
Reference

DTS/CABLE-00018-1

Keywords

cable, HFC, IPv6

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/standards-search>

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

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

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

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

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 2016.

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
Introduction	4
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references.....	8
3 Definitions and abbreviations.....	8
3.1 Definitions	8
3.2 Abbreviations	9
4 General Considerations	9
5 IPv6 Transition Technologies Overview.....	11
Annex A (informative): Bibliography.....	14
History	15

iTeh STANDARD PREVIEW
 (standards.iteh.ai)
 Full standard:
<https://standards.iteh.ai/catalog/standards/sist/00c6f12-0324-4a8a-ba3e-27474b5fac1c/etsi-ts-103-443-1-v1.1.1-2016-08>

Since then the industry has acquired more experience with the technology options settling in the main for DS-Lite across the cable network market and NAT64 IPv6 transition technologies across the mobile market.

The present document is the final part of a companion of ETSI standards developed in 4 phases to provide the cable sector in particular cable operators engineering and operational staff a standardized approach when integrating one of the five IPv6 transition technologies, NAT64, DS-Lite, 464XLAT, 6RD and MAP-E.

The first phase assessed the different IPv6 transition technology options being defined by industry with recommendation for the most appropriate with consideration of current network architectures, ensuring adequate scale and a cost effective transition approach from IPv4 to IPv6 as the IPv4 addresses deplete. The objective being to examine the pros and cons of the IPv6 transition technologies and recommend the most cost effective solution that would enable the cable operators to minimize the cost of upgrades to their existing network plant whilst maintain continuity of services to their present and new added customers. The details of the study are given by ETSI TR 101 569 [i.3].

In the second phase an ETSI TS 101 569-1 [1] was developed to specify technical requirements for six transition technologies that industry were considering for use by Cable Operators depending on the current state of their deployed cable network architecture, service model requirements and their IPv6 transition strategy as the IPv4 addresses depleted. These six IPv6 transition technologies are specified by ETSI TS 101 569-1 [1], covering NAT64, DS-Lite, 6RD, NAT44, 464XLAT and MAP-E.

In the third phase ETSI developed a series of conformance test specifications to enable the compliance verification of the five IPv6 transition technologies, NAT64, DS-Lite, 464XLAT, 6RD and MAP-E that were specified during phase 2 standardization. The conformance tests are developed against the requirements given by the ETSI TS 101 569-1 [1]. The series of conformance tests developed for each of the four transition technologies, are as given by, ETSI TS 103 238 parts 1 [13] to 3 [15] respectively for NAT64; ETSI TS 103 239 parts 1 [16] to 3 [18] respectively for MAP-E; ETSI TS 103 241 parts 1 [19] to 3 [21] respectively for DS-Lite; ETSI TS 103 242 parts 1 [22] to 3 [24] respectively for XLAT and ETSI TS 103 243 parts 1 [25] to 3 [27] respectively for 6RD.

Phase 4 is the present project phase for development of technical specifications covering the operational and engineering requirements with the present document being part 1, general part of a multi-part series presenting general information relative to each of the transition technologies.

DOCSIS® is a registered Trade Mark of Cable Television Laboratories, Inc., and is used in the present document with permission.

1 Scope

The present document presents the engineering and operational requirements for the application of IPv6 transition technologies as defined by ETSI TS 101 569-1 [1] (IPv6 Transition Requirements) implemented within an integrated broadband cable network end to end across its network domains.

The present document is part 1 of a multi-part series and presents a generic view of a typical end to end cable network when considering the key aspects to engineer and operate the IPv6 transition technology across its network domains.

The technical requirements addressing each network domain relative to the IPv6 transition technology in question is described in the clauses of the part specific to the IPv6 transition technology.

The operational aspects for the IPv6 transition technologies, NAT64, DS-Lite, MAP-E, 464XLAT and 6RD are considered when engineered end to end across the cable network domains:

- CPE Home Networking Domain
- Access Network Domain
- Core Network Domain
- Data Centre Domain
- DMZ Service Domain
- Transit and Peering Domain
- Management and Monitoring Domain
- Security Domain

The present document specifies the requirements to be considered when the defined IPv6 transition technology DS-Lite is engineered across the cable network domains.

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 <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.

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] ETSI EN 302 878-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Third Generation Transmission Systems for Interactive Cable Television Services - IP Cable Modems; Part 1: General; DOCSIS 3.0".
- [3] ETSI EN 302 878-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Third Generation Transmission Systems for Interactive Cable Television Services - IP Cable Modems; Part 2: Physical Layer; DOCSIS 3.0".

- [4] ETSI EN 302 878-3: "Access, Terminals, Transmission and Multiplexing (ATTM); Third Generation Transmission Systems for Interactive Cable Television Services - IP Cable Modems; Part 3: Downstream Radio Frequency Interface; DOCSIS 3.0".
- [5] ETSI EN 302 878-4: "Access, Terminals, Transmission and Multiplexing (ATTM); Third Generation Transmission Systems for Interactive Cable Television Services - IP Cable Modems; Part 4: MAC and Upper Layer Protocols; DOCSIS 3.0".
- [6] ETSI EN 302 878-5: "Access, Terminals, Transmission and Multiplexing (ATTM); Third Generation Transmission Systems for Interactive Cable Television Services - IP Cable Modems; Part 5: Security Services; DOCSIS 3.0".
- [7] CableLabs CM-SP-eRouter-I17-151210: DOCSIS IPv4 and IPv6 eRouter Specification.
- [8] ETSI TS 103 443-2: "Integrated broadband cable telecommunication networks (CABLE); IPv6 Transition Technology Engineering and Operational Aspects; Part 2: NAT64".
- [9] ETSI TS 103 443-3: "Integrated broadband cable telecommunication networks (CABLE); IPv6 Transition Technology Engineering and Operational Aspects; Part 3: DS-Lite".
- [10] ETSI TS 103 443-4: "Integrated broadband cable telecommunication networks (CABLE); IPv6 Transition Technology Engineering and Operational Aspects; Part 4: MAP-E".
- [11] ETSI TS 103 443-5: "Integrated broadband cable telecommunication networks (CABLE); IPv6 Transition Technology Engineering and Operational Aspects; Part 5: 464XLAT".
- [12] ETSI TS 103 443-6: "Integrated broadband cable telecommunication networks (CABLE); IPv6 Transition Technology Engineering and Operational Aspects; Part 6: 6RD".
- [13] ETSI TS 103 238-1: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for NAT64 technology; Part 1: Protocol Implementation Conformance Statement (PICS) proforma".
- [14] ETSI TS 103 238-2: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for NAT64 technology; Part 2: Test Suite Structure and Test Purposes (TSS&TP)".
- [15] ETSI TS 103 238-3: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for NAT64 technology; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".
- [16] ETSI TS 103 239-1: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for MAP-E technology; Part 1: Protocol Implementation Conformance Statement (PICS) proforma".
- [17] ETSI TS 103 239-2: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for MAP-E technology; Part 2: Test Suite Structure and Test Purposes (TSS&TP)".
- [18] ETSI TS 103 239-3: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for MAP-E technology; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".
- [19] ETSI TS 103 241-1: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for DS-Lite technology; Part 1: Protocol Implementation Conformance Statement (PICS) proforma".
- [20] ETSI TS 103 241-2: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for DS-Lite technology; Part 2: Test Suite Structure and Test Purposes (TSS&TP)".
- [21] ETSI TS 103 241-3: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for DS-Lite technology; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

- [22] ETSI TS 103 242-1: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for 464XLAT technology; Part 1: Protocol Implementation Conformance Statement (PICS) proforma".
- [23] ETSI TS 103 242-2: "Integrated broadband cable telecommunication networks (CABLE) Testing; Conformance test specifications for 464XLAT technology; Part 2: Test Suite Structure and Test Purposes (TSS&TP)".
- [24] ETSI TS 103 242-3: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for 464XLAT technology; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".
- [25] ETSI TS 103 243-1: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for 6rd technology; Part 1: Protocol Implementation Conformance Statement (PICS) proforma".
- [26] ETSI TS 103 243-2: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for 6rd technology; Part 2: Test Suite Structure and Test Purposes (TSS&TP)".
- [27] ETSI TS 103 243-3: "Integrated broadband cable telecommunication networks (CABLE); Testing; Conformance test specifications for 6rd technology; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".
- [28] IETF RFC 6145: "IP/ICMP Translation Algorithm".
- [29] draft-mdt-softwire-map-dhcp-option-03: "DHCPv6 Options for Mapping of Address and Port".

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] CableLabs.

NOTE: Available at <http://www.cablelabs.com/specs/>.

- [i.2] ETSI TR 101 569: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; Cable Network Transition to IPv6".
- [i.3] IETF RFC 1918: "Address Allocation for Private Internets".

3 Definitions and abbreviations

3.1 Definitions

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

4in6: encapsulation of IPv4 packets within IPv6 packet format

NAT44: network address translation from an IPv4 address to another IPv4 address

P Router: label switching router acting as a transit router in the core network of an MPLS network

3.2 Abbreviations

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

6RD	IPv6 Rapid Deployment
AFTR	Address Family Transition Router
BR	Border Relay
CIDR	Classless Inter-Domain Routing
CLAT	Customer-side transLATOR
CM	Cable Modem
CMTS	Cable Modem Termination System
CPE	Customer Premise Equipment
DHCP	Dynamic Host Configuration Protocol
DMZ	DeMilitarized Zone
DNS	Domain Name System
DOCSIS	Data Over Cable Service Interface Specification
DS-Lite	Dual Stack-Lite
IP	Internet Protocol
IPDR	Internet Protocol Detail Record
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
LAN	Local Area Network
MAP-E	Mapping of Address and Port - Encapsulation Mode
MAP-T	Mapping of Address and Port using Translation
MSS	Maximum Segment Size
NAT	Network Address Translation
NAT64	Network Address Translation IPv6 to IPv4
NDP	Neighbor Discovery Protocol
OSI	Open Systems Interconnection
OSS	Operational Support System
PCP	Port Control Protocol
PLAT	Provider-side transLATOR
PMTUD	Path Maximum Transport Unit (MTU) Discovery
RFC	Request For Comments
SI	Softwire Initiation
T&P	Transit and Provider
UI	User Interface
WAN	Wide Area Network
XLAT	(Address) TransLATOR

4 General Considerations

It should be noted that Cable broadband access networks may vary in build and design with some network characteristics that may be vendor equipment specific. Consequently there may be aspects to the engineering and operation of the IPv6 transition technology that are dependent on the network build and vendor specific equipment deployed.

The present document and its parts do not offer information that may be vendor and network build specific since such information may be confidential to the network operator and/or based on proprietary data.

The present document assumes the reader is familiar with the cable network architecture requirements since the description of the various elements within a cable network across its domains are already defined by ETSI standards and standards developed by CableLabs [i.1]. The present document details only the changes to the network aspects when operating the transition technology.