French C-ITS Deployment Coordination committee

Deliverable 2.4.1_M_bis List of standards

Activity 2: Studies

Sub Activity 2.4 > Specifications

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Quality rules

Reference to the version administration

Version number to be composed of <u>3 digits > vR.XY</u>
- **R** corresponds to the release number: it is upgraded each time SC Studies validates the diffusion of a new release,
- **X** is the major version number: it is upgraded each time SC Studies validates the deliverable,
- **Y** is the minor version number: it is upgraded each time a contributor changes anything.
Once the deliverable is approved, its version number is upgraded from vR.XY to vR.(X+1)0
Once the deliverable is release, its version number is upgraded from vR.XY to v(R+1).00

As illustration:
  0.03 > Work in progress version
  0.10 > Del. Approved by SC Studies but not released
  2.00 > Del. approved & released (in release 2)
  2.05 > Del. Updated - in progress version

BTP	Basic Transport Protocol
C2C-CC	Car2Car communications Consortium
CA	Cooperative Awareness
CAM	Cooperative Awareness Message
C-ITS	Cooperative Intelligent Transport Systems
DCC	Decentralised Congestion Control
DENM	Decentralized Environmental Notification Message
DP	DCC profile
DPID	DCC profile identifier
DSRC	Dedicated Short Range Communications
GBC	Geo Broadcast
GN	Geo Networking
GPS	Global Positioning System
HST	Header Sub-Type
HT	Header Type
ITS	Intelligent Transport Systems
IVI	Infrastructure to Vehicle Information
IVIM	Infrastructure to Vehicle Information Message

LT	Lifetime
MAP	Geometric information for the intersection
MAPEM	MAP (topology) Extended Message
MHP	Maximum Hop limit
NH	Next Hop
R-ITS-S	Roadside ITS Station (RSU in the French Terminology)
RSP	Wi-Fi ITS-G5 Roadside System Profile (short also Roadside System Profile)
RWW	Roadworks Warning
s	Seconds
SCF	Store Carry Forward
SHB	Single-Hop Broadcast
SPAT	Signal Phase and Timing
SPATEM	Signal Phase and Timing Extended Message
TC	Traffic class
TCC	Traffic Control Centre
ITS-G5	ITS-G5 is a European standard for ad-hoc short-range communication of vehicles among each other (V2V) and with Road ITS Stations (V2I). ITS-G5 refers to the approved amendment of the IEEE 802.11 (standard IEEE 802.11p). This technology (possibly others) uses the 5.9 GHz frequency band to support safety- and non-safety ITS applications. In this document ITS-G5 stands for IEEE802.11p/ETSI ITS-G5.
N/A	*Not Applicable*
TBC	*To Be Checked, with MS or associated partner*

Acronyms & abbreviations

Table of Contents

1. Introduction

This deliverable provides a list of published standards used in French C-ITS projects. Certain specification deliverables are based on other, possibly non-published standards; those deliverables shall provide the relevant references directly.

For implementation and specifications, our specifications come first as they provide agreed profile, then the standards must be followed, then European documents are considered.

All C-ITS stations shall follow:

title	standards	version	comment
Intelligent Transport Systems (ITS);Communications Architecture	ETSI EN 302 665	V1.1.1	

2. ITS-G5 access layer standards

This table lists the references and versions of the norms and standards chosen, which have been published and are available.

Table1: List of norms and standards for the ITS stations

title	standards	version
Intelligent Transport Systems (ITS); Radiocommunications equipment operating in the 5,855 MHz to 5,925 MHz frequency band; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive	EN 302 571	2.1.1 (2017-02)
Intelligent Transport Systems (ITS); Access layer specification for Intelligent Transport Systems operating in the 5 GHz frequency band	EN 302 663	1.~~2~~3.1 (~~2013-07~~2020-01)
Intelligent Transport Systems (ITS); Harmonized Channel Specifications for Intelligent Transport Systems operating in the 5 GHz frequency band	TS 102 724	1.1.1 (2012-10)

Intelligent Transport Systems (ITS); Mitigation techniques to avoid interference between European ESC Dedicated Short Range Communication (ESC DSRC) equipment and Intelligent Transport Systems (ITS) operating in the 5 GHz frequency range	TS 102 792	1.2.1 (06/2015)
Intelligent Transport Systems (ITS); Decentralized Congestion Control Mechanisms for Intelligent Transport Systems operating in the 5 GHz range; Access layer part	TS 102 687	V1.2.1
Cross Layer DCC Management Entity for operation in the ITS G5A and ITS G5B medium.	ETSI TS 103 175	V1.1.1 (2015-06)

3. Transport and networking layer standards

title	standards	version
Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality	EN 302 636-4-1	1.~~3~~4.1 (~~08/2017~~2 020-01)
Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 2: Media-dependent functionalities for ITS-G5	TS 102 636-4-2	1.1.1
Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol	EN 302 636-5-1	2.~~1~~2.1 (2019-05/~~2017~~)
Intelligent Transport Systems (ITS);GeoNetworking; Port Numbers for the Basic Transport Protocol (BTP)	TS 103 248	1.~~2~~3.1 (2019-04)

4.

4. Facilities layer standards

title	standards	version

Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Basic Awareness Service	EN 302 637-2	1.4.1 (04 1/2019)
Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Decentralized Environmental Notification Service; Release 2	ETSI TS 103 831	V2.1.1 (2022-11)
Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Basic Decentralized Environmental Notification Service	EN 302 637-3	1.3.1 (04/2019)
Intelligent Transport Systems (ITS); Vehicular Communications; Geographical Area Definition	EN 302 931	1.1.1 2011-07
Intelligent Transport Systems (ITS); Users and application requirements; Part 1: Facility layer structure, functional requirements and specifications	TS 102 894-1	1.1.1 2013-08
Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary	TS 102 894-2	1.3.1 (08/2018)
SPATEM /MAPEM Intelligent transport systems — Cooperative ITS — Using V2I and I2V communications for applications related to signalized intersections	TS 19091	1.3.1 2019 2 017 03
Intelligent Transport Systems (ITS);Vehicular Communications; Basic Set of Applications; Facilities layer protocols and communication requirements for infrastructure services	TS 103 301	V2.1.1 (2021-03)
Intelligent Transport Systems (ITS); Infrastructure to Vehicle Communication; Electric Vehicle Charging Spot Notification Specification	ETSI TS 101 556-1	V1.1.1 2012-07
intelligent transport systems — cooperative its — dictionary of in-vehicle information (ivi) data structures	ISO/TS 19321	15 avril 2015 2020
intelligent transport systems — cooperative systems — contextual speeds	ISO/TS 17426	2015

Intelligent transport systems — Cooperative ITS - Data exchange specification for in-vehicle presentation of external road and traffic related data	ESC ISO/DTS 17425	2016
~~Intelligent transport systems — Cooperative ITS - Dictionary of in- vehicle information (IVI) data structures~~	~~ESC ISO/PRF TS 19321~~	~~15 avril 2015~~
Intelligent transport systems — Cooperative ITS - Contextual speed	ESC ISO/DTS 17426*	2016
Intelligent Transport Systems (ITS);Vehicular Communications; Basic Set of Applications; Analysis of the Collective Perception Service (CPS); Release 2	ETSI TR 103 562	V2.1.1 (2019-12)
~~Intelligent transport systems — Cooperative ITS — Dictionary of in-vehicle information (IVI) data structures~~	~~ISO/TS 19321:2019~~	~~2020~~
IEEE Standard for Information technology — Telecommunications and information exchange between systems, local and metropolitan area networks — Specific requirements, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications	EEE Std. 802.11	2016
Road vehicles -- Vehicle dynamics and road-holding ability -- Vocabulary	ISO 8855	2011
Intelligent Transport Systems (ITS); Facilities layer function; Part 1: Services Announcement (SA) specification	ETSI EN 302 890-1	V1.2.1 (2019-07)
Codes for the representation of names of countries and their subdivisions --Part 1: Country codes ISO/TS 14823:2017. Intelligent transport systems --Graphic data dictionary	ISO 3166-1	2013

5.

5. Applications layer standards

title	standards	version
~~Intelligent Transport Systems (ITS); Application Object Identifier (ITS-AID); Registration list~~	~~TR 102 965~~	~~1.4.1 2018-11~~
Intelligent Transport Systems (ITS); V2X Applications; Part 1: Road Hazard Signalling (RHS) application requirements specification	TS 101 539-1	1.1.1 2013-08

title	standards	version
Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Definitions	TS 102 638	1.1.1 2009-06

6.

6.   Security standards

title	standards	version
Intelligent Transport Systems (ITS); Security; ITS communications security architecture and security management	TS 102 940	~~1.3.1 (04/2018)~~ 2.1.1 2021-07
Intelligent Transport Systems (ITS); Security; ITS; Trust and Privacy Management	TS 102 941	1.4.1 (02/2019)
Intelligent Transport Systems (ITS); Security; ITS; Security services and architecture	TS 102 731	1.1.1 (2010-09)
Intelligent Transport Systems (ITS); Security; Threat, Vulnerability and Risk Analysis (TVRA)	TR 102 893	1.2.1 (03/2017)
Intelligent Transport Systems (ITS); Security; Security header and privacy management	TS 103 097	~~1.4.1 2020-10~~ 2.1.1 2021-10
Intelligent Transport Systems (ITS); Security, Application Object Identifier	TS 102 965	~~1.41 2018-11~~ 2.1.1 2021-01
Intelligent Transport Systems (ITS); Security; ITS-AID Assigned Numbers"	ISO/TS17419	1.1.1 (2010-03)
Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 8: Interface between security entity and network and transport layer	TS 102 723-8	V1.1.1 (2016-04)
C-ITS Point of Contact (CPOC) Protocol	EUR 29634 EN	~~Release 1.1, January 2019~~ Release 1.2, December 2021

C-ITS Certificate Policy - Release from preparatory phase of C-ITS Delegated Regulation		March 2019
C-ITS Security Policy		March 2019

7.

7. Cartography

Cartography		
title	standards	version
Navigation Data Standard	https://nds-association.org/	
Intelligent transport systems — Geographic Data Files (GDF) GDF5.1 — Part 1: Application independent map data shared between multiple sources	ISO 20524-1	March 2020
Intelligent transport systems — Geographic Data Files (GDF) GDF5.1 — Part 2: Map data used in automated driving systems, Cooperative ITS, and multi-modal transport	ISO 20524-2	November 2020
• ADASIS, https://adasis.org/		

8.

8. Datex II Standards

DATEX		
title	standards	version
Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 1: Context and Framework	ESC/TS 16 157-1	2011-10
Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 2: Location referencing	ESC/TS 16 157-2	2011-10
Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 3: Situation publication	ESC/TS 16 157-3	2011-10
Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 4: Variable Message Sign (VMS) Publications;	ESC/TS 16 157-4	2014-04

title	standards	version
Intelligent transport systems - DATEX II data exchange specifications for traffic management and information – Part: 5 Measured and elaborated data publications	ESC/TS 16 157-5	2014-04
Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 6: Parking Publications.	ESC/TS 16 157-6	2015-10

9.

9. Standards for tests

title	standards	version
Intelligent Transport System (ITS); Testing; Framework for conformance and interoperability testing.	ETSI EG 202 798	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for TS 102 867 and TS 102 941 ; Part 1 : Test requirements and proforma Protocol Implementation Conformance Statement (PICS).	ETSI TS 103 096-1	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for TS 102 867 and TS 102 941 ; Part 2 : Test Suite Structure and Test Purpose (TSS&TP).	ETSI TS 103 096-2	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for TS 102 867 and TS 102 941 ; Part 3 : Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT).	ESTI TS 103 096 -3	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for TS 102 867 and TS 102 941 ; part 4 : Validation report.	ETSI TS 103 096 -4	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for Geonetworking Basic Transport Protocol (BTP) ; Part 1 : Test requirements and proforma Protocol Implementation Conformance Statement (PICS).	ETSI TS 102 870-1	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specifications for Geonetworking Basic Transport Protocol (BTP) ; Part 2 : Test Suite Structure and Test Purpose (TSS&TP).	ETSI TS 102 870-2	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specifications for Geonetworking Basic Transport Protocol (BTP) ; Part 3 : Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT).	ETSI TS 192 870-3	V1.1.1

Description	Reference	Version
Intelligent Transport System (ITS) ; Testing ; Conformance test specifications for Geonetworking ITS G5 ; Part 1 : test requirements and proforma Protocol Implementation Conformance Statement (PICS).	ETSI TS 102 871-1–	V1.3.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specifications for Geonetworking ITS G5 ; Part 2 : Test Suite Structure and Test Purpose (TSS&TP).	ETSI TS 102 871-2	~~V1.3.1~~ V1.4.1 (2017-05)
Intelligent Transport System (ITS) ; Testing ; Conformance test specifications for Geonetworking ITS G5 ; Part 3 : Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT).	ETSI TS 192 871-3	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for Cooperative Awareness Messages (CAM) ; Part 1 : Test requirements and proforma Protocol Implementation Conformance Statement (PICS).	ETSI TS 102 868-1	V1.3.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for Cooperative Awareness Messages (CAM) ; Part 2 : Test Suite Structure and Test Purpose (TSS&TP).	ETSI TS 102 868-2	V1.~~3~~5.1 (2020-04)
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for Cooperative Awareness Messages (CAM) ; Part 3 : Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT).	ETSI TS 102 868-3	V1.3.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for Decentralized Environmental Notification Messages (DENM) ; Part 1 : Test requirements and proforma Protocol Implementation Conformance Statement (PICS).	ETSI TS 102 869-1	V1.1.1
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for Decentralized Environmental Notification Messages (DENM) ; Part 2 : Test Suite Structure and Test Purpose (TSS&TP).	ETSI TS 102 869-2	~~V1.1.1~~ V1.6.1 (2020-04)
Intelligent Transport System (ITS) ; Testing ; Conformance test specification for Decentralized Environmental Notification Messages (DENM) ; Part 3 : Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT).	ETSI TS 102 869-3	V1.1.1
Conformance test specifications for Transmission of IP packets over GeoNetworking (GN6)	ETSI TS 102 859	
Architecture of conformance validation framework	ETSI TR 103 099	~~V.1.3.1~~ V1.5.1 (2022-03)

Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Facilities layer protocols and communication requirements for infrastructure services; Part 2: Test Suite Structure and Test Purposes (TSS & TP)	ETSI TS 103 191-2 (2017-03)	V1.2.1 (2017-03)
~~Régulation du trafic routier par feux de circulation - Spécification du dialogue standard des équipements de régulation de trafic - Diaser~~	~~NF P 99-071 (DIASER)~~	~~Mai 2020~~

10.

title	standards	version
Test suite validation; Access technology support ISO 21218	TR 103 101	
Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 1: Test requirements and proforma Protocol Implementation Conformance Statement (PICS).	TS 102 859-1	
Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 2: Test Suite Structure and Test Purpose (TSS&TP).	TS 102 859-2	
Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)	TS 102 859-3	.
Test specifications for the methods to ensure Cooperative ITS G5 coexists with RTTT DSRC; Part 1: Protocol Implementation Conformance Statement (PICS)	TS 102 916-1	
Test specifications for the methods to ensure Cooperative ITS G5 coexists with RTTT DSRC; Part 2: Test Suite Structure and Test Purpose (TSS&TP).	TS 102 916-2	
Test specifications for the methods to ensure Cooperative ITS G5 coexists with RTTT DSRC; Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT)	TS 102 916-3	
Test specifications for the channel congestion control algorithms operating in the 5.9 GHz range; Part 1: Protocol Implementation Conformance Statement (PICS)	TS 102 917-1	

Test specifications for the channel congestion control algorithms operating in the 5.9 GHz range; Part 2: Test Suite Structure and Test Purposes (TSS & TP).	TS 102 917-2	
Test specifications for the channel congestion control algorithms operating in the 5.9 GHz range; Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT)	TS 102 917-3	
ITS Testing - Interoperability test specifications for security	ETSI TS 103 600	V1.1.1

10. Hybrid communications standards

This section concerns standards linked to projects SCOOP@F, C-Roads and InterCor or hybrid communications and use cases.

All standards defined in 241bis are still remaining and they will not be added in this document. The general architecture is described in 2.4.1_H deliverable. Figure 1 is related to the different interfaces for hybrid approach in C-ITS french projects.
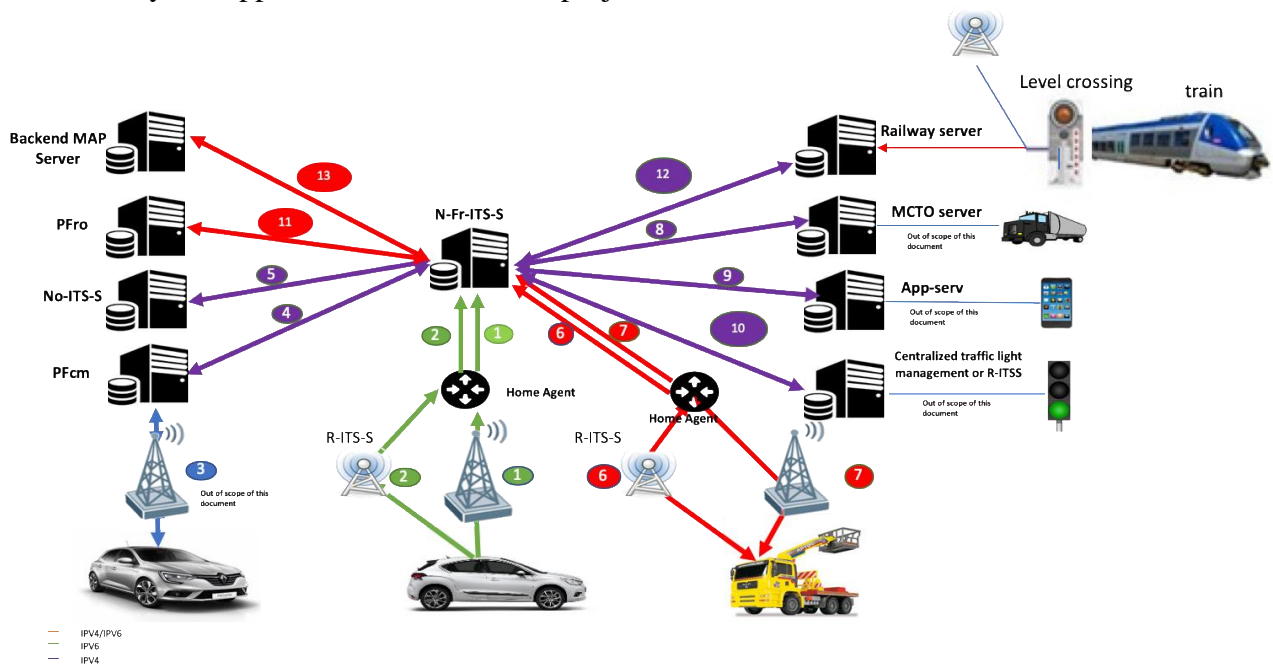

Figure 1 : Interface architecture

10.1. Security

title	standards	version	comment
IPsec			

IP Security (IPsec) and Internet Key Exchange (IKE) Document Roadmap	RFC 6071	FEBRUARY 2011	
Mobile IPv6 Operation with IKEv2 and the Revised IPsec Architecture	RFC 4877	APRIL 2007	
X509			
Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile	RFC 5280	VERSION V3, MAY 2008	
TLS			
The Transport Layer Security (TLS) Protocol	RFC 5246	VERSION 1.2. AOUT 2008	Updated by RFCs 5746, 5878,6176, 7465, 7507, 7568, 7627, 7685, 7905.

10.2.

10.2. geographical database

Geographical database is based on quadtree method (Figure 2)
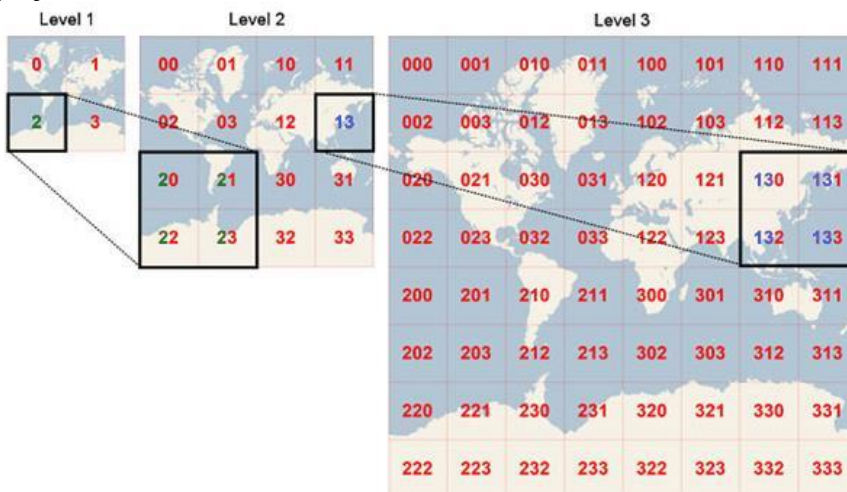
More information is available in: http://www.maptiler.org/google-maps-coordinates-tile-bounds-projection/.

Figure 2 : Quadtree structure

10.3. Standards for Interfaces

10.3.1. INTERFACE 1, 2, 6 AND 7

List
1. IETF RFC 3963: Network Mobility (NEMO) Basic Support Protocol
2. IETF RFC 5555: Mobile IPv6 Support for Dual Stack Hosts and Routers
3. IETF RFC 6089: Flow Bindings in Mobile IPv6 and Network Mobility (NEMO) Basic Support
4. IETF RFC 4862: "IPv6 Stateless Address Auto configuration
5. IETF RFC 4861 and 5175: RADVD, IPv6 router advertisement
6. RFC 5569, IPv6 rapid deployment on IPv4 infrastructures (6rd)
7. RFC 5969, IPv6 rapid deployment on IPv4 infrastructures (6rd) – Protocol specification
8. RFC 3964, security consideration for 6to4.
9. IETF RFC 4862: IPv6 Stateless Address Auto Configuration
10. IETF RFC 4861: RADVD
11. IETF RFC 5175: IPv6 Router Advertisement
12. IETF RFC 4429: Optimistic Duplicate Address Detection (DAD) for IPv6
13. IETF RFC 3963: Network Mobility (NEMO) Basic Support Protocol
14. IETF RFC 5555: Mobile IPv6 support for Dual Stack Hosts and routers
15. IETF RFC 6089: Flow Bindings in Mobile IPv6 and Network Mobility (NEMO) Basic Support
16. IETF RFC 6275: BU/BA mobility support IPv6
17. IETF RFC 5648: Multiple Care-of Address

10.3.2.

10.3.2. INTERFACE 4, 5, 8, 9, 10, 11 AND 12

List	standards	version	comment
Advanced Message Queuing Protocol Model : AMQP Model		1.0	~~https://www.rabbitmq.com/resources/specs/amqp0-9-1.pdf~~
MQTT		3.1.1	*MQTT Version 3.1.1.* Edited by Andrew Banks and Rahul Gupta. 29 October 2014. OASIS Standard. http://docs.oasis-open.org/mqtt/mqtt/v3.1.1/os/mqtt-v3.1.1-os.html. Latest version: http://docs.oasis-open.org/mqtt/mqtt/v3.1.1/mqtt-v3.1.1.html.

10.3.3.

11. Others

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