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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

ITU-T Y-SERIES RECOMMENDATIONS

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

GLOBAL INFORMATION INFRASTRUCTURE	
General	Y.100–Y.199
Services, applications and middleware	Y.200–Y.299
Network aspects	Y.300–Y.399
Interfaces and protocols	Y.400–Y.499
Numbering, addressing and naming	Y.500–Y.599
Operation, administration and maintenance	Y.600–Y.699
Security	Y.700–Y.799
Performances	Y.800–Y.899
INTERNET PROTOCOL ASPECTS	
General	Y.1000–Y.1099
Services and applications	Y.1100–Y.1199
Architecture, access, network capabilities and resource management	Y.1200–Y.1299
Transport	Y.1300–Y.1399
Interworking	Y.1400–Y.1499
Quality of service and network performance	Y.1500–Y.1599
Signalling	Y.1600–Y.1699
Operation, administration and maintenance	Y.1700–Y.1799
Charging	Y.1800–Y.1899
NEXT GENERATION NETWORKS	
Frameworks and functional architecture models	Y.2000–Y.2099
Quality of Service and performance	Y.2100–Y.2199
Service aspects: Service capabilities and service architecture	Y.2200–Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250–Y.2299
Numbering, naming and addressing	Y.2300–Y.2399
Network management	Y.2400–Y.2499
Network control architectures and protocols	Y.2500–Y.2599
Security	Y.2700–Y.2799
Generalized mobility	Y.2800–Y.2899

For further details, please refer to the list of ITU-T Recommendations.

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.

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.

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CONTENTS

Supplement 7 to ITU-T Y-series Recommendations

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.Sup1]   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.

NOTE - Gateway (GW) may exist in either transport stratum or end-user functions.
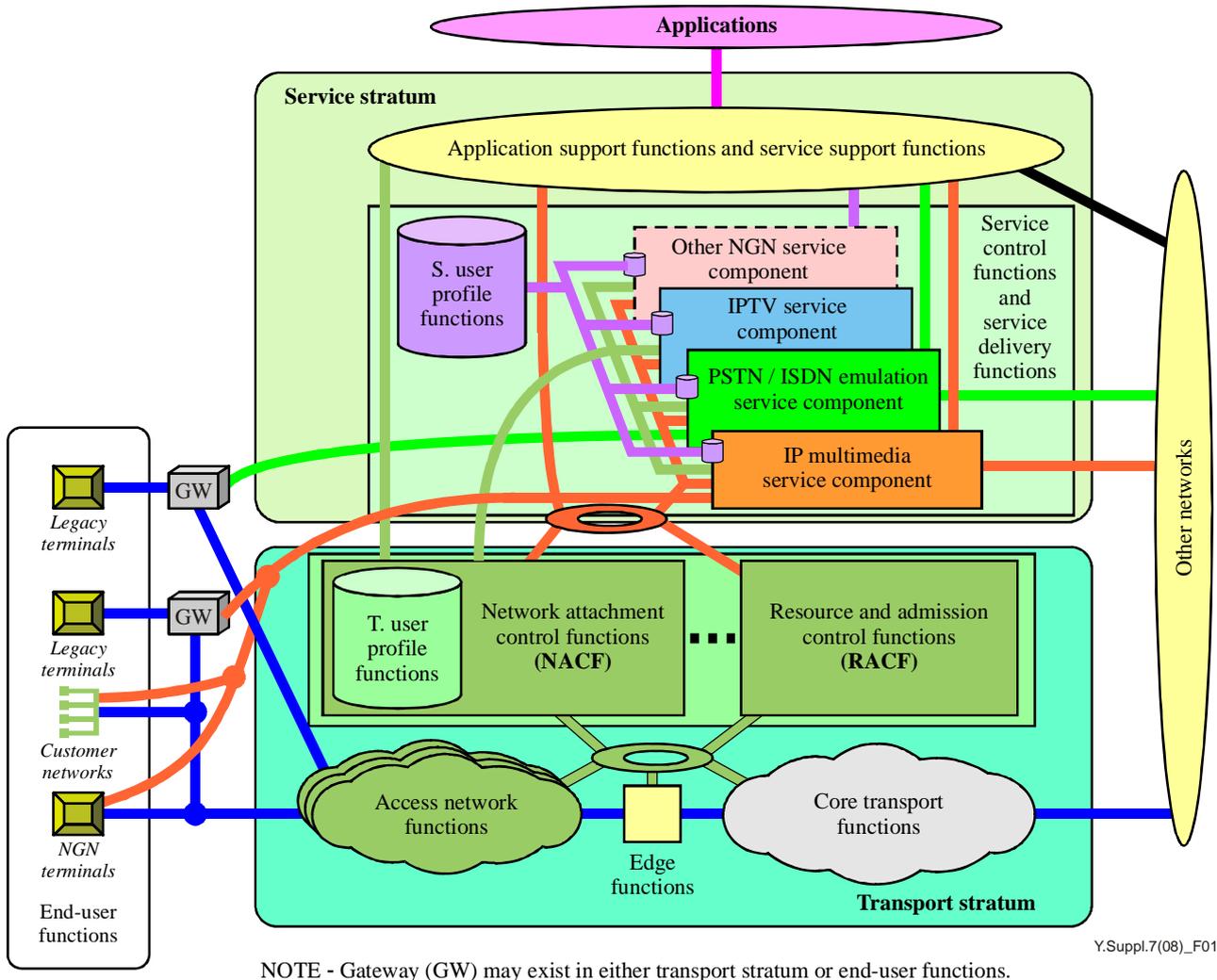
Figure 1 – Transport and service configuration of the NGN

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 GEPON), (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 NAPT/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.

4.4　User profile functions

NGN defines the user profile functions, which provide capabilities for managing user profiles and making the user profile information available to other NGN functions. A user profile is a set of attribute information related to a user. The user profile functions provide the flexibility to handle a wide variety of user information. Some of the user profile models which may influence the design of the user profile functions include:

- 3GPP generic user profile (GUP);
- 3GPP2 user profile;
- W3C composite capabilities/preference profile (CC/PP);
- OMA user agent profile;
- 3GPP/ETSI virtual home environment;
- Parlay Group – User profile data.

As shown in Figure 1, the user profile functions support the identified service and control functions in the service stratum, as well as the network access control functions in the transport stratum. This central role for the user profile functions is natural because users and their service requirements are the driving forces behind the existence of the network itself.

4.4.1　Service user profile functions

Through the service user profile functions, the following functions are supported:

- authentication;
- authorization;
- service subscription information;
- subscriber mobility;
- location;
- presence (e.g., online/offline status);
- charging.

The user profile may be stored in one database or separated into several databases.

4.4.2　Transport user profile functions

Transport user profile functions are used for storing and updating user profiles (e.g., QoS profile, P-CSC-FE address, and HGWC-FE address) related to the transport stratum. These functions provide filtered access to the user data, which may be restricted to certain interrogating entities (i.e., restricted rights to access user data), in order to guarantee user data privacy. These functions also provide basic data management and maintenance functions.

4.5　End-user functions

Customers may deploy a variety of network configurations, both wired and wireless, inside their customer network. This implies, for example, that NGN release 1 will support simultaneous access to NGN through a single network termination from multiple terminals connected via a customer network.

It is recognized that many customers deploy firewalls and private IP addresses in combination with NAPT. NGN support for user functions is limited to control of the user gateway functions between the end-user functions and the access transport functions. The device implementing these gateway functions may be managed by the customer or the access transport provider. Management of customer networks is, however, outside the scope of release 1. As a result, customer networks may have a negative impact on the QoS of an NGN service as delivered to user equipment.

Implications of specific architectures of customer networks on the NGN are beyond the scope of NGN release 1. Customer-network internal communications do not necessarily require the involvement of the NGN transport functions (e.g., IP PBX for corporate networks).

No assumptions are made about the diverse end-user interfaces and end-user networks that may be connected to the NGN access network. End-user equipment may be either mobile or fixed.

In release 2, an interface is added to allow the possibility that the end-user equipment has the specific capability to invoke the anchor services.

4.5.1   User equipment (NGN terminals)

The NGN is expected to support a variety of user equipment.

This includes legacy terminals connected via a gateway (examples of legacy terminals are voice telephones, facsimile, PSTN textphones, etc.), SIP phones, soft-phones (computer programs), IP phones with text capabilities, set-top boxes, multimedia terminals, PCs, user equipment with intrinsic capability to support a simple service set, and user equipment that can support a programmable service set. In NGN release 2, IPTV terminal devices [b-ITU-T H.720], including mobile IPTV terminals, are supported.

It is not intended to specify or mandate a particular NGN user equipment type or capability, beyond compatibility with NGN authentication, control and transport protocol stacks.

4.5.2   Customer network (home network)

The NGN is expected to provide diverse service and transport capabilities to the users of customer/home networks and it also supports an interconnection with the customer/home network through a gateway function [b-ITU-T H.622.1]. In NGN, the home gateway is at the boundary between CPN and NGN.

4.6   Gateway functions

The gateway functions provide capabilities to interwork with end-user functions and/or other networks, including other types of NGN and many existing networks; such as the PSTN/ISDN, the public Internet, and so forth.

Gateway functions can be controlled either directly from the service control functions or through the transport control functions.

5   NGN release 2 services

The services listed in this clause are expected to be those services that are supported by NGN release 2. Based on the NGN release concept, the NGN release 1 services are also described in this supplement. It should be noted that the selection of services to be included in any specific network is a deployment decision of the operator of that network.

5.1   Multimedia services (NGN R1 services)

NGN release 1 supports both real-time, conversational telecommunications (beyond voice) and non-real-time telecommunications. Examples of these are:

- **Real-time conversational voice services** (interoperable with the existing public-switched telephone network (PSTN) and with mobile networks).
- **Messaging services**, such as IM, SMS, MMS, etc.
- **Push to talk services over NGN (PoN)** – Push to talk services using an NGN core network that might be serving multiple types of access transport functions, see also Open Mobile Alliance, "Push to talk over cellular".

- **Point-to-point interactive multimedia services**, e.g., interactive real-time voice, real-time text, real-time video (e.g., IP videotelephony, see also [b-ITU-T F.724], total conversation (see also [b-ITU-T F.703]), voice telephony with text (see also [b-ITU-T T.140]), white-boarding, etc.).

- **Collaborative interactive communication services** – Support of low-latency multimedia conferencing with file sharing and application sharing, e-learning and gaming.

- **Content delivery services** – Delivery of video and other media streams to users, such as radio and video streaming, music and video on demand, financial information distribution, professional and medical image distribution and electronic publishing.

- **Push-based services** – Services provided via push capability (e.g., MMS notification). Note that public interest aspects must be taken into account.

- **Broadcast services** – These types of services rely on multicast mechanisms for the delivery of content streams to multiple users and groups. An example is reporting of alert conditions for emergency community notification.

- **Information services**, such as cinema ticket information, motorway traffic status, and use of advanced push services.

- **Location-based services**, such as tour guide service, user service, assistance service for disabled persons and emergency calls.

- **Presence and general notification services** – The presence service provides other users or services with access to presence information. 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, etc. The terms presence and availability are almost always used together to provide a complete set of presence information. NGN users are able to be both the suppliers of presence information (sometimes called presentities), as well as the requesters of presence information (watchers).

- **3GPP Release 6 and 3GPP2 Release A OSA-based services** (see also various publications related to open service access in the bibliography).

- **Customized multimedia ring services (CMR) (NGN R2 services)** – Customized multimedia ring service is a combination service that allows subscribers to customize the medium used to present to the called party or calling party based on the service information, and it includes customized ring back tone service, customized ring tone service and customized background tone service. The customized ring back tone service plays a customized ring back tone to the calling party, instead of the traditional ring back tone, during a call setting-up process according to call information and subscriber preference. The customized ring tone service plays a customized ring tone to the called party during a call setting-up process according to call information and subscriber preference. The customized background tone service enables the subscriber to customize the background medium. The medium includes audio, text, video, image, etc. that is customized by subscribers.

- **Visual surveillance services (NGN R2 service)** – Visual surveillance services deliver real-time video, voice and remote control information from one NGN user to another. They support the transferring, storing and processing of media signals captured from remote NGN users.

- **Multimedia communication centre services (NGN R2 service)** – Multimedia communication centre (MCC) services provide call centre services to the NGN subscribers. Through the MCC services, the calls to the same destination could be centralized and

managed efficiently so that uniformed customer service could be provided. The calls could be answered by automatic responses and/or enterprise's agents using multimedia. If the agents the users ask for are not available, the MCC services provide support to make the calls wait in line depending on multiple policies. Some call control operations for agents, such as holding and transferring the call etc., also are supported by MCC services. The MCC services may support other interactions between users and automatic responses/agents as well.

5.2 PSTN/ISDN emulation services (NGN R1 services)

5.2.1 General aspects for PSTN/ISDN emulation

PSTN/ISDN emulation provides PSTN/ISDN service capabilities and interfaces that use adaptations to an IP infrastructure.

It is anticipated that the NGN will support an orderly and market-driven evolution for the support of both legacy equipment and the PSTN/ISDN service set. Key scenarios of this feature are:

• PSTN/ISDN replacement (in whole or in part);

• support for legacy terminals connected to the NGN.

PSTN/ISDN replacement scenarios are dependent on the migration and evolution plans of network operators. These fall into one of two deployment scenarios:

• replacement of an existing PSTN/ISDN with a call server-based solution;

• replacement of an existing PSTN/ISDN with an IMS-based solution.

5.2.2 Terminals for PSTN/ISDN emulation

NGN release 1 is expected to include PSTN/ISDN emulation services that support legacy terminals and interfaces.

5.2.3 Target services for PSTN/ISDN emulation

The PSTN/ISDN service set is not redefined by NGN. Not all service capabilities and interfaces have to be present to provide an emulation of a particular PSTN/ISDN network.

5.3 PSTN/ISDN simulation services (NGN R1 services)

5.3.1 General aspects for PSTN/ISDN simulation

PSTN/ISDN simulation provides PSTN/ISDN-like service capabilities using session control over IP interfaces and infrastructure. The simulated services may not be identical to those in the PSTN/ISDN. PSTN/ISDN simulation is provided at the user interface, which may be different from PSTN/ISDN.

5.3.2 Terminals for PSTN/ISDN simulation

NGN release 1 is expected to support a set of PSTN/ISDN-like services for advanced terminals such as IP-phones, or for terminal adaptations connected to legacy terminals.

5.3.3 Target services for PSTN/ISDN simulation

ISDN bearer and supplementary services are described and defined in the ITU-T I.230- and I.250-series of Recommendations. These form the expected basis of simulated PSTN/ISDN services. Additional services, e.g., SIP based, may also be available when PSTN/ISDN simulation is provided.

NOTE – "Simulation" is said to be "based on" PSTN/ISDN services in order to provide PSTN/ISDN-like services.

5.4 Data communication services (NGN R1 services)

Other services and applications of the NGN include various data communication services that are commonly provided by packet data networks. Examples of these are:

- **virtual private network (VPN) services** – Multipoint controlled and secured communication services for the exchange of single or multimedia streams among a restricted group of service endpoints and the use of shared transport stratum resources.

  NGN release 2 may support VPN services in mobile environments as well as multicast VPN services;

  NOTE – VPN functionalities could also act as service enabler for support of applications and user services.

- **existing data services**, such as data file transfer, electronic mailbox and web browsing;

- **data retrieval services**, such as tele-software;

- **online services** – online sales for consumers, e-commerce, online procurement for commercial organizations;

- **remote control/tele-action services**, such as home application control, telemetry, alarms, monitoring service (baby, home security and traffic), etc.

5.5 Public interest aspects (NGN R1 services)

NGN also provides services required by regulations or laws of national or regional administrations and international treaties. These may include, among others:

- Emergency telecommunications services (including support of early warning):
  - individual-to-authority communications, e.g., calls to emergency service providers;
  - authority-to-authority communications, e.g., telecommunications for disaster relief (TDR); and
  - authority-to-individual communications, e.g., community notification services.
- Support for users with disabilities.
- Lawful interception.
- Service unbundling.
- Number portability.
- Network or service provider selection.
- Prevention of unsolicited bulk telecommunications.
- Malicious communication identification.
- User identifier presentation and privacy.

NOTE – NGN is not intended to preclude access to the Internet.

5.6 IPTV services (NGN R2 services)

IPTV is defined as multimedia services such as television/video/audio/text/graphics/data delivered over IP-based networks managed to provide the required level of QoS/QoE, security, interactivity and reliability (see [b-ITU-T Y.1901]). [b-Y.Sup5], IPTV service use cases, provides descriptions and use cases of various IPTV services. It categorizes the service from the end-user's perspective as:

- Distributed content services
  - Broadcast services:
    - linear TV,
    - linear TV with trick mode,

- pay per view,
- electronic program guide (EPG),
- personal broadcast service,
- hybrid: Online and off-air TV delivery,
- linear TV with multi-view service;

  – on-demand service
- video on demand (VoD),
- near VoD (NVoD),
- reserved delivery service,
- on-demand with multi-view service,
- music on demand (MoD);

  – advertising services
- traditional advertising service,
- targeted advertising,
- on-demand advertising,
- advertising message logging;

  – time-shifting and place-shifting services;

  – supplementary content;

- Interactive services
  - information services;
  - commercial services;
  - entertainment services;
  - learning services;
  - medicine services;
  - monitoring services;
  - portal services;
  - interactive advertising;
- Communication services;
- Other services
  - public interest services
    - support for end-users with disabilities,
    - emergency telecommunications,
    - community-related information;
  - hosting services
    - business-to-business,
    - user created content (UCC) hosting;
  - presence services;
  - session mobility services.

5.7 Enterprise network services

NGN provides enterprise services which include:

• Virtual leased line service,

• business trunking application, and

• hosted services for enterprises (IP centrex, etc.).

5.8 Converged web browsing services (CWBS) (NGN R2 service)

Web-browsing services enable a user to display text, images, and other information from web servers. In NGN environments, web-browsing services may not operate properly, due to incompatibilities between the different types of devices (e.g., screen size or resolution) and networks (e.g., CDMA, WLAN, WiMAX, Bluetooth). Converged web-browsing service (CWBS) provides more advanced web-browsing services in different NGN devices and various network environments with profile-based content adaptation capabilities, enabling NGN terminals to browse web content effectively, regardless of device and network types.

5.9 USN applications and services (NGN R2 service)

Ubiquitous sensor network (USN) is a conceptual network and an informational infrastructure that delivers sensed information and knowledge services to anyone, anywhere and at anytime. In the USN information and knowledge are developed using context awareness.

USN applications and services are created through the integration of sensor network services into the network infrastructure. They are applied to everyday life in an invisible way as everything is virtually linked by pervasive networking between users (including machines and humans) and sensor nodes, relayed through intermediate networking entities such as application servers, middleware entities, access network entities, and USN gateways. USN applications and services can be used in many civilian application areas such as industrial automation, home automation, agricultural monitoring, healthcare, environment, pollution and disaster surveillance, homeland security, and the military field.

5.10 Tag-based identification applications and services (NGN R2 service)

Tag-based identification applications and services provide users with access to multimedia information through the users' electronic devices equipped with ID terminals [b-ITU-T Y.2213]. Multimedia information related to the identifier is usually stored and managed in databases, which are connected to the ID terminal via NGN. When a user's ID terminal obtains an identifier from the ID tag described in [b-ITU-T Y.2213], independently of where it is attached, the ID terminal tries to find the associated information (URL, URN, IP address, E.164 number, etc.) of the related multimedia information automatically. This service enables the user to refer to the multimedia information without typing the content address on a keyboard or inputting the name of objects.

Tag-based identification applications and services are those using tag-based identification distinguished by the following four mandatory elements: Identifier, ID tag, ID terminal and associated information identifier. Applications and services that are not based on these four elements are out of scope of [b-ITU-T Y.2213].

5.11 Managed delivery services (MDS) (NGN R2 service)

Managed delivery services (MDS) are provided by an NGN provider to third-party service providers via an ANI ([ITU-T Y.2012]) of the NGN, in which comprehensive control capabilities for service delivery are available between third-party service providers and their users.

A third-party service provider will be able to provide more service capabilities by partnering with NGN providers without any further infrastructural investments between a user and a third-party

service provider or between users of the third-party service provider. Thanks to these additional capabilities, a third-party service provider can provide a better and broader range of services through the selection of the appropriate parameters. Users of a third-party service provider will use the services in various ways, depending on their needs. NGN providers will be able to extend their business coverage jointly with third-party service providers in order to increase their users directly or indirectly and to develop a value-added infrastructure.

Appendix I

Service descriptions and use cases

I.1   General use cases

I.1.1   Telephone service among VoIP/IP phone and mobile phone

A packet-based telephone service is similar to the telephone service of a circuit switched network. Mutual communication between fixed and mobile terminals and a roaming service are provided. Also, the phone network traces the location of users using the user identification functionality, so a person can be reached by one phone address, regardless of where the person is, and regardless of which terminal the person uses.

I.1.2   Video telephony and total conversation

A video telephony service is basically a point-to-point real-time multimedia communication service between human users providing communication by video and voice. Total conversation is a similar service providing real-time text in addition to video and voice. These services can be enhanced with additional features such as a multimedia messaging service (MMS) and an interactive video responder. For example, when the called person is not available, video, picture or text messages can be shown on the calling person's terminal, and the calling person can select an action such as forwarding the call to a mobile terminal, leaving a video message or sending an email.

Also the quality of the video or voice is automatically adjusted depending on the access transport function being used. When the call connection is established, the network automatically detects the type and quality of the access connection (such as dial-up, xDSL, FTTH, WLAN, etc.) of each end, and measures the end-to-end quality of the call connection. It notifies the quality information of the call connection to the user terminals, who can adjust the bit rate of the video stream, and the video quality which each user sees can be optimized. When adjusting the video quality, the user requirements of good flow of the video image for use in sign language and lip reading should be considered so that when conditions call for quality sacrifice, first spatial resolution is reduced and then, as a last resort, the temporal resolution.

I.1.3   Video on demand (VoD)

This service enables broadcasting of communication services in networks. All types of on demand communication (e.g., VoD) are assumed. It is assumed that such broadband data communication transmits high-capacity data. Even if all the registered users access simultaneously the quality of video should not be affected. Since need of service will be different for each user, the service level should be agreed between the user and the service provider when the user subscribes to the service. Size of the screen, frames per second and price will be different depending on the SLA, and even the same content should be delivered differently based on each user's SLA. Moreover, if a user watches video using one of the many kinds of terminals such as fixed television, fixed PC, mobile terminal, and so on, the bit rate of the video should be automatically adjusted, depending on the capacity of the terminal and access transport function. When a user changes from one type of terminal to another, the session management should be considered. For example, a user can suspend a video session at home and then resume the session on his/her PC at the office.

In order to provide a high bit rate and real-time broadcasting service to all people throughout a city or nation, a network needs to support an efficient data delivery mechanism. Since broadcasting is a one-to-many type of communication, the delivery network should support that communication type, which may require different mechanisms from those for one-to-one communication. Multicast type contents delivery will be one of the methods that will support one-to-many type of communications.

I.1.4 Multimedia conference

This is the application that enables many registered and authorized users to join in a conference with terminals handling multimedia data such as video, voice, image and real-time text. It realizes interactive communication not only amongst those attending that meeting, but also permits the sending of messages in any media. Users can specify another person with a user-friendly name, such as a URL or domain name, and the network will translate the name into a network address or number to connect. This makes it possible for various media such as voice, image and video to be treated, as well as text data like instant messaging and to display them in the most suitable way, according to the requirements of the users. Also, users can benefit from ubiquity by being able to receive services from anywhere and using any terminal connected to the network. This multimedia conference can be used for a virtual community site.

A multimedia conference is a many-to-many type of communication which is different from the one-to-one and the one-to-many types, especially in terms of scalability. Techniques like multicasting could be applied to this type of communication also. Moreover, it is important to adjust the quality of media (bit rate) depending on each user's requirements or type of access transport function.
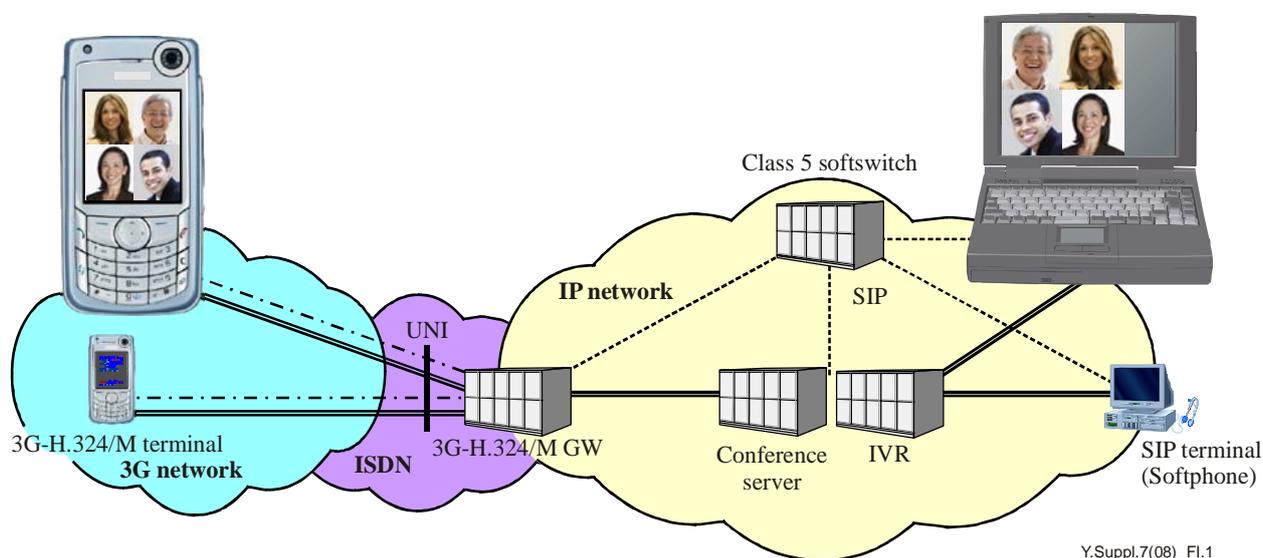

Figure I.1 – Example of a multimedia conference

Figure I.1 is an example of a multimedia conference which comprises a number of interconnected mobile and fixed telephone networks, which users of each network can join. According to the profiles of the users and/or terminals, text, voice and image can be transmitted in an appropriate way. In so doing, regarding the quality of service, the regular quality that provides stable services has to be guaranteed throughout the networks.

I.1.5 Online applications (e.g., sales/commerce, gaming, etc.)

A variety of commercial services, such as online sales for consumers, online procurement for commercials and information providing services will be deployed. It is supposed that more complicated services using web services or agent technology will be provided. For consumers, one example of service is the one that recommends shops based on the user profile and the nearest shop according to user location. On the other hand, for business use, it is necessary that network quality requirements are guaranteed and that reliability is ensured, in order to carry out mission critical transactions without failure. At the same time, security functions need guarantee that information is not leaked.

I.1.6 Remote control of home applications (ubiquitous network with home electrical appliances and sensing devices)

It is assumed that home electrical appliances, through the use of wireless technology such as Bluetooth, will become NGN enabled and thus can be integrated into networks. The term electrical appliances is to be interpreted in the most general sense and is intended to include such devices as security cameras, traffic observation cameras, observation devices for care, and water meters. As a result, these home electrical appliances and various sensors can be monitored and controlled from a distant place and will require an access control capability which allows for authentication of users.

I.1.7 Services utilizing location information

Considering mobility management in a ubiquitous environment, NGN should offer mechanisms to manage location information of users and terminals. Location information will be from GPS, indoor positioning services, RFID and telecom positioning information (e.g., cell station information). Location information is useful for NGN services such as tour guide services, user services, assistance services for the handicapped, and emergency calls.
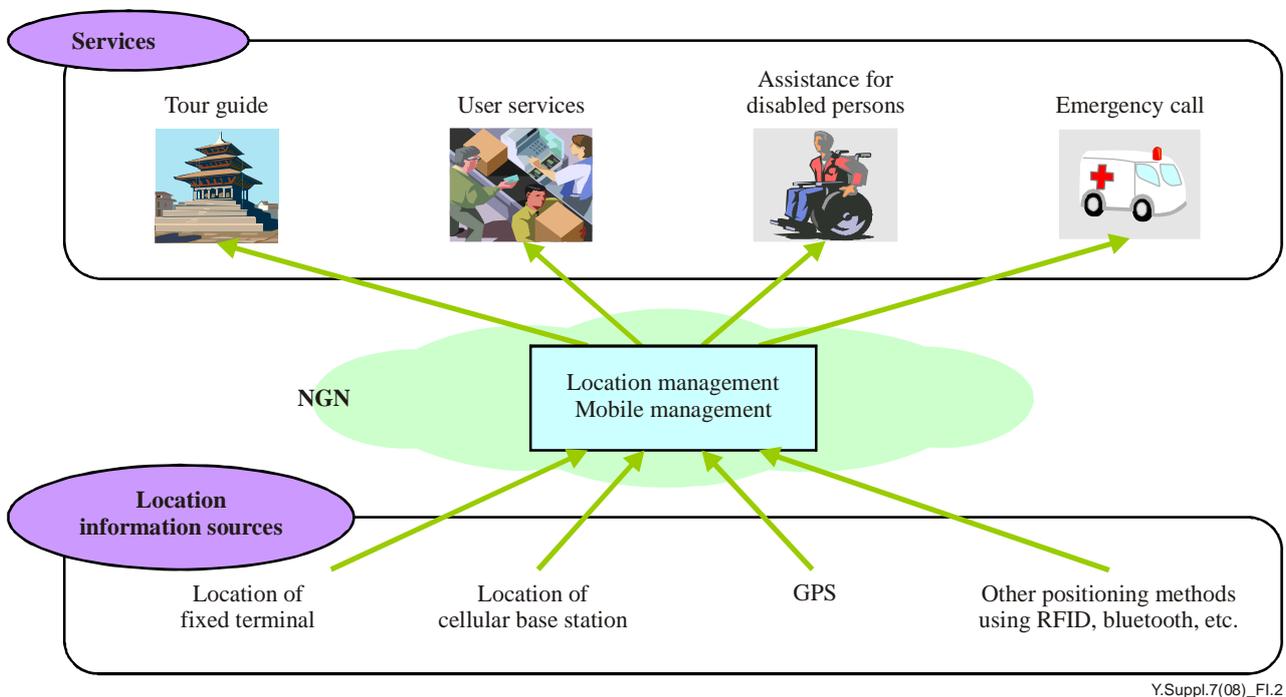
Figure I.2 – Services utilizing location information

I.1.8 Prioritized communication/traffic handling

As NGNs spread more and more widely in society, urgent calls, e.g., emergency calls and security calls need to be treated with priority. It has to be possible for computers and PDAs as well as fixed and mobile phones, to make such an urgent call (e.g., refer to [b-ITU-T E.106] and [b-ITU-T E.107]).

I.1.9 Presence enhanced services

The presence service provides access to the presence information of a user, user's devices, and services to other users or services. The presence information might be supplied by users who want to provide their presence information to other users or network systems which care about the user's session or service status.

The use of this service will enhance and enrich most of the NGN services currently present, including real-time conversational voice/video services, instant messaging, messaging services such as SMS, MMS, push to talk over NGN, and so on. These enhanced services may infer the current status, availabilities, and preferences of a user to initiate the various kinds of communications, by accessing the presence information of the user's devices and services.
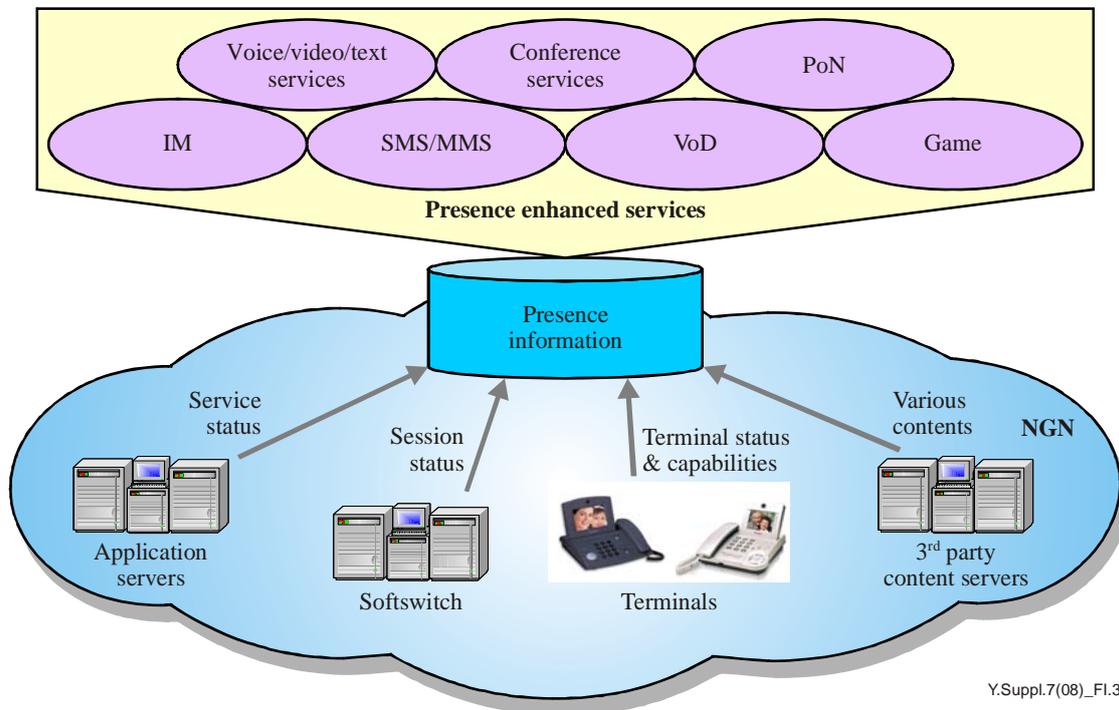
Figure I.3 – Presence enhanced services

Examples of such enhanced services are as follows:

–   User A, who wants to communicate with his friend B, finds that B's phone is busy on A's buddy list, so A may send an SMS message to him instead of making the phone call. (The call status information is retrieved from the presence server interworking with the session controller.)

–   User A finds out on his buddy list that his friend B is playing on line, and joins that game session by driving his game program. User A may also invite other friends, who use game phones and are in an idle state, to join the game, while at the same time sending an SMS to the friend who is busy, to hang up the phone and join the game. (The application service status information is retrieved from the presence server interworking with the various application servers.)

–   User A is always provided with the stock information that he is interested in, by registering the CP agent as his buddy. When the price of the stock matches the conditions preset, he is notified by SMS message or by a CP agent buddy status warning. (Information services are provided by registering various third party content providers on the buddy list.)

–   User A initiates a conference call with his buddy members just by clicking the buddy icon of presence client on his device. The conference service initiates the conference call to the members who are in idle state while sending an SMS (as above) to the members whose call status is busy requesting them to join the conference. (The enhanced application services are provided by requiring media to be converted and directed to specific devices, based on presence information and using the enhanced easy-to-use presence client.)

–　　　　User A is travelling to a distant land. Upon connecting his or her computer to the network, user A sees in the buddy list that user B is online. User A initiates a videophone call to user B to discuss a future trip. User B had a stroke a couple of years ago that affected his speech. So, when user B wants to contribute to the discussion, he types in the text area, and the text appears in near real-time on user A's terminal. User B shares his experience from an earlier trip to that distant land by sending photos. They discuss plans for future travel based on these pictures. Finally, they decide upon the destination of the trip. User A establishes a link to a travel information site to request information in order to continue planning after the current call.

I.1.10　Multimedia communication centre services

The multimedia communication centre (MCC) service provides call centre functionalities to the NGN subscribers. Through the MCC service, the calls to the same destination could be centralized and managed efficiently so that a uniform customer service can be provided.

An example of the use of MCC services is as follows:

Company A is an enterprise user of MCC and has 10 agents. Bob is one of company A's customers. Carol is the manager of company A's market department.

–　　　　Company A subscribed the MCC services, and obtained its enterprise identification from the operator. Company A should then carry out the following configurations and deployments: 1) Deploy its service application in the application server. The application could include the IVR (interactive voice response) service flow scripts, the company's personal information, etc. 2) Upload its personal media data, such as the company's welcome voice message, to the media resource device in the network. 3) Deploy its 10 agents in the network. Company A divided its agents into 3 groups to serve different customers. The agents should log onto the MCC system using the company's and the agent's profile.

–　　　　Bob calls the company A's identification using his sip-phone terminal in the NGN. The network has recognized that Bob is company A's customer because of the called party number, and A's welcome voice message is played to Bob.

–　　　　Bob listens to the A's welcome voice message and interacts with the IVR system, selecting the option of talking to the agent that belongs to the market department group. Then his call is distributed into the market department group's queuing line.

–　　　　If the agents of the market department group are all busy, Bob's call is queued up in the market department group's line and he waits for an available agent.

–　　　　If one of the agents becomes available, he/she answers Bob's call. When Bob asks for the information of company A, the agent pushes a segment of the introduction video of A to Bob.

–　　　　Through the introduction video, if Bob becomes very interested in company A's product, he tells the agent that he wants to talk with the manager of A's market department. The agent transfers the call to Carol's terminal.

–　　　　Carol's terminal rings and she picks up the call, and talks to Bob. After the conversation, Carol and Bob hang up the call and the service session is ended.

I.2　　Business use cases

Business use cases include:

1)　　　　business meetings through voice, text, video telephony, total conversation and conferencing;

2)　　　　secure access to the corporate network from outside the office (VPN);

3)   access to email and the world wide web from a laptop, handheld PC or cell phone;

4)   handover of applications (e.g., VoIP) between enterprise or home wireless hotspots and WAN;

5)   roaming of terminals across network domains and operators;

6)   use of multimedia information sharing tools, such as 'whiteboarding';

7)   routing of incoming faxes and multimedia messages to a particular terminal or network server;

8)   synchronization of work-office with home-office applications;

9)   cooperative product development from multiple remote locations;

10)   device-management monitoring/control services;

11)   downloading the device management information through over-the-air multicast and broadcast;

12)   customer service desk supporting deaf clients, through a video-relay service or a real-time text-relay service for translation between sign language and voice or between real-time text and voice.

Special considerations:

•   secure mobile access from any location with wireless signal coverage;

•   support for a wide variety of device types and capabilities;

•   transcoding or adaptation of content according to network and/or terminal capabilities;

•   mobile location services.

I.3   Medical use cases

Medical use cases include:

1)   a doctor on the move requires storage and manipulation of patient data;

2)   immediate on-site video transmission to a doctor for first aid assistance;

3)   transmission of medical data to a doctor or consultant;

4)   transmission of surgical treatment to remote medical staff;

5)   communication with older people in home care, who may need to see the person they are talking to and need text or lip-reading to compensate for hearing reduced by age;

6)   mobile telemedicine system.

Mobile telemedicine is a service for communication between ambulances and hospitals, and it enables the sharing of medical data (real-time vital data from the ambulance, medical care information and so on) of the patient among medical experts in hospitals, and enables quick decisions to be made that could save the patient's life. Because this service manages critical information, the communication link should be highly reliable even though wireless communication media will be used. NGN shall support priority management of emergency calls and quality assurance of mobile communications.

NOTE – Priority management of emergency calls is for further study.

– Exchanging patient's vital data, images, medical information
– Video conference

NGN
– Priority control
– Mobile QoS assurance
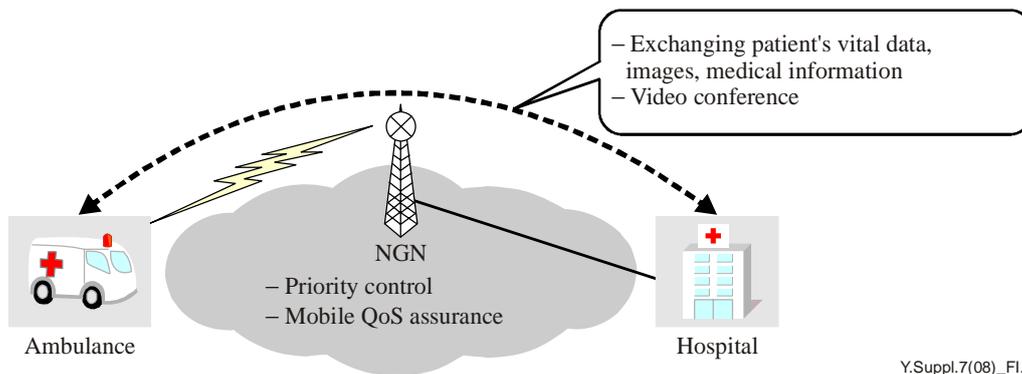
Ambulance

Hospital

Y.Suppl.7(08)_FI.4

Figure I.4 – Mobile telemedicine system

Special considerations:

- large data volumes;
- scalable data, including lossless data storage;
- transcoding or adaptation of content according to network and/or terminal capabilities;
- reliability;
- privacy.

Appendix II

Examples of categorization of services

II.1 Basic/enhanced services versus service/transport stratum

Table II.1 – Basic/enhanced services versus service/transport stratum categorization

	Service stratum	Transport stratum
Basic services	e.g., • Point-to-point voice • Point-to-point fax • Point-to-point text services • Point-to-point total conversation (video, text and voice) • Point-to-point video services	e.g., • Bandwidth and circuit wholesaling
Enhanced services	e.g., • Multipoint voice, fax and video services • Content delivery services • Presence services • Multimedia conferencing	e.g., • Virtual private connectivity

II.2 Unicast/multicast/broadcast versus real-time/non-real-time: General mapping

**Table II.2 – General unicast/multicast/broadcast versus
real-time/non-real-time categorization**

		Real time	Non-real time
Unicast	Peer-to-peer	<u>Single medium</u> – (voice) Telephony – Instant messaging / Chat – Gaming – File sharing – Voice conferencing – Push to talk – Push to view – Emergency messaging services	<u>Single medium</u> – e-mail – SMS – Fax

Table II.2 – General unicast/multicast/broadcast versus
real-time/non-real-time categorization

		Real time	**Non-real time**
Unicast	Peer-to-peer	<u>Multimedia</u> – Video telephony – Text telephony – Total conversation – Video conferencing – Whiteboarding – Emergency messaging services	<u>Multimedia</u> – MMS
	Client-server	<u>Single medium</u> – Gaming – Voice conferencing – Radio (broadcast) streaming – Websurfing	<u>Single medium</u> – Music on demand (MoD) – Video on demand (VoD)
		<u>Multimedia</u> – Video conferencing – Television (broadcast) streaming – Video security	<u>Multimedia</u>
Multicast		<u>Single medium</u> – Radio multicast – Gaming – Emergency alert	<u>Single medium</u> – OTA/OTN device management – Cell broadcast SMS
		<u>Multimedia</u> – Video multicast – Gaming	<u>Multimedia</u> – Cell broadcast MMS
Broadcast		<u>Single medium</u> – Radio broadcast	<u>Single medium</u>
		<u>Multimedia</u> – Television broadcast	<u>Multimedia</u>

II.3 Business mapping

**Table II.3 – Business unicast/multicast/broadcast versus
real-time/non-real-time categorization**

		Real time	Non-real time
Unicast	Peer-to-peer	Single medium – Identity management (personal, security inventory) – Location applications – Presence applications	Single medium
		Multimedia – Whiteboarding	Multimedia – Product marketing
	Client-server	Single medium – e-commerce – Stock trading – Business transactions – Product software updates – User portal personalization – Terminal software integrity checks – Remote monitoring of terminal radio capabilities	Single medium – Product database access
		Multimedia – Professional training – Marketing tools	Multimedia – e-learning
Multicast		Single medium – Sales targeting – Traffic alert	Single medium – Electronic publishing – Electronic coupon – Traffic alert
		Multimedia – Traffic alert with route information	Multimedia – Traffic alert with route information
Broadcast		Single medium – Radio broadcast	Single medium – Sales promotions
		Multimedia – General news, financial and travel information	Multimedia – Movie trailers

II.4   Medical mapping

Table II.4 – Medical unicast/multicast/broadcast versus real-time/non-real-time categorization

		Real time	**Non-real time**
Unicast	Peer-to-peer	<u>Single medium</u> – Medical sensor applications – Patient surveillance	<u>Single medium</u> – Medical sensor data applications
		<u>Multimedia</u> – First aid assistance – Medical inspection relay	<u>Multimedia</u> – Medical database transfer (large data size, lossless storage)
	Client-server	<u>Single medium</u> – Equipment data logging	<u>Single medium</u> – Equipment data processing or viewing
		<u>Multimedia</u> – Home medicine – Telepresence	<u>Multimedia</u> – Personal medical database (large data size, lossless storage) – Medical library / diagnosis
Multicast		<u>Single medium</u>	<u>Single medium</u>
		<u>Multimedia</u> – Specialized medical training	<u>Multimedia</u> – Targeted advertising of health products
Broadcast		<u>Single medium</u>	<u>Single medium</u> – Alerts by centre of disease control
		<u>Multimedia</u> – Medical professional education	<u>Multimedia</u> – Medical product information distribution

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