



**Integrated broadband cable  
telecommunication networks (CABLE);  
Testing;  
Conformance test specifications for 6rd technology;  
Part 2: Test Suite Structure and  
Test Purposes (TSS&TP)**

STANDARDS PREVIEW  
<https://standards.iso.org/standards/catalogue/etsi-ts-103-243-2-v1.1.1-37ea-4cf3-b105-4540-51964ae0-2-2-v1.1.1->

## Reference

DTS/CABLE-00015-2

## Keywords

IP, IPv6, transition, TSS&amp;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  
Sous-Préfecture de Grasse (06) N° 7803/88

**Important notice**

The present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

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

[http://portal.etsi.org/chaicor/ETSI\\_support.asp](http://portal.etsi.org/chaicor/ETSI_support.asp)

**Copyright Notification**

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

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

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

© European Telecommunications Standards Institute 2014.

All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

**GSM®** and the GSM logo are Trade Marks registered and owned by the GSM Association.

# Contents

|   |           |
|---|-----------|
| Intellectual Property Rights .....              | 4         |
| Foreword.....                                   | 4         |
| Modal verbs terminology.....                    | 4         |
| 1 Scope .....                                   | 5         |
| 2 References .....                              | 5         |
| 2.1 Normative references .....                  | 5         |
| 2.2 Informative references.....                 | 5         |
| 3 Abbreviations .....                           | 5         |
| 4 Test Suite Structure .....                    | 6         |
| 5 Test Purposes (TP) .....                      | 7         |
| 5.1 TPs for CPE.....                            | 7         |
| 5.1.1 Gateway Assignment .....                  | 7         |
| 5.1.2 Basic Function .....                      | 8         |
| 5.1.3 Fragmentation .....                       | 8         |
| 5.1.4 MSS Clamping.....                         | 9         |
| 5.1.5 Tunnel Identifiers.....                   | 10        |
| 5.2 TPs for BR.....                             | 10        |
| 5.2.1 Basic Function .....                      | 10        |
| 5.2.2 Session Control.....                      | 11        |
| 5.2.3 Fragmentation .....                       | 11        |
| 5.2.4 MSS Clamping.....                         | 12        |
| 5.2.5 NAT Timers.....                           | 13        |
| 5.2.6 Anycast Addressing .....                  | 13        |
| 5.2.7 Address Withdrawal .....                  | 14        |
| 5.2.8 Routing Tables.....                       | 15        |
| <b>Annex A (informative): Bibliography.....</b> | <b>17</b> |
| History .....                                   | 18        |

---

## Intellectual Property Rights

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

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

---

## Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Integrated broadband cable telecommunication networks (CABLE).

The present document produced for the transition technologies accommodates an urgent need in the industry to define requirements that enable seamless transition of Cable Networks to IPv6. Considering the depletion of IPv4 addresses, transition to IPv6 is required in order to enable continued growth of the customer base connected to Cable Networks and ensure service continuity for existing and new customers. High-quality connectivity to all kinds of IP-based services and networks is essential in today's business and private life.

A plethora of transition technologies have been proposed in IETF, other standardization organizations and by manufacturers of IP technology to allow coexistence of IPv4 and IPv6 hosts, access and core networks as well as services. Each of these technology options is specified, implemented and deployed in various forms and stages. The present document is based on the requirements of ETSI TS 101 569-1 [1].

The present document is part 2 of a multi-part deliverable covering the conformance tests specification for 6rd technology.

- Part 1: "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)".

---

## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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

---

## 1 Scope

The present document provides the Test Suite Structure and Test Purposes (TSS&TP) descriptions for the IPv6 transition technology 6rd to validate its implementation within a cable communications networks.

The tests are in reference to [1], the ETSI specifications for IPv6 transition technology.

The ISO standards for the methodology of conformance testing (ISO/IEC 9646-1 [i.4] and ISO/IEC 9646-2 [i.5]) as well as the ETSI rules for conformance testing (ETSI ETS 300 406 [i.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 101 569-1: "Integrated Broadband Cable Telecommunication Networks (CABLE); Cable Network Transition to IPv6 Part 1: IPv6 Transition Requirements".

### 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.4] ISO/IEC 9646-1 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts".
- [i.5] ISO/IEC 9646-2 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite specification".
- [i.6] ETSI ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".
- 

## 3 Abbreviations

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

|      |  |
|------|--|
| 6rd  | IPv6 Rapid Deployment                  |
| ATS  | Abstract Test Suite                    |
| B4   | (6rd) Basic Bridging BroadBand element |
| BR   | Border Relay                           |
| CPE  | Customer Premises Equipment            |
| DF   | Don't Fragment flag (in IPv4 header)   |
| GRT  | Global Routing Table                   |
| GW   | GateWay                                |
| HTML | HyperText Markup Language              |

|      |  |
|------|--|
| IP   | Internet Protocol  |
| IPv4 | IP version 4   |
| IPv6 | IP version 6   |
| IUT  | Implementation Under Test                                |
| MSS  | (TCP) Maximum Segment Size                               |
| MTS  | Methods for Testing and Specification                    |
| MTU  | Maximum Transmission Unit                                |
| NAT  | Network Address Translation / Network Address Translator |
| PICS | Protocol Implementation Conformance Statement            |
| TCP  | Transmission Control Protocol                            |
| VRF  | Virtual Routing and Forwarding                           |

## 4 Test Suite Structure

The identifier of the TP is built according to table 1 as recommended in the MTS methodologies.

**Table 1: TP naming convention for 6rd**

| TP/<root>/<gr>/<sgr>/<x>/<nn>                   |      |   |
|---|------|---|
| <root> = root                                   | 6RD  | IPv6 encapsulated within IPv4 – IPv6 rapid deployment |
| <gr> = group                                    | BR   | Border Router   |
|   | CPE  | Customer Premise Equipment                            |
| <sgr> = sub-group                               | BF   | Basic Function  |
|   | AA   | Anycast Addressing                                    |
|   | AW   | Address Withdrawal                                    |
|   | FRAG | Fragmentation   |
|   | MSSC | Maximum Segment Size Clamping                         |
|   | TI   | Tunnel Identifiers                                    |
|   | NT   | NAT Timers  |
|   | SC   | Session Control                                       |
|   | RT   | Routing Tables  |
|   | GWA  | Gateway Assignment                                    |
| <x> = type of testing                           | BV   | Valid Behaviour tests                                 |
| <nn> = sequential number                        |      | 01 to 99  |
| NOTE: A sub-group may not apply for all groups. |      |   |

## 5 Test Purposes (TP)

This clause proposes a TP proforma which is used in the present document. The fields of this proforma as used in the present document are explained in table 2.

**Table 2: TP proforma field description**

| TP Header                            |   |
|--------------------------------------|---|
| <b>TP ID</b>                         | The TP ID is a unique identifier according to the TP naming conventions in table 1  |
| <b>Test objective</b>                | Short description of test purpose objective according to the requirements from the base standard.   |
| <b>Reference</b>                     | The reference indicates the clauses of the reference standard specifications in which the conformance requirement is expressed.   |
| <b>PICS selection</b>                | Reference to the PICS statement involved for selection of the TP. Contains a Boolean expression. May contain PICS acronyms specified in table. This section is only used in case an optional or conditional behaviour needs to be selected. Mandatory behaviour is not identified here. |
| TP Behaviour                         |   |
| <b>Initial conditions (optional)</b> | The initial conditions define in which initial state the IUT has to be to apply the actual TP. In the corresponding "Test Case" (TC), when the execution of the initial condition does not succeed, it leads to the assignment of an Inconclusive verdict.                              |
| <b>Expected behaviour (TP body)</b>  | 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 TC, " Pass" or "Fail" verdicts can be assigned there.  |

### 5.1 TPs for CPE

#### 5.1.1 Gateway Assignment

|  |   |
|--|---|
| <b>TP Id</b>   | TP/6RD/CPE/GWA/BV/01  |
| <b>Test objective</b>  | Check that IUT sends a DHCPv4 Request to the DHCPv4 Server after initialization |
| <b>Reference</b>   | [1]: clause 6.8.9.3 Feature: 6RD Configuration                                  |
| <b>Initial conditions</b>  |   |
| with {<br>the IUT is properly provisioned<br>the interfaces are connected & functional<br>}  |   |
| <b>Expected behaviour</b>  |   |
| ensure that {<br>when {<br>the IUT goes online<br>the IUT sends a DHCPv4 Request to DHCPv4 Server<br>}<br>then {<br>the IUT receives the external interface address assignment<br>}<br>} |   |

### 5.1.2 Basic Function

|   |  |
|---|--|
| <b>TP Id</b>  | TP/6RD/ CPE/BF/BV/01   |
| <b>Test objective</b>   | Check that the IUT supports the functionality of 6RD encapsulation |
| <b>Reference</b>  | [1]: clause 6.8.9.12 Feature: NAT                                  |
| <b>Initial conditions</b>   |  |
| <p><b>with {</b><br/> the IUT being properly provisioned<br/> and the interfaces are connected &amp; functional<br/> <b>}</b></p>   |  |
| <b>Expected behaviour</b>   |  |
| <p><b>ensure that {</b><br/> <b>when {</b><br/> the IUT receives multiple HTML IPv6 packets<br/> containing source address<br/> indicating a public IPv6 address<br/> containing destination address<br/> indicating a public IPv6 address<br/> from multiple hosts<br/> <b>}</b><br/> <b>then {</b><br/> the IUT encapsulates each HTML IPv6 packet unchanged into IPv4 packet<br/> containing destination address<br/> indicating IPv4 BR GW address<br/> and the IUT forwards the packet to the BR<br/> <b>}</b><br/> <b>}</b></p> |  |

### 5.1.3 Fragmentation

|   |   |
|---|---|
| <b>TP Id</b>  | TP/6RD/CPE/FRAG/BV/01                                     |
| <b>Test objective</b>   | Check that the IUT fragments an HTML IPv6 packet upstream |
| <b>Reference</b>  | [1]: clause 6.8.7.21 Feature: Fragmentation & Buffering   |
| <b>Initial conditions</b>   |   |
| <p><b>with {</b><br/> the physical MTU (Phy-MTU) size being equal or greater than the 6RD IPv4 packet between all devices<br/> and the 6RD Tunnel MTU (6RD-MTU) being lower than the encapsulated software packet<br/> <b>}</b></p>   |   |
| <b>Expected behaviour</b>   |   |
| <p><b>ensure that {</b><br/> <b>when {</b><br/> the IUT receives multiple HTML IPv6 packets<br/> containing source address<br/> indicating a public IPv6 address<br/> containing destination address<br/> indicating a public IPv6 address<br/> from multiple hosts<br/> containing the DF bit<br/> indicating the value 0.<br/> with a packet size greater than the 6RD tunnel MTU<br/> <b>}</b><br/> <b>then {</b><br/> the IUT fragments into IPv4 packets<br/> and the IUT forwards correctly formatted IPv4 through the tunnel<br/> <b>}</b><br/> <b>}</b></p> |   |



|  |  |
|--|--|
| <b>TP Id</b>   | TP/6RD/CPE/FRAG/BV/02  |
| <b>Test objective</b>  | Check that the IUT reassembles an IPv6 payload from the IPv4 packet downstream |
| <b>Reference</b>   | [1]: clause 6.8.7.21 Feature: Fragmentation & Buffering                        |
| <b>Initial conditions</b>  |  |
| <p>with {<br/> the IUT being properly provisioned<br/> and the interfaces are connected &amp; functional<br/> }</p>  |  |
| <b>Expected behaviour</b>  |  |
| <p>ensure that {<br/> <b>when</b> {<br/> the IUT receives multiple IPv4 packets<br/> containing IPv4 transport header<br/> containing source address<br/> indicating B4 IPv4 address<br/> containing destination address<br/> indicating IUT GW IPv4 address<br/> containing IPv6 payload<br/> containing source address<br/> indicating a public IPv6 address<br/> containing destination address<br/> indicating a public IPv6 address<br/> containing the IPv6 fragments within the IPv4 packets<br/> from multiple source hosts<br/> }<br/> <b>then</b> {<br/> the IUT reorders &amp; reassembles into IPv6 packets<br/> and the IUT forwards correctly formatted IPv6<br/> }<br/> }</p> |  |

#### 5.1.4 MSS Clamping

|  |   |
|--|---|
| <b>TP Id</b>   | TP/6RD/CPE/MSSC/BV/01                                   |
| <b>Test objective</b>  | Check that the IUT functions with MSS clamping upstream |
| <b>Reference</b>   | [1]: clause 6.8.7.20 Feature: MSS Clamping              |
| <b>Initial conditions</b>  |   |
| <p>with {<br/> the physical MTU (Phy-MTU) size being equal or greater than the 6RD IPv6 packet between all devices<br/> and the 6RD Tunnel MTU (6RD-MTU) being lower than the encapsulated softwired packet<br/> and the MSS value is below that of the TCP segment size of the incoming packet<br/> }</p>   |   |
| <b>Expected behaviour</b>  |   |
| <p>ensure that {<br/> <b>when</b> {<br/> the IUT receives multiple HTML IPv6 packets<br/> containing source address<br/> indicating a public IPv6 address<br/> containing destination address<br/> indicating a public IPv6 address<br/> from multiple hosts<br/> with a segment size greater than the IUT MSS value<br/> }<br/> <b>then</b> {<br/> the IUT receives the packet<br/> and the IUT drops the packet &amp; returns a packet-too-big message to the originator<br/> }<br/> }</p> |   |