ETSI GS NGP 001 V1.3.1 (2019-01)

Next Generation Protocols (NGP); Scenario Definitions

Disclaimer

The present document has been produced and approved by the Next Generation Protocols (NGP) ETSI Industry Specification Group (ISG) and represents the views of those members who participated in this ISG.
It does not necessarily represent the views of the entire ETSI membership.

Reference
RGS/NGP-001v131

Keywords
core network, cyber security, IoT, mobility, network, QoE, reliability, security, service, use case

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 prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

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

Contents

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables 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 (https://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.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Next Generation Protocols (NGP).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**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 scope of the present document is to specify the minimum set of key scenarios for the Next Generation Protocols (NGP), Industry Specific Group (ISG).

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 https://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] NGMN: "5G Whitepaper".

NOTE: Available at https://www.ngmn.org/fileadmin/ngmn/content/downloads/Technical/2015/NGMN_5G_White_Paper_V1_0.pdf.

[2] Recommendation ITU-T Y.2091: "Terms and definitions for next generation networks".

[3] Recommendation ITU-T Y.2720: "NGN identity management framework".

[4] IETF RFC 8113: "Locator/ID Separation Protocol (LISP): Shared Extension Message & IANA Registry for Packet Type Allocations".

[5] IETF RFC 760: "DoD standard Internet Protocol".

[6] ISO/IEC 7498-1:1994: "Information technology - Open Systems Interconnection -- Basic Reference Model: The Basic Model".

[7] Department of Defense World Geodetic System 1984 TR 8350.2.

NOTE: Available at http://earth-info.nga.mil/GandG/publications/tr8350.2/tr8350_2.html

[8] ETSI GS NFV 002: "Network Functions Virtualisation (NFV); Architectural Framework".

[9] ETSI GS NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".

[10] IETF RFC 4364: "BGP/MPLS IP Virtual Private Networks (VPNs)".

[11] IETF RFC 4761: "Virtual Private LAN Service (VPLS) Using BGP for Auto-Discovery and Signaling".

[12] IETF RFC 3753: "Mobility Related Terminology".

[13] IETF RFC 7333: "Requirements for Distributed Mobility Management".

[14] IETF draft-ietf-lisp-lcaf-14 (LISP): "LISP Canonical Address Format (LCAF)".

[15] IETF draft-farinacci-lisp-eid-anonymity-00 (LISP): "LISP EID Anonymity".

[16] ETSI GS NFV 001 (V1.1.1): "Network Functions Virtualisation (NFV); Use Cases".

NOTE: ETSI NFV references are available at http://www.etsi.org/deliver/etsi_gs/NFV/.

[17] ETSI GS NFV-MAN 001 (V1.1.1): "Network Functions Virtualisation (NFV); Management and Orchestration".

[18] ETSI GS NFV-SEC 003 (V1.1.1): "Network Functions Virtualisation (NFV); NFV Security; Security and Trust Guidance".

[19] ETSI GS MEC 001 (V1.1.1): "Mobile Edge Computing (MEC) Terminology".

NOTE: MEC references are available at http://www.etsi.org/deliver/etsi_gs/MEC/.

[20] ETSI GS MEC 003 (V1.1.1): "Mobile Edge Computing (MEC); Framework and Reference Architecture".

[21] ETSI GS MEC-IEG 004 (V1.1.1): "Mobile-Edge Computing (MEC); Service Scenarios".

[22] ETSI TS 103 307: "CYBER; Security Aspects for LI and RD Interfaces".

[23] ETSI GS NFV-SEC 009 (V1.1.1): "Network Functions Virtualisation (NFV); NFV Security; Report on use cases and technical approaches for multi-layer host administration".

[24] ETSI TS 132 500: "Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Self-Organizing Networks (SON); Concepts and requirements (3GPP TS 32.500)".

[25] MEC White-paper: "Mobile Edge Computing: A key technology towards 5G", 2015.

NOTE: ETSI whitepapers are available at http://www.etsi.org/technologies-clusters/white-papers-and-brochures/etsi-white-papers.

[26] IEEE 802.1Q™-2011: "IEEE Standard for Local and metropolitan area networks--Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks".

NOTE: Available at https://ieeexplore.ieee.org/document/6009146.

[27] ETSI TS 123 401: "LTE; General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access (3GPP TS 23.401 Release 13)".

[28] 3GPP TS 122 261: "5G; Service requirements for next generation new services and markets (3GPP TS 22.261 Release 15)".

[29] ETSI TS 122 280: "LTE; Mission Critical Services Common Requirements (3GPP TS 22.280 Release 14)".

[30] Society of Automotive Engineers, J3016: " Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems".

NOTE: Available at http://standards.sae.org/j3016_201401/.

[31] IETF RFC 3246: "An Expedited Forwarding PHB (Per-Hop Behavior)".

[32] ETSI TS 123 501: "5G; System Architecture for the 5G System (3GPP TS 23.501 Release 15)".

[33] 3GPP TR 29.891: "3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; 5G System - Phase 1; CT WG4 Aspects (Release 15)".

[34] ETSI TS 138 300: " 5G; NR; Overall description; Stage-2 (3GPP TS 38.300)".

[35] ETSI TS 129 281: "Universal Mobile Telecommunications System (UMTS); LTE; General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U) (3GPP TS 29.281)".

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] 3GPP TR 22.891: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Feasibility Study on New Services and Markets Technology Enablers; Stage 1".

NOTE: 3GPP™ specifications are available at http://www.3gpp.org/specifications/specifications.

[i.2] 3GPP TR 23.799: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on Architecture for Next Generation System (NexGen)".

[i.3] ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Vocabulary for 3GPP Specifications (3GPP TR 21.905)".

[i.4] 5GPPP Whitepaper on Automotive Vertical Sector.

[i.5] 5GPPP Whitepaper on Energy Vertical Sector.

[i.6] 5GPPP Whitepaper on Factories of the Future.

[i.7] 5GPPP Whitepaper on E-Health.

[i.8] Elements of Mathematics: "General Topology", Berlin, Springer- Verlag, 1990, Bourbaki, N. 1971.

[i.9] "Elements of the Topology of Plane Sets of Points", Newman, M, 1964.

[i.10] Stallings, William: "High-Speed Networks and Internets", Prentice-Hall™, 2002.

[i.11] Risk Nexus: "Overcome by cyber risks? Economic benefits and costs of alternate cyber futures".

NOTE: Available at http://www.cse.wustl.edu/~jain/papers/.

[i.12] "A Binary Feedback Scheme for Congestion Avoidance in Computer Networks with Connectionless Network Layer", ACM Transactions on Computer Systems, Vol. 8, No. 2, May 1990, pp. 158-181, K. Ramakrishnan and Raj Jain.

NOTE: Available at http://www.cse.wustl.edu/~jain/papers/.

[i.13] Digital Equipment Corporation Technical Report No. DEC-TR-510: "Congestion Avoidance in Computer Networks with A Connectionless Network Layer: Part IV: A Selective Binary Feedback Scheme for General Topologies", August 1987, 43 pp., K. Ramakrishnan and Raj Jain.

[i.14] Void.

[i.15] IETF RFC 4762: "Virtual Private LAN Service (VPLS) Using Label Distribution Protocol (LDP) Signaling".

[i.16] IETF RFC 4984: "Report from the IAB Workshop on Routing and Addressing".

[i.17] 3GPP TR 23.863: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Support of Short Message Service (SMS) in IP Multimedia Subsystem (IMS) without Mobile Station International ISDN Number (MSISDN); Stage 2".

[i.18] 3GPP TR 22.864: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Feasibility Study on New Services and Markets Technology Enablers - Network Operation; Stage 1".

[i.19] IETF RFC 6582: "The NewReno Modification to TCP's Fast Recovery Algorithm".

[i.20] IETF RFC 2018: "TCP Selective Acknowledgment Options".

[i.21] ETSI GS MEC 002: "Mobile Edge Computing (MEC); Technical Requirements".

[i.22] ETSI GS MEC-IEG 005: "Mobile-Edge Computing (MEC); Proof of Concept Framework".

[i.23] IETF RFC 7041: "Extensions to the Virtual Private LAN Service (VPLS) Provider Edge (PE) Model for Provider Backbone Bridging".

[i.24] 5G Manifesto for timely deployment of 5G.

[i.25] ETSI TR 138 913: "5G; Study on Scenarios and Requirements for Next Generation Access Technologies (3GPP TR 38.913)".

[i.26] IETF Charter of IETF DMM documents.

NOTE: IETF DMM Charter references are available at https://datatracker.ietf.org/wg/dmm/charter/.

[i.27] Broadband Forum TR-069: "CPE WAN Management Protocol".

[i.28] 3GPP TR 38.801: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Study on new radio access technology: Radio access architecture and interfaces".

[i.29] 3GPP TR 36.881: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Study on latency reduction techniques for LTE".

[i.30] Ericsson Research AB: "Service Mobility in Mobile Networks", 2015 IEEE 8th International Conference on Cloud Computing .

[i.31] Nokia: "W01-Third Workshop on 5G Architecture (5GArch 2016)", Mobility Management Enhancements for 5G Low Latency Services.

[i.32] IETF draft-briscoe-tsvwg-ecn-l4s-id-00 K. De Schepper, I. Tsang, Bell Labs, B. Briscoe, Ed Simula Research Lab: "Identifying Modified Explicit Congestion Notification (ECN) Semantics for Ultra-Low Queuing Delay".

[i.33] Void.

[i.34] 3GPP TR 22.862: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Feasibility Study on New Services and Markets Technology Enablers for Critical Communications; Stage 1" (Release 14).

[i.35] National Highway Traffic Safety Administration: "Preliminary statement of policy concerning automated vehicles" (2013).

NOTE: Available at http://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf.

[i.36] 5GPPP white paper: "5G Automotive Vision".

[i.37] 3GPP TR 22.886: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on enhancement of 3GPP Support for 5G V2X Services (Release 15)".

[i.38] Society of Automotive Engineers Mobulus: "Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems".

NOTE: Available at http://standards.sae.org/j3016_201401/.

[i.39] Driverless Future.

NOTE: Available at http://www.driverless-future.com/?page_id=774#ethical-judgements.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms applying to scenarios that include mobile network architectures given in ETSI TR 121 905 [i.3] and 3GPP TR 23.799 [i.2] and the following apply:

access point: point of access to a network, which in this generic NGP context may be a traditional Wi-Fi access point, 3GPP cellular network base station, RRU supporting a cell or sector or part thereof if the cell is configured as a multi-point access cell

address: identifier for a specific termination point and is used for routing to this termination point

NOTE: See Recommendation ITU-T Y.2091 [2].

application process: instantiation of a program executing in a processing system intended to accomplish some purpose

NOTE: An application contains one or more application protocol machines.

application process name: name of an application process

application protocol: protocol characterized by modifying state external to the protocol by performing remote operations on an object model

NOTE: The minimal set of operations are create/delete, start/stop and read/write.

application protocol name: name of an application protocol

asymmetric link: link with transmission characteristics which are different depending upon the relative position or design characteristics of the transmitter and the receiver of data on the link

NOTE: For instance, the range of one transmitter may be much higher than the range of another transmitter on the same medium see IETF RFC 3753 [12].

autonomous: entity capable of piloting itself based on sensory input and pre-defined behaviours, including collision avoidance, speed limits and geographical constraints

NOTE 1: Used in the context of communications pertaining to an autonomous drone or vehicle in the present document.

NOTE 2: However, a remote piloting capability may be provided via a network to which the vehicle is able to communicate with.

autonomous drone: autonomous vehicle with no human operator on-board

NOTE: The distinction between a 'drone' and an 'autonomous drone' is that in the case of an 'autonomous drone', the vehicle is piloted through on-board sensor processing, and optionally, and less frequently remote control 'managed by' a human operator. Where: the term 'managed by' indicates that the human operator may be actively monitoring the vehicle's progress, and taking control manually on an event triggered basis, as necessary; or delegating the remote control to a computing process.

autonomous vehicle: vehicle capable of piloting itself, that also has a human operator on-board

NOTE 1: The distinction between an 'autonomous vehicle' and an 'autonomous drone' is the presence of a human operator in the vehicle.

NOTE 2: The 'autonomous vehicle' is piloted through a combination of on-vehicle sensor readings, which are processed to determine action, and optional interjection from a human operator. An example of this kind of situation is when there is a 'self-driving car' with a human passenger on-board who is capable of piloting the car.

backhaul: transmission system between a base station entity and the cellular core network or Non-Access Stratum

binding a name to an object: function, $Fn(M_{NS})$, that defines the mapping of elements of NS(namespace) to elements of M(object)

NOTE 1: The result of this function is called a *binding*. e.g. In LISP, the binding operation is called mapping.

NOTE 2: For example, <ID1, RLOC1> is the mapping of ID1="identity1" to RLOC1="an ip address or any other form of addressing".

care-of-address: IP address associated with a mobile node while visiting a foreign link; the subnet prefix of this IP address is a foreign subnet prefix

NOTE: A packet addressed to the mobile node which arrives at the mobile node's home network when the mobile node is away from home and has registered a Care-of Address will be forwarded to that address by the Home Agent in the home network see IETF RFC 3753 [12].

centralized mobility management: makes use of centrally deployed mobility anchors

NOTE: Please see IETF RFC 7333 [13].

compound connection: connection that includes logical connectivity to more than one access network at a time

congestion avoidance: mechanism that operates the network at the knee of the congestion or response time (or delay) curve to optimize the trade-off between response time and throughput

congestion 'cliff': congestion point of the response time (or delay) curve at which a session collapses

congestion control: control scheme that manages packet congestion, by constantly testing the congestion level that causes the network communications to collapse and responds by introducing packet loss to reduce the load during periods of congestion so that the network can recover to an uncongested state

NOTE 1: The congestion level that causes the network to collapse is often referred to as the 'congestion cliff' because the curve of throughput versus load, becomes very steep beyond this congestion level.

NOTE 2: Addresses the "social" problem of having various logical links in a network cooperate in order to avoid and/ or recover from congestion of the intermediate nodes that they share.

congestion 'knee': congestion point of the response time (or delay) curve at which as session begins to notably deteriorate

connected vehicle: vehicle connected to one or more communications networks and piloted by a human operator

NOTE 1: The network will allow the vehicle to share data with other connected vehicles and remote servers.

NOTE 2: A Connected vehicle does not need to be autonomous, but is network connected for purposes of assisted navigation, environmental updates, vehicle analysis, infotainment etc.

connection: shared state between EFCPM-instances

NOTE: See ISO/IEC 7498-1 [6].

C-RAN: Cloud RAN where the physical radio part of a base station termed the RRU has been remoted from its base band equipment termed the BBU via 'fronthaul' transmission and the BBU part connects the composite RAN equipment to the cellular core via 'backhaul'

NOTE: Often multiple RRU communicate with a single BBU to effect RAN optimization at the BBU level across a number of Cells provided by the RRH.

data transfer protocol, machine dtp(m): half of the EFCP that performs tightly bound mechanisms, such as ordering, and fragmentation/reassembly

NOTE: One instantiation is created for each flow allocated, see ISO/IEC 7498-1 [6].