
Group 1.6.7.2.2	"Form Neighbor Advertisement Header (FNAH)"
Group 1.6.7.3	"Generate Router Solicitation (GRA)"
Group 1.6.7.4	"Generate Router Advertisement (GRA)"
Group 1.6.7.5	"Generate Redirect Message (GRM)"
Group 1.7	"Address Architecture (AA)"
Group 1.8	"Jumbograms (JG)"
Group 1.8.1	"TCP Jumbograms (TCPJG)"
Group 1.8.2	"UDP Jumbograms (UDPJG)"
Group 1.8.3	"Process Jumbograms (PJG)"
Group 1.8.4	"Generate Jumbograms (GJG)"
Group 2	"Host (HS)"
Group 2.3	"Initialize (INI)"
Group 2.3.2.2.1	"Form Link-local Address (LLA)"
Group 2.3.2.6	"Assign Global Address (GA)"
Group 2.3.2.6.1	"Use of M-bit (UMB)"
Group 2.3.2.6.2	"Use of O-Flag (UOB)"

Group 2.3.2.6.3	"Process the Prefix Information Option (PFX)"
Group 2.6	"Neighbour Discovery (ND)"
Group 2.6.1	"ND Protocol Constants and Default Values (NDPCDV)"
Group 2.6.6.1.4	"Process NS for Address Resolution (PNSAR)"
Group 2.6.6.3.3	"Host Processing of RS (HPRS)"
Group 2.6.6.4.3	"Host Processing of RA (HPRA)"
Group 2.6.6.4.5	"Process Option Anomalies in RA (POARA)"
Group 2.6.6.5.3	"Host Processing of Redirect Message (HPRM)"
Group 2.6.6.5.4	"Process Field Anomalies in Redirect Message (PFARM)"
Group 2.6.6.5.5	"Process Option Anomalies in Redirect Message (POARM)"
Group 2.6.7.3	"Generate Router Solicitation (GRS)"
Group 2.6.7.3.1	"Generate Router Solicitation Header (GRSH)"
Group 2.6.7.3.2	"Generate RS Source Link-layer Address Option (GRSSLAO)"
Group 2.6.7.3.3	"Router Solicitation Behavior (RSB)"
Group 3	"Router (RT)"
Group 3.2	"Process IPv6 packets (PIP)"
Group 3.2.1.2	"Process Routing Header (PRH)"
Group 3.3	"Initialize (INI)"
Group 3.3.2	"Configure Address {CA}"
Group 3.3.2.2	"Stateless Autoconfiguration (SAC)"
Group 3.3.2.2.1	"Form Link-local Address (LLA)"
Group 3.5	"ICMPv6 Functions (ICF)"
Group 3.5.2	"Process ICMPv6 Messages (PIM)"
Group 3.5.3.2.2	"Generate Time Exceeded Message (GTEM)"
Group 3.5.3.2.3	"Generate Message Too Big Message (GMTBM)"
Group 3.5.3.2.4	"Generate Destination Unreachable Message (GTEM)"
Group 3.5.3.2.4.1	"Destination Unreachable Code Field Value (DUCFV)"
Group 3.6	"Neighbour Discovery (ND)"
Group 3.6.1	"ND Protocol Constants and Default Values (NDPCDV)"
Group 3.6.2.1	"Address Resolution Behavior (ARB)"
Group 3.6.3.1.1	"Start Neighbor Reachability Determination (SNRD)"
Group 3.6.6.1.4	"Process NS for Address Resolution (PNSAR)"
Group 3.6.6.3	"Process Router Solicitation (PRS)"
Group 3.6.6.3.1	"Discover Neighbor by RS (DNRS)"
Group 3.6.6.3.2	"Router Processing of RS (RPRS)"

Group 3.6.6.3.4	"Process Field Anomalies in RS (PFARS)"
Group 3.6.6.3.5	"Process Option Anomalies in RS (POARS)"
Group 3.6.6.5.2	"Router Processing of Redirect Message (RPRM)"
Group 3.6.7.2	"Generate Neighbor Advertisement (GNA)"
Group 3.6.7.2.1.2	"Generate Unsolicited Proxy NA (GUPNA)"
Group 3.6.7.4	"Generate Router Advertisement (GRA)"
Group 3.6.7.4.1	"Form Router Advertisement Header (FRAH)"
Group 3.6.7.4.2	"Form Router Advertisement Options (FRAO)"
Group 3.6.7.4.2.1	"RA MTU Option (RAMTUO)"
Group 3.6.7.4.2.2	"RA Source Link-layer Address Option (RASLAO)"
Group 3.6.7.4.2.3	"RA Prefix Information Option (RAPIO)"
Group 3.6.7.4.3	"Router Advertisement Behavior (RAB)"
Group 3.6.7.4.3.1	"Startup Router Advertisement Behavior (SRAB)"
Group 3.6.7.4.3.1.1	"AdvCurHopLimit (ACHL)"
Group 3.6.7.4.3.1.2	"AdvDefaultLifetime (ADL)"
Group 3.6.7.4.3.1.3	"AdvManagedFlag (AMF)"
Group 3.6.7.4.3.1.4	"AdvOtherConfigFlag (AOCF)"
Group 3.6.7.4.3.1.5	"AdvReachableTime (ART)"
Group 3.6.7.4.3.1.6	"AdvRetransTimer (ADRT)"
Group 3.6.7.4.3.1.7	"MaxRtrAdvInterval (MAXRAI)"
Group 3.6.7.4.3.1.8	"MinRtrAdvInterval (MINRAI)"
Group 3.6.7.4.3.2	"Router Advertisement Behavior on Reconfiguration (RABR)"
Group 3.6.7.5	"Generate Redirect Message (GRM)"
Group 3.6.7.5.1	"Generate Redirect Options (GRO)"
Group 3.6.7.5.2	"Determine Redirect Target Address Field (DRTA)"

5 Test Purposes (TP)

The test purposes have been written in the formal notation TPlan as described in annex A of TS 102 351 [1]

```

TSS      : COR
Title    : 'IPv6 Core TSS and TP'
Version  : 1.0.1
Date     : 12.09.2007
Author   : 'STF276'
-- *****

--***Cross references***

xref RQ_000 { RFC 2460, RF C2461, RFC 2463, RFC 2463, RFC 3513, RFC 1981, RFC 2675 }

--***Definitions***

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