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SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

ITU-T Y.2000-series – Supplement on NGN release 2 scope

ITU-T Y-series Recommendations – Supplement 7

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Supplement 7 to ITU-T Y-series Recommendations

ITU-T Y.2000-series – Supplement on NGN release 2 scope

Summary

Supplement 7 to ITU-T Y-series Recommendations on the scope of release 2 of the next generation network (NGN) provides business roles and use cases, and discusses the value of the release.

Source

Supplement 7 to ITU-T Y-series Recommendations was agreed on 12 September 2008 by ITU-T Study Group 13 (2005-2008).

FOREWORD

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ITU-T Y.2000-series – Supplement on NGN release 2 scope

1 Scope

This supplement provides the scope of NGN release 2 of the next generation network (NGN). This supplement provides the environment, service descriptions and use cases of NGN release 2. It also includes the text of the scope of NGN release 1 according to the NGN release concept defined in [ITU-T Y.2006].

2 References

- [ITU-T Y.2001] Recommendation ITU-T Y.2001 (2004), *General overview of NGN*.
- [ITU-T Y.2006] Recommendation ITU-T Y.2006 (2008), *Description of capability set 1 of NGN release 1*.
- [ITU-T Y.2012] Recommendation ITU-T Y.2012 (2006), *Functional requirements and architecture of the NGN release 1*.
- [ITU-T Y.2014] Recommendation ITU-T Y.2014 (2008), *Network attachment control functions in next generation networks*.
- [ITU-T Y.2091] Recommendation ITU-T Y.2091 (2007), *Terms and definitions for Next Generation Networks*.
- [ITU-T Y.Supp1] Supplement 1 to Y-series Recommendations (2006), *ITU-T Y.2000 series – Supplement on NGN release 1 scope*.

3 Terms and definitions

3.1 Definitions

This supplement uses the following terms:

3.1.1 context awareness: Context awareness is a capability to determine a next step in a telecommunication or computer system by referring status of relevant entities, such as subscriber's connectivity, the location of remarked goods in a distribution system, and traffic status in a network.

3.1.2 customer premises equipment (CPE) [ITU-T Y.2014]: One or more devices allowing a user to access services delivered by NGN.

3.1.3 customer premises network (CPN): A network administered by the users.

3.1.4 home gateway (HGW) [ITU-T Y.2014]: Gateway between the customer premises network (CPN) and the access network.

3.1.5 third-party service provider [b-ITU-T M.3050.1]: The third-party service provider provides services to the enterprise for integration or bundling as an offer from the enterprise to the customer. Third-party service providers are part of an enterprise's seamless offer. In contrast, a complementary service provider is visible in the offer to the enterprise's customer, including having customer interaction.

3.2 Abbreviations and acronyms

This supplement uses the following abbreviations and acronyms:

10Base-T	10 Mbit/s Baseband data transmission over Twisted-pair copper wire
3GPP	3rd Generation Partnership Project
3GPP2	3rd Generation Partnership Project 2
ADSL	Asymmetric Digital Subscriber Line
ANI	Application Network Interface
ATM	Asynchronous Transfer Mode
BPON	Broadband Passive Optical Network
CC/PP	Composite Capabilities/Preference Profile
CMR	Customized Multimedia Ring Services
CP	Content Provider
CPN	Customer Premises Network
CWBS	Converged Web Browsing Service
DVB	Digital Video Broadcast
EPON	Ethernet Passive Optical Network
FMC	Fixed-Mobile Convergence
FTTH	Fibre to the Home
GPS	Global Positioning System
GUP	Generic User Profile
GW	Gateway
ID/LOC	Identifier and Locator
IM	Instant Messaging
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IP-CAN	IP Connectivity Access Network
IPTV	Internet Protocol Television
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISDB-T	ISDN Digital Broadcast Terrestrial
ISDN	Integrated Services Digital Network
IVR	Interactive Voice Response
LAN	Local Area Network
MCC	Multimedia Communication Centre
MDS	Managed Delivery Service
MMS	Multimedia Messaging Service
NACF	Network Attachment Control Functions
NAPT	Network Address Port Translation
NGN	Next Generation Network
NNI	Network-Network Interface
OMA	Open Mobile Alliance
OSA	Open Service Access

PBX	Private Branch Exchange
PC	Personal Computer
PDA	Personal Digital Assistant
PLC	Power Line Carrier
PLMN	Public Land Mobile Network
PoN	Push to talk over NGN
PSTN	Public Switched Telephone Network
QoE	Quality of Experience
QoS	Quality of Service
RACF	Resource Admission Control Functions
RFID	Radio Frequency Identification
SDH	Synchronous Digital Hierarchy
SIP	Session Initiation Protocol
SLA	Service Level Agreement
SMS	Short Message Service
TDR	Telecommunications for Disaster Relief
UNI	User-Network Interface
URL	Uniform Resource Locator
USN	Ubiquitous Sensor Network
VDSL	Very high speed Digital Subscriber Line
VoD	Video on Demand
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
WLAN	Wireless Local Area Network
xDSL	Various types of Digital Subscriber Line
xPON	Various types of Passive Optical Networks

4 NGN release 2 environment overview

The definition of an NGN is contained in [ITU-T Y.2001]. The objectives for NGN release documents are to provide an extensible platform for services, and an overall architecture designed to be extensible, allowing new services to be provided as required.

The NGN framework is expected to support advanced architecture objectives, to enable the offering of a comprehensive set of services over a unifying IP-layer network. The NGN is expected to support a multiplicity of access transport functions and a variety of mobile and fixed terminal types. Services are not limited to those provided by the "home network", but may be obtained from multiple service providers and third parties. Services are able to traverse multiple providers' networks. The functions that are supported by NGN release 1 specifications are illustrated in Figure 1. The figure includes the interfaces between NGN and end-user functions, between NGN and other networks, and between NGN and applications.

The objectives for NGN release 1 are to provide an extensible platform and architecture supporting:

- multimedia services (including PSTN/ISDN simulation services);
- PSTN/ISDN replacement support (emulation services);
- data communication services; and
- public interest aspects (for both multimedia services and PSTN/ISDN replacement support).



In NGN release 1, all services are carried over IP, although IP itself may in turn be carried over a number of underlying technologies, such as ATM, ethernet, etc. Release 1 assumes IPv4 or IPv6 networking at packet interconnection points and packet network interfaces, and therefore focuses on the definition of IP packet interfaces.

In addition to these objectives, NGN release 2 provides an extensible platform and architecture supporting the following:

- IPTV services;
- converged web browsing services;
- ubiquitous sensor network (USN) applications and services;
- tag-based identification applications and services;
- managed delivery services.

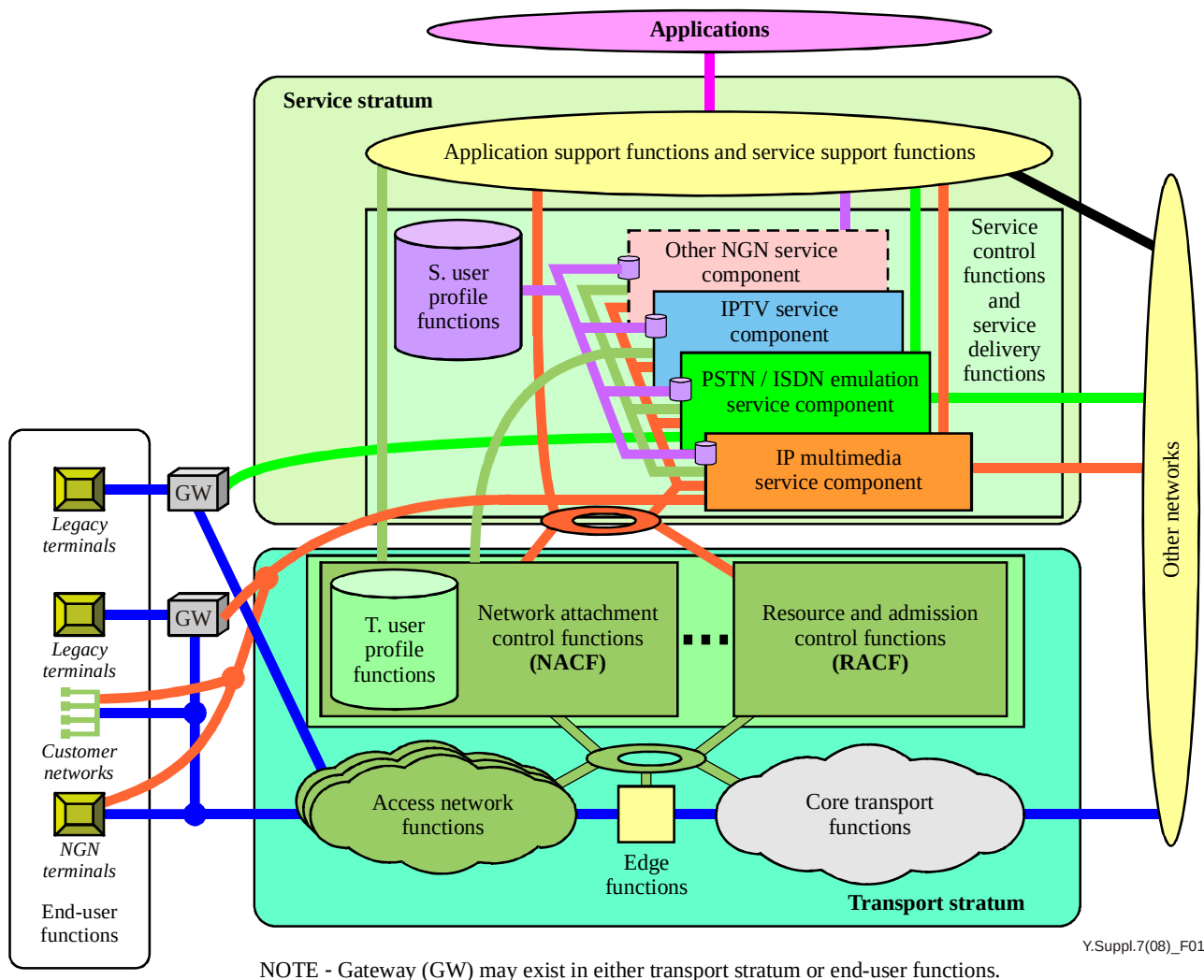


Figure 1 – Transport and service configuration of the NGN

NGN release 1 is expected to support the following functions:

- the control of access and core transport networks (QoS, admission control, authentication, etc.);
- the coordination of multiple control components to a single core transport network for resource control;

- the interworking and interoperability with legacy networks;
- mutual de-coupling of the application support functions from the service control functions and the transport stratum;
- access technology independence of service control functions and application support functions.

Figure 1 shows a representation of the components of the NGN. The components shown overlap and may share functionality. It combines both the physical and functional overview of the scope of NGN and provides a simplistic decomposition of an NGN into defined portions to enable standardization activities to progress in parallel.

Figure 1 makes extensive use of colour to group related aspects of service delivery. Service delivery and control are represented by components and are intended to collate related control functions. Complex services are supported in the NGN by common application support functions.

The components are related to each other and may contain common or shared functionality. No assumptions are made concerning their representation as separate components in the figure.

SIP-controlled services including the control and delivery of real-time conversational services are provided by the IP multimedia component (orange) based on the re-use of the IMS. The IMS is extended in the NGN to support additional access network types (mid-green), such as xDSL and WLAN.

The PSTN/ISDN emulation component (fluorescent green) provides all of the network functionality associated with supporting existing services to legacy customer interfaces and equipment.

Physical transport networks provide the connectivity for all components and physically separated functions within the NGN. Transport network functions are divided into access networks and a core transport network, with a border gateway linking the two transport network categories.

IP-connectivity is provided to the NGN customer equipment by the transport stratum, under the control of the network attachment control functions and the resource and admission control functions.

Figure 1 represents the compilation of user and other control data into two functions: "service user profile" and "transport user profile" functions. These functions may be specified and realized as a set of cooperating databases with functionality residing in any part of the NGN.

End-user interfaces are supported by both physical and functional (control) interfaces. No assumptions are made about the diverse customer interfaces and customer networks that may be connected to the NGN access network. All categories of customer equipment are supported in the NGN, from single-line legacy telephones to complex corporate networks. Customer equipment may be either mobile or fixed.

The NGN interface(s) to other networks are identified in clause 4.2.1.

The NGN interfaces to other networks both at the control level and at the transport level. Interactions between the control and transport level may take place, directly or through the RACF functionality.

All of the interfaces and service categories are further overviewed within this supplement.

NGN release 2 is expected to support the following functions:

- all the functionalities of NGN release 1;
- delivery functions for streaming content including multicasting, such as IPTV services;
- mobility support functions, e.g., fixed-mobile convergence (FMC) and seamless handover.

In Figure 1, the IPTV service component is added by the NGN release 2.

The IPTV service component (blue) provides the service control and content delivery functionalities associated with providing IPTV services over an NGN environment.

4.1 Transport functions

The transport functions provide the connectivity for all components and physically separated functions within the NGN. These functions provide support for the transfer of media information as well as the transfer of control and management information.

Transport functions include access network functions, edge functions, core transport functions, and gateway functions.

To support the multicast service, NGN release 2 is expected to provide multicast functions according to the NGN architecture; multicast functions are considered not only in the transport stratum but also in the service stratum of the NGN architecture.

The multicast service control functions provide control functions for multicast services such as, multicast session function, service user profile, and service authentication and authorization functions at the service stratum.

The service control functions accommodate service user profiles for the multicast group to which the user subscribes. These functional databases may be specified and implemented as a set of cooperating databases with functionalities residing in any part of the NGN.

ID/LOC separation is meant to eliminate the overloaded semantics of IP addresses from the NGN architecture, especially when IP addresses are a key factor of the IP protocol used for forwarding data underlying transport technologies in access and core portions of the transport stratum, as well as for identifying the communication session for an application.

Therefore, functionalities related to the ID/LOC separation may be applied to the transport stratum in NGN, to exclude using an IP address as the identifier for a communication session.

To eliminate the conventional relationship between the NGN identification and the IP address, a new binding between an ID and multiple LOCs is added into the binding, by using functionalities of the ID/LOC separation.

4.1.1 Access transport functions

NGN release 1 supports access transport functions of diverse technologies and capabilities. NGN communications and services are available to all qualified users requesting those services, regardless of the type of access transport function technology.

An access transport function provides IP connectivity, at the transport stratum, between the end-user functions and the NGN core transport functions.

See also "Terms and definitions for next Generation Networks", [ITU-T Y.2091].

The following is the proposed list of technologies that implement access transport functions for NGN release 1.

- Wireline
 - XDSL: this includes ADSL (see also [b-ITU-T G.992.1], [b-ITU-T G.992.3] and [b-ITU-T G.992.5]); SHDSL (see also [b-ITU-T G.991.2]); and VDSL (see also [b-ITU-T G.993.1] and [b-ITU-T G.993.2]) transport systems, and supporting connection/multiplexing technologies;
 - SDH dedicated bandwidth access (see also [b-ITU-T G.707]);

- optical access: this covers point-to-point (see also IEEE 802.3ah 100Base-LX/BX) and xPON transport systems such as BPON (see also [b-ITU-T G.983-series]), GPON (see also [b-ITU-T G.984-series]), EPON (Gigabit EPON is sometimes called GEAPON), (see also IEEE 802.3ah 1000Base-PX);
- cable networks: cable networks based on PacketCable multimedia specifications as another type of access transport function (see also [b-ITU-T J.179]);
- LANs: LANs using either coaxial or twisted pair cable, including 10Base-T Ethernet (see also [b-IEEE 802.3]), Fast Ethernet (see also [b-IEEE 802.3u]), Gigabit Ethernet (see also [b-IEEE 802.3z]), 10 Gigabit Ethernet (see also [b-IEEE 802.3ae]);
- PLC (Power Line Carrier) networks: the PLC network transmits and receives data over the power line.
- Wireless
 - IEEE 802.X wireless networks (see also various publications for wireless LAN and broadband wireless access in the bibliography);
 - 3GPP or 3GPP2 IP-CAN;
 - broadcast networks (3GPP/3GPP2 Internet broadcast/multicast, DVB, ISDB-T) (see also various publications related to broadcast in the bibliography).

4.1.2 Core transport functions

The core transport functions are responsible for ensuring information transport throughout the core network. They provide the means to differentiate the quality of transport in the core network.

These functions provide QoS mechanisms dealing directly with user traffic, including buffer management, queuing and scheduling, packet filtering, traffic classification, marking, policing, shaping, gate control, and firewall capability.

4.1.3 Network attachment control functions

The network attachment control functions (NACF) provide registration at the access level and initialization of CPE for accessing the NGN services. The functions provide network-level identification/authentication, they manage the IP address space of the access network functions, and authenticate access sessions.

The NACF also announces the contact point of the NGN service stratum components to the CPE [ITU-T Y.2014].

Network attachment through NACF is based on implicit or explicit user identity and authentication credentials stored in the NACF.

The NACF provides the following functionalities:

- dynamic provisioning of IP addresses and other user equipment configuration parameters;
- by endorsement of user, auto-discovery of user equipment capabilities and other parameters;
- authentication of end-user and network at the IP layer (and possibly other layers). Regarding the authentication, mutual authentication between end-user and the network attachment is performed;
- authorization of network access, based on user profiles;
- access network configuration, based on user profiles;
- location management at the IP layer.

In NGN release 2, a handover and seamless handover feature that enables service continuity should be supported. Handover should cover inter-access networks and intra-access networks scenarios. An inter-core networks handover scenario that typically represents mobility among different providers is for further study.

4.1.4 Resource and admission control functions

Application functions supporting different NGN services interact with the resource and admission control functions to provide capabilities for control of NGN transport resources, including QoS control and NATP/firewall traversal control.

RACF interacts with transport functions to control one or more of the following functionalities in the transport stratum: packet filtering; traffic classification, marking and policing; bandwidth reservation and allocation; prevention of IP address spoofing; network address and port translation (NAPT), firewall traversal; and usage metering.

RACF also interacts with NACF, including network access registration, authentication and authorization, parameters configuration, to check user profiles against service level agreement (SLA).

The resource and admission control functional architecture meets the following high-level requirements in release 2:

- 1) Support resource and admission control for multicast in support of, e.g., IPTV.
- 2) Support the interaction between CPE/CPN and RACF.
- 3) Support resource and admission control in support of mobility.

4.2 Network-network interfaces (NNIs)

The network-network interface (NNI) should be understood as general NGN reference points that can be mapped to specific physical interfaces depending on the particular physical implementations.

4.2.1 NNIs to non-NGNs

NGN supports interconnection to any IP-based network that complies with the NGN interconnection protocol suite.

NGN supports interconnection with the PSTN/ISDN by means of interworking functions that are implemented within the NGN.

Additional target network types for interconnect in release 1 include:

- Cable networks;
- broadcast networks;
- PLMN.

4.2.2 NNIs between NGNs

NGN allows for the partition of the NGN into separate administrative domains. Interfaces on a trust boundary between domains need to support various functionalities to enable robust, secure, scalable, billable, QoS-enabled, and service-transparent interconnection arrangements between network providers. Some of the trusted domain's internal information may be removed across a trust boundary, for instance, to hide the user's private identifier or network topology information.

4.3 User network interfaces (UNIs)

The user-network interface (UNI) should be understood as general NGN reference points that can be mapped to specific physical interfaces depending on the particular physical implementations.