



TECHNICAL SPECIFICATION

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

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ETSI

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

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

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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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-F [1].

The present document is part 2 of a multi-part deliverable covering the conformance test specification for DS-Lite 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).

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1 Scope

The present document provides the Test Suite Structure and Test Purposes (TSS&TP) descriptions for the IPv6 transition technology DS-Lite 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 [2] and ISO/IEC 9646-2 [3]) as well as the ETSI rules for conformance testing (ETSI ETS 300 406 [4]) 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] 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] ETSI ETS 300 406: "Methods for Testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".
- [5] IETF RFC 6333: "Dual-Stack Lite Broadband Deployments Following IPv4 Exhaustion".

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.

Not applicable.

3 Abbreviations

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

AFTR	Address Family Transition Router
ALG	Application Layer Gateway
ATS	Abstract Test Suite
B4	(DS-Lite) Basic Bridging BroadBand element
CPE	Customer Premises Equipment
DF	Don't Fragment flag (in IPv4 header)

DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DSLITE	Dual-Stack Lite
DS-MTU	DS-Lite Tunnel MTU
FTP	File Transfer Protocol
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
TC	Test Case
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

TP/<root>/<gr>/<sgr>/<x>/<nn>	
<root> = root	DSLITE Dual-Stack Lite
<gr> = group	B4
<sgr> = sub-group	AFTR
	GWA Gateway Assignment
	BF Basic Function
	MSS Maximum Segment Size
	FRAG Fragmentation
	ALG Application Layer Gateway
	RT Routing Tables
	AW Address Withdrawal
<x> = type of testing	BV Valid Behaviour tests
	TI Timer
<nn> = sequential number	01 to 99

5 Test purposes

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	
TP ID	The TP ID is a unique identifier according to the TP naming convention in table 1
Test objective	Short description of test purpose objective according to the requirements from the base standard.
Reference	The reference indicates the clauses of the reference standard specifications in which the conformance requirement is expressed.
TP Behaviour	
Initial conditions (optional)	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.
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 TC, " Pass" or "Fail" verdicts can be assigned there.

5.1 TPs for B4

5.1.1 Gateway Assignment

TP Id	TP/DSLITE/B4/GWA/BV/01
Test objective	Check that IUT sends a DHCPv6 Request to the DHCPv6 Server after initialization.
Reference	[1]: clause 6.3.8 Feature: DS-Lite CPE Requirements
Initial conditions	
with { the IUT is properly provisioned the interfaces are connected & functional }	
Expected behaviour	
ensure that { when { the IUT goes online } then { the IUT sends a DHCPv6 Request to DHCPv6 Server containing the Option field indicating the AFTR-name DHCPv6 Option (value 64) } }	

TP Id	TP/DSLITE/B4/GWA/BV/02
Test objective	Check that IUT sends a DNS Query to the DNS Server
Reference	[1]: clause 6.3.8 Feature: DS-Lite CPE Requirements
Initial conditions	
with { the IUT having sent a DHCPv6 Request to the DHCPv6 Server }	
Expected behaviour	
ensure that { when { the IUT receives a DHCPv6 Reply from the DHCPv6 Server } then { the IUT sends a DNS query containing the Resolver request name indicating the AFTR-name received in the DHCPv6 Reply } }	

TP Id	TP/DSLITE/B4/GWA/BV/03
Test objective	Check that IUT correctly adds the AFTR IPv6 address
Reference	[1]: clause 6.3.6.13 Feature: AFTR Address
Initial conditions	
with { the IUT having sent a DNS query }	
Expected behaviour	
ensure that { when { the IUT receives the DNS response } then { the IUT adds the AFTR GW IPv6 address to the default route configuration } }	
NOTE:	To check the default route configuration for DS-Lite a HTML IPv4 packet is sent from Test System to the IUT.

5.1.2 Basic Function

TP Id	TP/DSLITE/B4/BF/BV/01
Test objective	Check that the IUT correctly encapsulates and forwards the IPv4 packets from multiple hosts
Reference	[1]: clause 6.3.1 DS-Lite Technology Feature Summary
Initial conditions	
with { the IUT being configured with a correct AFTR GW IPv6 address }	
Expected behaviour	
ensure that { when { the IUT receives multiple HTML IPv4 packets containing source address indicating a private IPv4 address containing destination address indicating a public IPv4 address from multiple hosts } then { the IUT encapsulates each HTML IPv4 packet unchanged into IPv6 packet containing destination address indicating IPv6 AFTR GW address and the IUT forwards the packet to the AFTR GW } }	

5.1.3 Fragmentation

TP Id	TP/DSLITE/B4/FRAG/BV/01
Test objective	Check that the IUT fragments an HTML IPv4 packet when DF bit is not set
Reference	[1]: clause 6.3.6.22 Feature: DS-Lite Fragmentation and Buffering according to RFC 6333 [5]
Initial conditions	
with { the physical MTU (Phy-MTU) size being equal or greater than the IPv4 or IPv6 packet between all devices and the DS-lite Tunnel MTU (DS-MTU) being lower than the encapsulated softwired packet }	
Expected behaviour	
ensure that { when { the IUT receives an HTML IPv4 packet containing source address indicating a private IPv4 address containing the DF bit indicating the value 0. with a packet size greater than the DS-MTU } then { the IUT fragments that packet before it encapsulates it in IPv6 and the IUT forwards correctly formatted fragmented packets to the AFTR } }	