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INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Next Generation Networks – Service aspects: Service
capabilities and service architecture

Requirements and capabilities for ITU-T NGN

Recommendation ITU-T Y.2201



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Recommendation ITU-T Y.2201

Requirements and capabilities for ITU-T NGN

Summary

Recommendation ITU-T Y.2201 provides high-level requirements for services and capabilities of a next generation network (NGN).

Source

Recommendation ITU-T Y.2201 was approved on 12 September 2009 by ITU-T Study Group 13 (2009-2012) under the WTSA Resolution 1 procedure. This edition includes Corrigendum 1 which was approved on 29 January 2010 by ITU-T Study Group 13.

Keywords

Accounting, addressing, authentication, authorization, capabilities, capability requirements, charging, context awareness, enterprise network, identification, identity management, interoperability, interworking, IPTV, IPv6 support, management, mobility, multicast, naming, NGN, numbering, OAM, open service environment, policy, privacy, profile, QoS, security, service enabler.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation ITU-T Y.2201

Requirements and capabilities for ITU-T NGN

1 Scope

This Recommendation specifies the high-level requirements for the development of a set of ITU-T Recommendations which will constitute NGN.

The high-level requirements and related capabilities specified in this Recommendation are aligned with the general goals and objectives captured in [ITU-T Y.2001] and are based on the objectives of NGN release 2 [b-ITU-T Y.Sup-7].

The requirements are mainly provided from a high-level perspective, and are not intended to constitute precise functional requirements for the different NGN entities.

More detailed requirements are outside the scope of this Recommendation.

It is recognized that a specific realization of NGN may be constituted by an arbitrary set (or superset) of services supported in NGN and of capabilities as specified in this Recommendation.

NOTE 1 – Text taken from [ITU-T Y.2201] uses blue font. Also, Appendix I identifies the main differences in terms of high-level requirements and capabilities between this Recommendation and [ITU-T Y.2201].

NOTE 2 – It is also required to consider how NGN can contribute to energy savings. However, studies for this topic are ongoing in ITU-T Study Group 5 based on the output from the ITU-T Focus Group on ICTs and Climate Change. So requirements from energy savings aspects are for further study in this Recommendation. For the output from the ITU-T Focus Group on ICTs and Climate Change, please see [b-ITU-T Climate].

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- | | |
|---------------|---|
| [ITU-T E.106] | Recommendation ITU-T E.106 (2003), <i>International Emergency Preference Scheme (IEPS) for disaster relief operations.</i> |
| [ITU-T E.107] | Recommendation ITU-T E.107 (2007), <i>Emergency Telecommunications Service (ETS) and interconnection framework for national implementations of ETS.</i> |
| [ITU-T E.164] | Recommendation ITU-T E.164 (2005), <i>The international public telecommunication numbering plan.</i> |
| [ITU-T E.212] | Recommendation ITU-T E.212 (2008), <i>The international identification plan for public networks and subscriptions.</i> |
| [ITU-T G.711] | Recommendation ITU-T G.711 (1988), <i>Pulse code modulation (PCM) of voice frequencies.</i> |
| [ITU-T G.722] | Recommendation ITU-T G.722 (1988), <i>7 kHz audio-coding within 64 kbit/s.</i> |

[ITU-T G.722.2]	Recommendation ITU-T G.722.2 (2003), <i>Wideband coding of speech at around 16 kbit/s using Adaptive Multi-Rate Wideband (AMR-WB)</i> .
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[ITU-T G.808.1]	Recommendation ITU-T G.808.1 (2006), <i>Generic protection switching – Linear trail and subnetwork protection</i> .
[ITU-T H.263]	Recommendation ITU-T H.263 (2005), <i>Video coding for low bit rate communication</i> .
[ITU-T H.264]	Recommendation ITU-T H.264 (2005), <i>Advanced video coding for generic audiovisual services</i> .
[ITU-T I.610]	Recommendation ITU-T I.610 (1999), <i>B-ISDN operation and maintenance principles and functions</i> .
[ITU-T M.3050.0]	Recommendation ITU-T M.3050.0 (2007), <i>Enhanced Telecom Operations Map (eTOM) – Introduction</i> .
[ITU-T M.3050.1]	Recommendation ITU-T M.3050.1 (2007), <i>Enhanced Telecom Operations Map (eTOM) – The business process framework</i> .
[ITU-T M.3060]	Recommendation ITU-T M.3060/Y.2401 (2006), <i>Principles for the Management of Next Generation Networks</i> .
[ITU-T Q.825]	Recommendation ITU-T Q.825 (1998), <i>Specification of TMN applications at the Q3 interface: Call detail recording</i> .
[ITU-T Q.1703]	Recommendation ITU-T Q.1703 (2004), <i>Service and network capabilities framework of network aspects for systems beyond IMT-2000</i> .
[ITU-T Q.1706]	Recommendation ITU-T Q.1706/Y.2801 (2006), <i>Mobility management requirements for NGN</i> .
[ITU-T X.462]	Recommendation ITU-T X.462 (1996), <i>Information technology – Message Handling Systems (MHS) Management: Logging information</i> .
[ITU-T X.805]	Recommendation ITU-T X.805 (2003), <i>Security architecture for systems providing end-to-end communications</i> .
[ITU-T Y.101]	Recommendation ITU-T Y.101 (2000), <i>Global Information Infrastructure terminology: Terms and definitions</i> .
[ITU-T Y.110]	Recommendation ITU-T Y.110 (1998), <i>Global Information Infrastructure principles and framework architecture</i> .
[ITU-T Y.1271]	Recommendation ITU-T Y.1271 (2004), <i>Framework(s) on network requirements and capabilities to support emergency telecommunications over evolving circuit-switched and packet-switched networks</i> .
[ITU-T Y.1541]	Recommendation ITU-T Y.1541 (2006), <i>Network performance objectives for IP-based services</i> .
[ITU-T Y.1710]	Recommendation ITU-T Y.1710 (2002), <i>Requirements for Operation & Maintenance functionality in MPLS networks</i> .

[ITU-T Y.1730]	Recommendation ITU-T Y.1730 (2004), <i>Requirements for OAM functions in Ethernet-based networks and Ethernet services.</i>
[ITU-T Y.1901]	Recommendation ITU-T Y.1901 (2009), <i>Requirements for the support of IPTV services.</i>
[ITU-T Y.2001]	Recommendation ITU-T Y.2001 (2004), <i>General overview of NGN.</i>
[ITU-T Y.2012]	Recommendation ITU-T Y.2012 (2006), <i>Functional requirements and architecture of the NGN release 1.</i>
[ITU-T Y.2051]	Recommendation ITU-T Y.2051 (2008), <i>General overview of IPv6-based NGN.</i>
[ITU-T Y.2091]	Recommendation ITU-T Y.2091 (2008), <i>Terms and definitions for Next Generation Networks.</i>
[ITU-T Y.2111]	Recommendation ITU-T Y.2111 (2008), <i>Resource and admission control functions in next generation networks.</i>
[ITU-T Y.2201]	Recommendation ITU-T Y.2201 (2007), <i>NGN release 1 requirements.</i>
[ITU-T Y.2212]	Recommendation ITU-T Y.2212 (2008), <i>Requirements of managed delivery services.</i>
[ITU-T Y.2213]	Recommendation ITU-T Y.2213 (2008), <i>NGN service requirements and capabilities for network aspects of applications and services using tag-based identification.</i>
[ITU-T Y.2215]	Recommendation ITU-T Y.2215 (2009), <i>Requirements and framework for the support of VPN services in NGN, including the mobile environment.</i>
[ITU-T Y.2233]	Recommendation ITU-T Y.2233 (2008), <i>Requirements and framework allowing accounting and charging capabilities in NGN.</i>
[ITU-T Y.2234]	Recommendation ITU-T Y.2234 (2008), <i>Open service environment capabilities for NGN.</i>
[ITU-T Y.2236]	Recommendation ITU-T Y.2236 (2009), <i>Framework for NGN support of multicast-based services.</i>
[ITU-T Y.2701]	Recommendation ITU-T Y.2701 (2007), <i>Security requirements for NGN release 1.</i>
[ITU-T Y.2720]	Recommendation ITU-T Y.2720 (2009), <i>NGN identity management framework.</i>
[ITU-T Z.100]	Recommendation ITU-T Z.100 (2007), <i>Specification and Description Language (SDL).</i>
[ETSI TS 126.071]	ETSI TS 26.071 V6.0.0 (2004-12), <i>Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); AMR speech Codec; General description (3GPP TS 26.071 version 6.0.0 Release 6).</i>
[TIA-127-C]	TIA Standard TIA-127-C (2007), <i>Enhanced Variable Rate Codec, Speech Service Options 3, 68, and 70 for Wideband Spread Spectrum Digital Systems.</i>

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3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 accounting [ITU-T X.462]: The action of collecting information on the operations performed within a system and the effects thereof.

3.1.2 address [ITU-T Y.2091]: An address is the identifier for a specific termination point and is used for routing to this termination point.

3.1.3 application network interface (ANI) [ITU-T Y.2012]: Interface which provides a channel for interactions and exchanges between applications and NGN elements. The ANI offers capabilities and resources needed for realization of applications.

3.1.4 billing [ITU-T Q.1703]: Administrative function to prepare bills to service customers, to prompt payments, to obtain revenues and to take care of customer reclaims.

3.1.5 charging [ITU-T Q.825]: The set of functions needed to determine the price assigned to the service utilization.

3.1.6 corporate network [ITU-T Y.2701]: A private network that supports multiple users and may be in multiple locations (e.g., an enterprise, campus).

NOTE – Equipment of the private network is owned by or managed on behalf of an enterprise, and is interconnected to provide telecommunication services to a defined group of users belonging to that enterprise.

3.17 customer [ITU-T M.3050.1]: The customer buys products and services from the enterprise or receives free offers or services. A customer may be a person or a business.

3.1.8 end user [ITU-T M.3050.1]: The end user is the actual user of the products or services offered by the enterprise. The end user consumes the product or service. See also the definition of subscriber.

3.1.9 entity [ITU-T Y.2720]: Anything that has separate and distinct existence that can be uniquely identified. In the context of IdM, examples of entities include subscribers, users, network elements, networks, software applications, services and devices. An entity may have multiple identifiers.

3.1.10 federation [ITU-T Y.2720]: Establishing a relationship between two or more entities or an association comprising any number of service providers and identity providers.

3.1.11 handover [ITU-T Q.1706]: The ability to provide services with some impact on their service level agreements to a moving object during and after movement.

3.1.12 home network [ITU-T Q.1706]: The network to which a mobile user is normally connected, or the service provider with which the mobile user is associated, and where the user's subscription information is managed.

3.1.13 identifier [ITU-T Y.2091]: An identifier is a series of digits, characters and symbols or any other form of data used to identify subscriber(s), user(s), network element(s), function(s), network entity(ies) providing services/applications, or other entities (e.g., physical or logical objects). Identifiers can be used for registration or authorization. They can be either public to all networks, shared between a limited number of networks or private to a specific network (private IDs are normally not disclosed to third parties).

3.1.14 identity [ITU-T Y.2720]: Information about an entity that is sufficient to identify that entity in a particular context.

3.1.15 identity management [ITU-T Y.2720]: Set of functions and capabilities (e.g., administration, management and maintenance, discovery, communication exchanges, correlation and binding, policy enforcement, authentication and assertions) used for:

- assurance of identity information (e.g., identifiers, credentials, attributes);
- assurance of the identity of an entity (e.g., users/subscribers, groups, user devices, organizations, network and service providers, network elements and objects, and virtual objects); and
- enabling business and security applications.

3.1.16 identity provider [ITU-T Y.2720]: An entity that creates, maintains and manages trusted identity information of other entities (e.g., user/subscribers, organizations, and devices) and offers identity-based services based on trust, business and other types of relationship.

3.1.17 Internet [ITU-T Y.101]: A collection of interconnected networks using the Internet Protocol which allows them to function as a single, large virtual network.

3.1.18 IPv6-based NGN [ITU-T Y.2051]: This refers to NGN that supports addressing, routing protocols, and services associated with IPv6. An IPv6-based NGN shall recognize and process the IPv6 headers and options, operating over various underlying transport technologies in the transport stratum.

3.1.19 mobility [ITU-T Y.2001]: The ability for the user or other mobile entities to communicate and access services irrespective of changes of the location or technical environment. The degree of service availability may depend on several factors including the Access Network capabilities, service level agreements between the user's home network and the visited network (if applicable), etc. Mobility includes the ability of telecommunication with or without service continuity.

NOTE – In [ITU-T Y.2001] this is called "generalized mobility".

3.1.20 mobility management [ITU-T Q.1706]: The set of functions used to provide mobility. These functions include authentication, authorization, location updating, paging, download of user information and more.

3.1.21 nomadism [ITU-T Q.1706]: The ability of the user to change their network access point on moving. When changing the network access point, the user's service session is completely stopped and then started again, i.e., there is no service continuity or hand-over used. It is assumed that normal usage pattern is that users shut down their service session before attaching to a different access point.

3.1.22 personally identifiable information [ITU-T Y.2720]: The information pertaining to any living person, which makes it possible to identify such individual (including the information capable of identifying a person when combined with other information even if the information does not clearly identify the person).

3.1.23 personal mobility [ITU-T Q.1706]: This is the mobility for those scenarios where the user changes the terminal used for network access at different locations. The ability of a user to access telecommunication services at any terminal on the basis of a personal identifier, and the capability of the network to provide those services delineated in the user's service profile.

3.1.24 presence [ITU-T Y.2720]: A set of attributes that characterizes an entity relating to current status.

3.1.25 public network [b-ITU-T I.570]: A network which provides services to the general public.

NOTE – This definition does not include legal or regulatory aspects and does not indicate any aspect of ownership.

3.1.26 roaming [ITU-T Q.1706]: This is the ability of users to access services according to their user profile while moving outside of their subscribed home network, i.e., by using an access point of a visited network. This requires the capability for access to the visited network, the existence of an interface between home network and visited network, as well as a roaming agreement between the respective network operators.

3.1.27 seamless handover [ITU-T Q.1706]: It is a special case of mobility with service continuity since it preserves the ability to provide services without any impact on their service level agreements to a moving object during and after movement.

3.1.28 service (Supplement 1 to Z-series Recommendations): A set of functions and facilities offered to a user by a provider.

3.1.29 service continuity [ITU-T Q.1706]: The ability for a moving object to maintain ongoing service over including current states, such as user's network environment and session for a service.

3.1.30 subscriber [ITU-T M.3050.1]: The subscriber is responsible for concluding contracts for the services subscribed to and for paying for these services.

3.1.31 terminal mobility [ITU-T Q.1706]: This is the mobility for those scenarios where the same terminal equipment is moving or is used at different locations. The ability of a terminal to access telecommunication services from different locations and while in motion, and the capability of the network to identify and locate that terminal.

3.1.32 user network [ITU-T Y.2701]: A private network consisting of terminal equipment that may have multiple users.

3.1.33 visited network [ITU-T Q.1706]: The network outside a home network that provides service to a mobile user. This term is more business significant than geographically significant.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 break-in: A communication from a user of a public network to a user of an enterprise network.

3.2.2 break-out: A communication from a user of an enterprise network to a user of a public network.

3.2.3 business trunking: Connection of a next generation corporate network (NGCN) to an NGN.

3.2.4 business trunking application: NGN application that either provides transit capabilities between next generation corporate networks (NGCNs), or break-in capabilities from NGN to NGCN and/or break-out capabilities from NGCN to NGN.

NOTE – A business trunking application may also provide additional services beyond basic break-in, break-out and transit capabilities to the NGCN.

3.2.5 context awareness: Context awareness is a capability to determine or influence a next action in telecommunication or process by referring to the status of relevant entities, which form a coherent environment as a context.

3.2.6 corporate network user identifier: Identifies a corporate network user on communications entering, leaving or transiting the NGN, either representing an originating corporate network user or as a globally routable target identity.

3.2.7 enterprise communication: Any communication that is either:

- 1) originated in a next generation corporate network (NGCN); or
- 2) terminated in an NGCN; or

- 3) originated in the NGN on behalf of an enterprise; or
- 4) terminated in the NGN on behalf of an enterprise;

and which is subject to special arrangements between the NGN operator and the enterprise.

3.2.8 enterprise communication capabilities: Any capability whether hosted in a next generation corporate network (NGCN) or an NGN that enables and/or enriches enterprise communications.

NOTE – Business trunking application, hosted enterprise services and virtual leased line are examples of enterprise communication capabilities hosted in NGN.

3.2.9 hosted enterprise services (HES): NGN application whereby the NGN hosts all originating and/or terminating business communication capabilities for enterprise users that are directly attached to NGN and have a subscription for this application in NGN.

NOTE – This is known commonly as IP-Centrex.

3.2.10 next generation corporate network (NGCN): Self-contained corporate network designed to take advantage of emerging IP-based communications solutions and that can have its own applications and service provisioning.

NOTE – For the purpose of this Recommendation, it is a corporate network that provides an IP-based interface to an NGN.

3.2.11 NGCN site: A separate part of a next generation corporate network (NGCN).

NOTE – An NGCN site might represent a part of an NGCN bound to a specific geographic location. When an NGCN site serves more than one geographic location, all locations served by that NGCN site would have access to an NGN concerned via the NGCN site's connectivity arrangement with that NGN. Communication between different NGCN sites belonging to the same NGCN can, but need not, pass through their respective NGN(s). For example, such communications might be routed by NGN(s) only during periods of high traffic or equipment outage within the NGCN. An NGCN site can have access to its NGN either directly or via some other NGN that provides a transit capability. An NGCN can have NGCN sites in different countries.

3.2.12 priority classification: Classification of traffic classes according to different levels of priorities.

3.2.13 priority enabling mechanisms: The mechanisms by which appropriate treatment of traffic according to priority classes may be enabled in the network.

3.2.14 private network traffic: Traffic sent to or received from an NGN for processing according to an agreed set of rules specific to an enterprise or a community of closely related enterprises.

3.2.15 public network traffic: Traffic sent to or received from an NGN for processing according to the normal NGN rules.

3.2.16 single sign-on: The ability to use an authentication assertion from one network operator/service provider to another operator/service provider for a user either accessing a service or roaming into a visited network.

3.2.17 terminal equipment identifier: A unique identifier of a terminal equipment.

3.2.18 user: A user includes end user [ITU-T Y.2091], person, subscriber, system, equipment, terminal (e.g., FAX, PC), (functional) entity, process, application, provider or corporate network.

3.2.19 user attribute: A characteristic that describes the user (e.g., user identifier's lifetime, user status as being "available", "don't disturb", etc.).

3.2.20 user identifier: A type of password, image or pseudonym associated with a user, assigned by and exchanged between operators and service providers to identify a user, to authenticate her/his identifier and/or authorize the use of service. Examples are identifiers such as SIP URI, etc.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AMR	Adaptive Multi-Rate
ANI	Application Network Interface
API	Application Programming Interface
ATM	Asynchronous Transfer Mode
B2B	Business-to-Business
CC	Content of Communication
CD	Compact Disk
cPVR	client Personal Video Recorder
DECT NG	Digital Enhanced Cordless Telecommunications New Generation
DNS	Domain Name System
DTMF	Dual Tone Multi-Frequency
EAN	Emergency Alert Notification
ENUM	tElephone NUmber Mapping
ETS	Emergency Telecommunications Service
EVRC	Enhanced Variable Rate Codec
HES	Hosted Enterprise Services
HTML	HyperText Markup Language
IdM	Identity Management
IEPS	International Emergency Preference Scheme
IM	Instant Messaging
IMS	Internet Protocol Multimedia Subsystem
IN	Intelligent Network
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IPTV	Internet Protocol Television
IRI	Intercept Related Information
ISDN	Integrated Services Digital Network
LDAP	Lightweight Directory Access Protocol
LEA	Law Enforcement Agencies
MMS	Multimedia Messaging Service
MPLS	Multi-Protocol Label Switching
NAI	Network Access Identifier
NAPT	Network Address Port Translation
NAT	Network Address Translation

NB	Narrow-Band
NGCN	Next Generation Corporate Network
NGN	Next Generation Network
NNA	Numbering, Naming and Addressing
NNI	Network-to-Network Interface
nPVR	network Personal Video Recorder
OAM	Operations, Administration and Maintenance
OIP	Originating Identity Presentation
OMA	Open Mobile Alliance
OS	Operating System
OSA	Open Service Access
OTN	Optical Transport Network
PBX	Private Branch eXchange
PC	Personal Computer
PDA	Personal Digital Assistant
PII	Personally Identifiable Information
PNP	Private Numbering Plan
POTS	Plain Old Telephone Service
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
QoE	Quality of Experience
QoS	Quality of Service
QoSM	Quality of Service Measurement
RACF	Resource and Admission Control Functions
SIP	Session Initiation Protocol
SLA	Service Level Agreement
SMS	Short Message Service
SR	Service Resiliency
TDR	Telecommunication for Disaster Relief
TE	Terminal Equipment
TIP	Termination Identity Presentation
UC	Unsolicited Communication
UDDI	Universal Discovery, Description and Integration
UMTS	Universal Mobile Telecommunications System
UNI	User-to-Network Interface
URI	Uniform Resource Identifier
USN	Ubiquitous Sensor Network

VoD	Video on Demand
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
WB	WideBand
WiFi	Wireless Fidelity
xDSL	various types of Digital Subscriber Lines

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The keywords "is prohibited from" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformance.

The keywords "is not recommended" indicate a requirement which is not recommended but which is not specifically prohibited. Thus, conformance with this specification can still be claimed even if this requirement is present.

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

For the purpose of this Recommendation, the terms "enterprise network" and "corporate network" can be used interchangeably.

6 Transport

6.1 Transport connectivity

NGN transport stratum [ITU-T Y.2012] is required to use the IP protocol for general, ubiquitous and global public connectivity. The IP protocol may be carried over various underlying transport technologies in the access and core portions of the transport stratum (e.g., xDSL, ATM, MPLS, frame relay, OTN) according to the operator's environment.

NOTE – This does not prevent operators providing technology-specific services directly to users (e.g., ATM, MPLS, frame relay, OTN).

Connectivity is required to accommodate:

- 1) use of IPv4 and IPv6;
- 2) real-time and non-real-time communications;
- 3) one-to-one connectivity;
- 4) one-to-many connectivity.

6.2 Communication modes

NGN is required to support the following communication modes:

- one-to-one;

- one-to-many;
- many-to-many;
- many-to-one.

6.3 Transport network components

It is an NGN objective to support services and applications independently of the technologies concerning access network and core network. Thus:

- 1) NGN is required to support diverse access and core transport function technologies.
- 2) The transport stratum is required to be capable of providing IP connectivity between the end-user functions and core transport functions.
- 3) NGN is required not to preclude user networks of any level of configuration complexity.

6.4 Network attachments

The following requirements related to network attachment apply:

- 1) NGN is required to support registration at the access network level, initialization of end-user functions for accessing the NGN services and management of the access network IP address space, including a NAT function.
- 2) The user profile is required to keep user access authentication data and information related to the required network access configuration.
- 3) NGN is required to support the re-configuration of services available to the user when the user is nomadic and accesses their services from a location other than the subscribed-to location. Services may be dependent on any or all of: the user device, the access network and arrangements (e.g., roaming agreements) between the service provider and the access network provider. The access network is required to allocate resources according to the services to be provided.
- 4) When multiple access networks are connected to a single NGN core network, an access network is required to be able to authenticate/authorize access by a user roaming on this access network from another access network.
- 5) To guarantee the availability of roaming services, the NGN access network attachment procedures are required to support access network authentication based on a standardized method for identifying users at access network level (e.g., the network access identifier (NAI) mechanism specified in [b-IETF RFC 2486]).

6.5 IPv6 support

IPv6 supports not only extensions of IP address space but also various advanced features which influence NGN functions and relevant functional entities. That is, IPv6 also has more flexibility for introducing new applications/services using the combination of extension headers and options.

Therefore, this clause identifies general requirements of IPv6-based NGN which are influenced by IPv6 features. It is recognized that IPv6-based NGN is required to satisfy the following requirements:

- IPv6-based NGN is required to support the IPv6 extension headers and options;
- IPv6-based NGN is required to accommodate IPv6 addressing schemes.

6.5.1 Multi-homing for IPv6-based NGN

- IPv6-based NGN is required to support multiple access capabilities for a user, including access capabilities to access networks using different technologies (e.g., mobile network, WiFi).

- A user terminal is required to have multiple connections with multiple network interfaces and/or multiple IPv6 addresses.
- A user terminal using multi-homing with IPv6 is recommended to acquire (or relinquish) additional IPv6 addresses dynamically.
- A user terminal using multi-homing with IPv6 is recommended to acquire (or relinquish) additional network interface(s) dynamically.
- IPv6-based NGN is required to acquire (or relinquish) additional IPv6 prefixes dynamically.

6.5.2 Signalling in IPv6-based NGN

- 1) IPv6-based NGN is required to support signalling interworking with other networks (e.g., IPv4-based NGN).
- 2) IPv6-based NGN is required to support signalling minimizing required modifications for signalling protocols used in IPv4-based NGN.

6.5.3 IPv6 migration in NGN

NGN is required to support IPv6 migration function in access transport functions or core transport functions.

6.6 Multicast support

These capabilities enable applications to deliver content to multiple users at the same time.

In addition to unicast, multicast capabilities are required to be supported for efficient network resource usage and scalable data delivery.

The following requirements apply to NGN:

- 1) It is required to provide multicast-based capabilities in a single NGN domain.
- 2) It is recommended to provide multicast-based capabilities across multiple NGN domains.
- 3) NGN is required to provide multicast data delivery capabilities.
- 4) NGN is required to provide multicast service control capabilities.
- 5) NGN is required to support multicast group management capabilities.
- 6) NGN is required to support security mechanisms for multicast.
- 7) NGN is required to support nomadism for multicast communications.
- 8) NGN is recommended to support pre-defined, multicast group-wide QoS capabilities without QoS negotiation support.
- 9) NGN is recommended to support seamless mobility for multicast communications.
- 10) NGN can optionally support reliability for multicast capabilities.

NOTE – For further details, see [ITU-T Y.2236].

7 Service and application support

7.1 Open service environment

7.1.1 General requirements for open service environment

Open service environment capabilities stem from the general characteristics of the NGN in supporting and establishing an environment for enhanced, flexible and open service creation and provisioning within the service stratum.

Implementing new functionalities in current networks may be limited or impossible due to the capabilities of the installed equipment. Software provisioning to implement new functionalities is essentially restricted to equipment vendors, since the application programming interfaces (APIs) are typically proprietary (i.e., not open).

NGN is required to enable new capabilities and support a wide range of emerging services, including services with advanced and complex functionalities. Due to a drive from third-party application and service providers to develop new applications and capabilities accessible via open and standard interfaces, there is an increasing need for network and service providers to cooperate in the development of standard application network interfaces (ANIs). Furthermore, software reusability and portability, and use of commercial software, are recommended to be supported to facilitate cost effective development.

Some general benefits of an open service environment are as follows.

- Applications and capabilities can be easily developed by network providers as well as by third parties.
- Capabilities can be made portable and/or reusable across networks.
- Open and standard ANIs will accommodate interactions between NGN entities and applications (e.g., for service creation).

Within an open service environment, each capability is required to be able to function either independently or in conjunction with other capabilities for the realization of applications. Each capability performs all corresponding service functions for the requesting entity (e.g., third party). Applications may be provisioned in different networks, so the capabilities have to be able to function independently from the underlying network technologies.

NGN is required to satisfy the following open service environment general requirements:

- 1) Independence from transport network providers: Functionalities, operations and management of applications and services are required to be independent from the underlying transport network providers' infrastructure and network technologies.
- 2) Independence from manufacturers: A multi-vendor open service environment is required to be supported, providing users with a wide range of services and applications in a competitive environment.
- 3) Location transparency: In a distributed environment, service providers are required to be able to access capabilities from anywhere, regardless of the actual physical location of such capabilities.
- 4) Network transparency: The open service environment is required to allow applications and services to be technology- and terminal-agnostic.
- 5) Protocol transparency: Protocol transparency is required to be achieved by providing open standardized protocol programming interface tools for realizing independent service control process and shielding complex network technical details to the open service environment.
- 6) Secure access to open service environment capabilities is required to satisfy the general NGN security requirements as specified in clause 10.

NOTE – Additional requirements to support an open service environment are provided in [ITU-T Y.2234]

7.2 Service enablers

The "service enablers" category groups capabilities providing features for specific or advanced services and applications, and/or enabling access to, and/or handling of, the specific information provided by these same capabilities.

NOTE – Appendix II provides an example mapping of selected services to selected service enablers.

7.2.1 Group management

This capability provides functionalities related to the secure and efficient management of groups of network entities (terminals, users, network nodes, etc.). It may be used by applications and services for different purposes, including VPN applications, video content distribution, device management, transport and service provisioning and management, emergency (community notification) services, etc.

A typical case which requires group management is a VPN service provided by a provider. In the VPN case, a closed group has to be defined with a member list of service users, and communications within this group is recommended to be securely protected from other users. NGN is recommended to manage such groups and provide secure group communications.

Another example is simultaneous distribution of video content by multicast from a source to multiple users in a group. For such an application, the group management capability is also essential. Requirements of group management are as follows:

- 1) NGN is required to provide a capability which enables the creation of transport stratum groups.
- 2) NGN is required to provide a capability which enables the creation of service group and/or service-specific groups (service stratum).
- 3) NGN is required to manage groups, and provide secure group communications.

7.2.2 Personal information management

This capability provides management of application-specific static and dynamic information (user-related and communication-context-related). Examples of application-specific information include user contact information, application membership (passwords, etc.), default application parameters, bandwidth/QoS preferences (e.g., according to available access networks), media preferences, user-specified data, etc. Delivered by applications (e.g., notification and information services) according to pre-defined user preferences and policy attributes (e.g., across various mobile devices and access network types), this information may be stored and managed by the personal information management capability on behalf of the users. The personal information management capability, acting as user proxy with respect to applications, may also retrieve this information from applications on behalf of the users.

The following are requirements for the personal information management capability:

- 1) A personal information management capability can optionally be provided. The personal information management capability may store and manage application-specific static and dynamic information on behalf of the users; it may also retrieve this information from applications on behalf of the users.
- 2) The information managed by the personal information management capability is required to be protected against unauthorized access/retrieval or manipulation, etc.
- 3) The personal information management capability is recommended to support different communication contexts.

7.2.3 Message handling

In today's networks, some services are supported in both wired and wireless environments, others are only found in one. For example, short message service (SMS) has been designed for a wireless environment, although it can now be found in some fixed networks, whereas instant messaging (IM) has been designed for a wired environment, although some mobile networks have implemented IM services. The expectations of the various services also differ in that some services are designed to be used in what is perceived as 'real time' and others are designed as a 'mailbox' service where the message is stored ready for delivery at a later time.

The message handling capability provides functionalities for message-based services. Functionalities include real-time and non-real-time messaging service control. Examples of real-time messaging are IM and Chat, non-real-time examples being electronic mail, SMS and multimedia messaging service (MMS).

General requirements are as follows:

- 1) NGN message handling capability is required to support messaging services accessible by both types of terminals, those which are for use of wired transport access and those for use of wireless transport access.
- 2) NGN message handling capability is required to support both real-time and non-real-time messaging services.

NOTE – The group management capability may be also necessary for supporting messaging services.

In addition, there are user requirements for the message handling capability to enable configuration features of messaging services, such as selection, filtering, formatting, group management and processing (e.g., isolation of unsolicited bulk telecommunications).

7.2.4 Presence

The presence capability (service) provides access to presence information and its availability to users or services. Presence is a set of attributes characterizing the current properties (e.g., status, location, etc.) of an entity.

An entity in this respect is any device, service, application, etc., that is capable of providing presence information. Availability, on the other hand, denotes the ability and willingness of an entity to communicate based on various properties and policies associated with that entity – e.g., time of day, device capabilities, media preferences and capabilities, etc. The terms "presence" and "availability" are almost always used together to provide a complete set of presence information.

NGN is required to support both a user as the supplier of presence information (sometimes called presentity [b-ETSI TR 121 905]), and a user as the requester of presence information (watcher).

Presence is enabled by three capability groupings. Requirements for each capability grouping are described below.

Presence collection

- 1) NGN is required to provide a capability to collect information describing the connectivity state of the presentity on permission of the user, e.g., the device(s) used by a user.
- 2) NGN is required to provide a capability to collect information concerning the location of the presentity according to national regulations and laws.
- 3) NGN is required to provide a capability to collect the information concerning multimedia content of the presentity.
- 4) NGN is required to provide a capability to aggregate the presence information of multiple presentities.

Presence distribution

- 5) NGN is required to provide a capability to enable an entity, e.g., a user, to be informed of current presence status of the presentity. Another example is the usage of this capability to enable another service to access the users' presence information depending on the permission of the user.
- 6) NGN is required to provide a capability to distribute the information concerning multimedia content of the presentity.
- 7) NGN is required to provide a capability to send the notifications in bulk for multiple presentities.

