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

Next Generation Networks – Frameworks and functional architecture models

NGN capability set 2

Recommendation ITU-T Y.2007

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Recommendation ITU-T Y.2007

NGN capability set 2

Summary

Recommendation ITU-T Y.2007 aligns with fundamental ITU-T documents for NGN, such as:

– Supplement 7 to ITU-T Y-series Recommendations regarding NGN release 2 scope;

– Recommendation ITU-T Y.2201 on requirements and capabilities for ITU-T NGN;

– Recommendation ITU-T Y.2012 dealing with functional requirements and architecture of NGN;

– technical specifications (e.g., protocol related) identified as being part of NGN capability set 2.

NGN capability set 2 includes all features of NGN capability set 1 (Recommendation ITU-T Y.2006) and features related to Internet protocol television (IPTV) basic services such as linear TV and video on demand services. Moreover, it provides a description of the network framework and protocols that have been standardized in ITU-T.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Y.2007	2010-01-29	13

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.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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NGN capability set 2

1 Scope

This Recommendation gives a description of NGN capability set 2 in terms of the overall requirements and a high-level overview of the functional features that are supported. This Recommendation also lists ITU-T Recommendations relevant to NGN capability set 2.

To fulfil the general objectives and principles of the NGN identified in [ITU-T Y.2001] and [ITU-T Y.2011], this Recommendation focuses on key capabilities whilst ensuring that the general and long-term architectural direction of NGN is maintained to be as flexible as possible to allow future enhancements.

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 G.1080] Recommendation ITU-T G.1080 (2008), *Quality of experience requirements for IPTV services*.

[ITU-T H.622.1] Recommendation ITU-T H.622.1 (2008), *Architecture and functional requirements for home networks supporting IPTV services*.

[ITU-T H.701] Recommendation ITU-T H.701 (2009), *Content delivery error recovery for IPTV services*.

[ITU-T H.720] Recommendation ITU-T H.720 (2008), *Overview of IPTV terminal devices and end systems*.

[ITU-T H.721] Recommendation ITU-T H.721 (2009), *IPTV terminal device: Basic model*.

[ITU-T H.750] Recommendation ITU-T H.750 (2008), *High-level specification of metadata for IPTV services*.

[ITU-T H.760] Recommendation ITU-T H.760 (2009), *Overview of multimedia application frameworks for IPTV services*.

[ITU-T H.770] Recommendation ITU-T H.770 (2009), *Mechanisms for service discovery and selection for IPTV services.*

[ITU-T M.3060] Recommendation ITU-T M.3060/Y.2401 (2006), *Principles for the Management of Next Generation Networks*.

[ITU-T Q.1706] Recommendation ITU-T Q.1706/Y.2801 (2006), *Mobility management requirements for NGN*.

[ITU-T Q.3221] Recommendation ITU-T Q.3221 (2008), *Requirements and protocol at the interface between the service control entity and the transport location management physical entity (S-TC1 interface)*.

[ITU-T Q.3223] Recommendation ITU-T Q.3223 (2009), *Requirements and protocol for the interface between a transport location management physical entity and a policy decision physical entity (Ru Interface).*

[ITU-T Q.3300] Recommendation ITU-T Q.3300 (2008), *Architectural framework for the Q.33xx series of Recommendations*.

[ITU-T Q.3301.1] Recommendation ITU-T Q.3301.1 (2007), *Resource control protocol No. 1 – Protocol at the Rs interface between service control entities and the policy decision physical entity*.

[ITU-T Q.3302.1] Recommendation ITU-T Q.3302.1 (2007), *Resource control protocol No. 2 – Protocol at the Rp interface between transport resource control physical entities*.

[ITU-T Q.3303.0] Recommendation ITU-T Q.3303.0 (2007), *Resource control protocol No. 3 – Protocols at the Rw interface between a policy decision physical entity (PD-PE) and a policy enforcement physical entity (PE-PE): Overview*.

[ITU-T Q.3303.1] Recommendation ITU-T Q.3303.1 (2007), *Resource control protocol No. 3 – Protocol at the interface between a Policy Decision Physical Entity (PD-PE) and a Policy Enforcement Physical Entity (PE-PE): COPS alternative*.

[ITU-T Q.3303.2] Recommendation ITU-T Q.3303.2 (2007), *Resource control protocol No. 3 – Protocol at the interface between a Policy Decision Physical Entity (PD-PE) and a Policy Enforcement Physical Entity (PE-PE) (Rw interface): H.248 alternative*.

[ITU-T Q.3303.3] Recommendation ITU-T Q.3303.3 (2008), *Resource control protocol No. 3 – Protocols at the Rw interface between a policy decision physical entity (PD-PE) and a policy enforcement physical entity (PE-PE): Diameter*.

[ITU-T Q.3304.1] Recommendation ITU-T Q.3304.1 (2007), *Resource control protocol No. 4 (rcp4) – Protocols at the Rc interface between a transport resource control physical entity (TRC-PE) and a transport physical entity (T-PE): COPS alternative*.

[ITU-T Q.3304.2] Recommendation ITU-T Q.3304.2 (2007), *Resource control protocol No. 4 (rcp4) – Protocols at the Rc interface between a transport resource control physical entity (TRC-PE) and a transport physical entity (T-PE): SNMP alternative*.

[ITU-T Q.3305.1] Recommendation ITU-T Q.3305.1 (2008), *Resource control protocol No. 5 (rcp5) – Protocol at the interface between a transport resource control physical entity (TRC-PE) and a policy decision physical entity (PD-PE) (Rt interface): Diameter-based*.

[ITU-T Q.3306.1] Recommendation ITU-T Q.3306.1 (2009), *Resource control protocol No. 6 (rcp6) - Protocol at the interface between intra-domain policy decision physical entities (PD-PE) (Rd interface)*.

[ITU-T Q.3401] Recommendation ITU-T Q.3401 (2007), *NGN NNI signalling profile (protocol set 1)*.

[ITU-T Q.3401 Amd.1] Recommendation ITU-T Q.3401 (2007) Amd.1 (2008), *Extensions of NGN NNI signalling profile including video and data services*.

[ITU-T Q.3402] Recommendation ITU-T Q.3402 (2008), *NGN UNI signalling profile (Protocol set 1)*.

[ITU-T X.1191] Recommendation ITU-T X.1191 (2009), *Functional requirements and architecture for IPTV security aspects.*

[ITU-T Y.1901] Recommendation ITU-T Y.1901 (2009), *Requirements for the support of IPTV services*.

[ITU-T Y.1910] Recommendation ITU-T Y.1910 (2008), *IPTV functional architecture*.

[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.2011] Recommendation ITU-T Y.2011 (2004), *General principles and general reference model for Next Generation Networks*.

[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.2017] Recommendation ITU-T Y.2017 (2009), *Multicast functions in next generation networks*.

[ITU-T Y.2021] Recommendation ITU-T Y.2021 (2006), *IMS for Next Generation Networks*.

[ITU-T Y.2031] Recommendation ITU-T Y.2031 (2006), *PSTN/ISDN emulation architecture*.

[ITU-T Y.2111] Recommendation ITU-T Y.2111 (2008), *Resource and admission control functions in next generation networks*.

[ITU-T Y.2201] Recommendation ITU-T Y.2201 (2009), *Requirements and capabilities for ITU-T NGN*.

[ITU-T Y.2233] Recommendation ITU-T Y.2233 (2008), *Requirements and framework allowing accounting and charging capabilities in NGN*.

[ITU-T Y.2236] Recommendation ITU-T Y.2236 (2009), *Framework for NGN support of multicast-based services*.

[ITU-T Y.2262] Recommendation ITU-T Y.2262 (2006), *PSTN/ISDN emulation and simulation*.

[ITU-T Y.2271] Recommendation ITU-T Y.2271 (2006), *Call server-based PSTN/ISDN emulation*.

[ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN release 1*.

[ITU-T Y.2702] Recommendation ITU-T Y.2702 (2008), *Authentication and authorization requirements for NGN release 1*.

3 Terms and definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 Internet protocol television (IPTV) [ITU-T Y.1901]: Multimedia services such as television/video/audio/text/graphics/data delivered over IP-based networks managed to support the required level of QoS/QoE, security, interactivity and reliability

3.1.2 nomadism [ITU-T Q.1706]: Ability of the users 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.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 capability set: A set of NGN capabilities that allows provisioning of services selected from services and capabilities for a given NGN scope to ensure functional consistency.

NOTE – In consideration of the priority of a market, the concept of a capability set that breaks down the release concept is adopted because necessary functional groups exist prior to a target completion date of release. A capability set includes requirements, architecture and technical specifications necessary to provide specific services. This means that the release concept now determines the scope of NGN standardization in ITU-T and the capability set concept specifies the related Recommendations necessary for the support of specific services.

3.2.2 capability set completion: An NGN capability set is completed as soon as the related NGN capability set description Recommendation has been approved by ITU-T and all documents referenced in that Recommendation have been approved by the responsible body. Whilst in principle, all services and capabilities defined in a given capability set are to be specified to the stage 3 level to ensure that the capability set is fully implementable, exceptions can be accepted.

3.2.3 NGN release: A set of NGN specifications covering a defined capability set of services and capabilities for implementation in a timely manner. A given specification of a given NGN release can be categorized using three stages: service aspects (stage 1), functional network aspects (stage 2) and network implementation aspects (stage 3).

NOTE – ITU-T adopted a release-based approach for the development of NGN Recommendations, with the scope of each release clearly defined and target deadlines for completion specified. The objective was to aid project management and to ensure concentration of effort on a smaller set of deliverables to be achieved in a shorter timescale, thus achieving feasible deliverables in a timely manner. It was decided to no longer use the release concept in ITU-T NGN Recommendations from the 2009-2012 study period.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ANI Application Network Interface

DTMF Dual-Tone Multi-Frequency

GW Gateway

IMS Internet Protocol Multimedia Subsystem

IP Internet Protocol

ISDN Integrated Services Digital Network

MoD Music on Demand
NACF Network Attachment Control Functions
NAPT Network Address and Port Translation
NAT Network Address Translation
NGN Next Generation Network
NNI Network-Network Interface
OAM Operation, Administration and Maintenance
PBX Private automatic Branch eXchange
PD-PE Policy Decision Physical Entity
PE Physical Entity
PE-PE Policy Enforcement Physical Entity
PLMN Public Land Mobile Network
PSTN Public Switched Telephone Network
QoE Quality of Experience
QoS Quality of Service
RACF Resource and Admission Control Functions
RCIP Resource Connection Initiation Protocol
RTP Real-time Transport Protocol
SCE Service Control Entity
SDP Session Description Protocol
SIP Session Initiation Protocol
SLA Service Level Agreement
T-PE Transport Physical Entity
TLM-PE Transport Location Management Physical Entity
TRC-PE Transport Resource Control Physical Entity
UCC User-Created Content
UNI User-Network Interface
VoD Video on Demand
VoIP Voice over IP

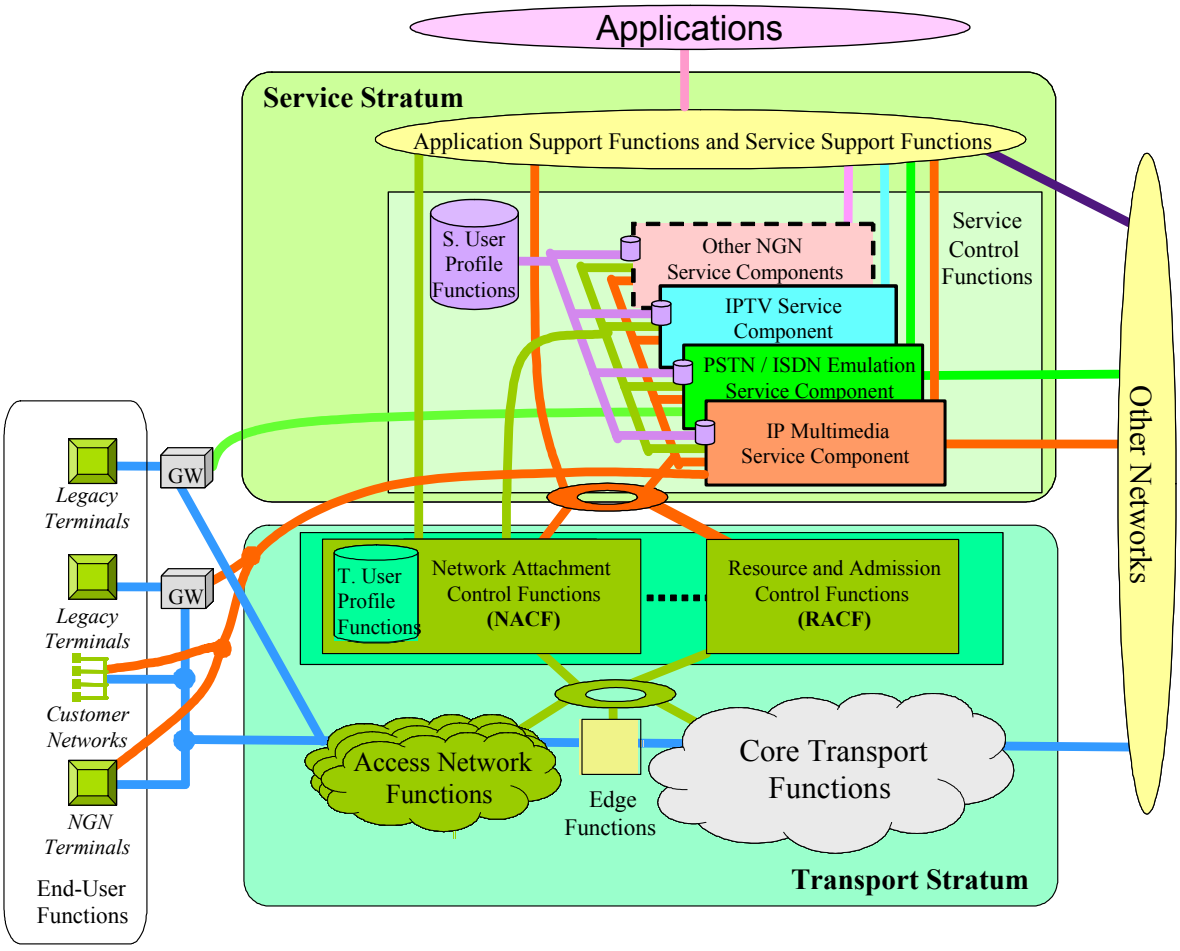
5 Conventions

None.

6 NGN environment

The objective for NGN is to provide an extensible platform for services and an overall architecture designed to be extensible, allowing new services to be provided as required. The functions that are supported by NGN 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.

More detailed information on the NGN environment can be found in [b-ITU-T Y-Sup.7].



* NOTE – Gateway (GW) may exist in either Transport Stratum or End-User Functions.

Figure 1 – Transport and service configuration of NGN

6.1 Transport functions

6.1.1 Access transport functions

NOTE – The following text is based on the text in clause 4.1.1 of [b-ITU-T Y-Sup.7].

NGN supports access transport functions of diverse technologies and capabilities.

6.1.2 NGN core transport functions

NOTE – The following text is based on the text in clause 4.1.2 of [b-ITU-T Y-Sup.7].

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.

6.1.3 Network attachment control functions

NOTE – The following text is based on the text in clause 4.1.3 of [b-ITU-T Y-Sup.7].

The network attachment control functions (NACF) provide registration at the access level and initialization of end-user functions for accessing the NGN services.

6.1.4 Resource and admission control functions

NOTE – The following text is based on the text in clause 4.1.4 of [b-ITU-T Y-Sup.7].

Application functions supporting different NGN services interact with the resource and admission control functions (RACF) to provide capabilities for control of NGN transport resources, including quality of service (QoS) control as well as NAPT and firewall traversal control.

6.2 Network-to-network interfaces (NNIs)

6.2.1 NNIs to non-NGNs

NOTE – The following text is based on the text in clause 4.2.1 of [b-ITU-T Y-Sup.7].

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

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

6.2.2 NNIs between NGNs

NOTE – The following text is based on the text in clause 4.2.2 of [b-ITU-T Y-Sup.7].

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.

6.3 User profile functions

NOTE – The following text is based on the text in clause 4.4 of [b-ITU-T Y-Sup.7].

NGN defines user profile functions, which provide capabilities for managing user profiles and making the user profile information available to other NGN functions.

6.4 End-user functions

NOTE – The following text is based on the text in clause 4.5 of [b-ITU-T Y-Sup.7].

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 customer-managed or access transport provider-managed. In addition, an interface is added to allow the possibility that the end-user equipment has the specific capability to invoke the anchor services.

6.4.1 User equipment (NGN terminals)

NGN is expected to support a variety of user equipment.

6.4.2 Customer network (home network)

NGN is expected to provide diverse service and transport capabilities to users of customer networks (home networks) and it also supports interconnection with customer networks (home networks) through a gateway function.

6.5 NGN service components

NOTE – The following text is based on the text in clause 10 of [ITU-T Y.2012].

The objectives for NGN 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 functions that are supported by NGN 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.

6.5.1 IP multimedia service component

NOTE – The following text is based on the text in clause 10.1.1 of [ITU-T Y.2012].

The IP multimedia service component supports mediated multimedia services. These services may include multimedia session services and some non-session services.

6.5.2 PSTN/ISDN emulation service component

NOTE – The following text is based on the text in clause 10.1.2 of [ITU-T Y.2012].

The PSTN/ISDN emulation service component enables the support of legacy terminals connected through a gateway to an IP network.

6.5.3 IPTV service component

NOTE – The following text is based on the text in clause 4 of [b-ITU-T Y-Sup.7].

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

6.5.4 Other NGN service components

These components might be added in the future.

7 NGN capability set 2

Details on requirements and capabilities for NGN can be found in [ITU-T Y.2201].

The technical specifications are selected according to the following criteria as defined in capability set 1 of NGN [ITU-T Y.2006].

– Criterion 1: Requirements and the functional architecture of specific services provided by NGN are completed.
– Criterion 2: External interfaces such as user-network interface (UNI) and network-network interface (NNI) are specified.
– Criterion 3: Functions and their interfaces that provide QoS assurance are specified.

Criterion 1 covers stage 1, and criteria 2 and 3 cover stage 3.

Capability set 1, defined in [ITU-T Y.2006], is mainly focused on basic communication services and achieving them.

Capability set 2 includes features that are necessary to provide basic IPTV services (linear TV and video on demand (VoD)) in NGN. Therefore, capability set 2 includes ITU-T Recommendations related to NGN-based IPTV.

IPTV-related items that are included in capability set 2 are as follows:

– Network.
– Quality of experience (QoE).
– Security.
– End system.

7.1 Transport connectivity

NOTE – The following text is based on the text in clause 6.1 of [ITU-T Y.2201].

NGN transport stratum [ITU-T Y.2012] uses IP for general, ubiquitous and global public connectivity.

7.2 Communication modes

NOTE – The following text is based on the text in clause 6.2 of [ITU-T Y.2201].

NGN supports one-to-one, one-to-many, many-to-many, and many-to-one communication modes.

7.3 Transport network component

NOTE – The following text is based on the text in clause 6.3 of [ITU-T Y.2201].

NGN supports services and applications independently of the technologies concerning access network and core network.

7.4 Network attachment

NOTE – The following text is based on the text in clause 6.4 of [ITU-T Y.2201].

NGN supports 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.

7.5 IPv6 support

NOTE – The following text is based on the text in clause 6.5 of [ITU-T Y.2201].

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.

7.6 Multicast support

NOTE – The following text is based on the text in clause 6.6 of [ITU-T Y.2201] and on text of [ITU-T Y.2236].

NGN supports capabilities enabling applications to deliver content to multiple users at the same time. [ITU-T Y.2236] describes a framework for NGN support of multicast-based services. It provides a general description of NGN multicast capabilities and the functional requirements for each functional group of the NGN architecture (i.e., transport stratum functions, service stratum functions, end-user functions and management functions).

7.7 Routing

NOTE – The following text is based on the text in clause 8 of [ITU-T Y.2201].

NGN provides capabilities to select the proper routing paths between the traffic originating endpoint and the traffic receiving endpoint and support routing schemes most suitable for NGN providers.

7.8 Quality of service

NOTE – The following text is based on the text in clause 9 of [ITU-T Y.2201].

NGN supports end-to-end and multiple levels of QoS across different networks of varying infrastructure technologies provided by multiple operators to ensure the required service level for users or applications.

7.9 Identification, authentication and authorization

NOTE – The following text is based on the text in clause 10.2 of [ITU-T Y.2201].

NGN provides capabilities for user identification in order for network operators and service providers to identify the users of certain NGN services and use this information as required (e.g., for authentication and authorization procedures). Further information can be found in [ITU-T Y.2702].

7.10 Security

NOTE – The following text is based on the text in clause 10.6 of [ITU-T Y.2201].

NGN supports security features incorporated in existing networks and allows for secure interconnection with other NGNs or non-NGN networks. Further information can also be found in [ITU-T Y.2701] and [ITU-T Y.2702].

7.11 Management

NOTE – The following text is based on the text in clause 11 of [ITU-T Y.2201]. Further information is provided by [ITU-T M.3060].

NGN management capabilities support management areas that cover the planning, installation, operations, administration, maintenance and provisioning of networks and services. The high level goal is to provide survivable and cost-effective networks.

7.12 Mobility management

NOTE – The following text is based on the text in clause 12 of [ITU-T Y.2201].

Mobility management involves the ability of mobile objects, such as users, terminals and networks, to roam between different networks (NGNs or non-NGNs). In NGN, two distinct types of mobility are considered: personal mobility and terminal mobility. Further information is provided in [ITU-T Q.1706].

7.13 Codecs

NOTE – The following text is based on the text in clause 14.2 of [ITU-T Y.2201].

NGN supports end-to-end negotiation of any codec between NGN entities (terminals and network elements) and between the NGN and other networks (including PSTN/ISDN, PLMN and other NGNs).

7.14 Operations and provisioning

NOTE – The following text is based on the text in clause 16.3 of [ITU-T Y.2201].

NGN provides operation, administration and maintenance (OAM) functions for both service and transport strata. To offer reliable NGN services that can support the requirements of service level agreements (SLAs), NGN services have their own OAM capabilities.

7.15 Interconnection and interworking

NOTE – The following text is based on the text in clause 18 of [ITU-T Y.2201].

Interconnection includes connectivity-oriented interconnection and service-oriented interconnection. Interoperability and interworking can enable certain services to be provided across an end-to-end path comprising a single NGN, multiple NGNs or even a combination of NGN and non-NGN.

7.16 PSTN/ISDN emulation and simulation

NOTE – The following text is based on the text in clauses 19.1 and 19.2 of [ITU-T Y.2201].

For the transition period from PSTN/ISDN to NGN, NGN provides PSTN/ISDN emulation and PSTN/ISDN simulation capabilities. Further information is provided in [ITU-T Y.2262] and [ITU-T Y.2271].

7.17 IPTV services

NOTE – A number of IPTV use cases are provided in [b-ITU-T Y-Sup.5]. The following text is based on the text in clause 1 of [ITU-T Y-Sup.5].

[b-ITU-T Y-sup.5] provides a list of IPTV use cases that are informative illustrations of how IPTV services can be designed, deployed and operated. From the end-user's perspective, use cases have been categorized by distributed content services, interactive services, communication services and others.

7.17.1 IPTV service requirements

NOTE – The following text is based on the text in clause 1 of [ITU-T Y.1901].

[ITU-T Y.1901] specifies the high level requirements to support IPTV services. These include IPTV requirements for service offering, network aspects, QoS and QoE, service and content protection, end system, middleware and content.

7.17.2 IPTV quality of experience (QoE) requirements

NOTE – The following text is based on the text in clause 1 of [ITU-T G.1080].

[ITU-T G.1080] defines user requirements for QoE for IPTV services. The QoE requirements are defined from an end-user perspective and are agnostic to network deployment architectures and transport protocols. The QoE requirements are specified for the end-to-end service and information is provided on how they influence network transport and application layer behaviour.

7.17.3 IPTV security requirements

NOTE – The following text is based on the text in clause 1 of [ITU-T X.1191].

[ITU-T X.1191] addresses the functional requirements, architecture and mechanisms dealing with the security aspects of IPTV content, IPTV services, networks, terminal devices and subscribers.

7.18 Public interest aspect

NOTE – The following text is based on the text in clause 20 of [ITU-T Y.2201].

NGN provides capabilities for the support of public interest services required by regulations or laws of national or regional administrations and international treaties.

8 NGN architecture overview

NOTE – The following text is based on the content in clause 7 of [ITU-T Y.2012].

Along with a new architecture, NGN will bring an additional level of complexity beyond that of existing networks. The NGN architecture provided in this Recommendation supports the delivery of services identified in the NGN scope [b-ITU-T Y-Sup.7], as well as the requirements identified in the NGN requirements [ITU-T Y.2201].

More detailed architecture and functions can be found in:

– Functional requirements and architecture of NGN [ITU-T Y.2012].
– IMS for next generation networks [ITU-T Y.2021].
– PSTN/ISDN emulation architecture [ITU-T Y.2031].

8.1 Overview of NGN architecture

NOTE – The following text is based on the text in clause 7 of [ITU-T Y.2012].

An overview of the NGN functional architecture that allows the support of NGN services is shown in Figure 2. The NGN functions are divided into service stratum functions and transport stratum functions according to [ITU-T Y.2011].

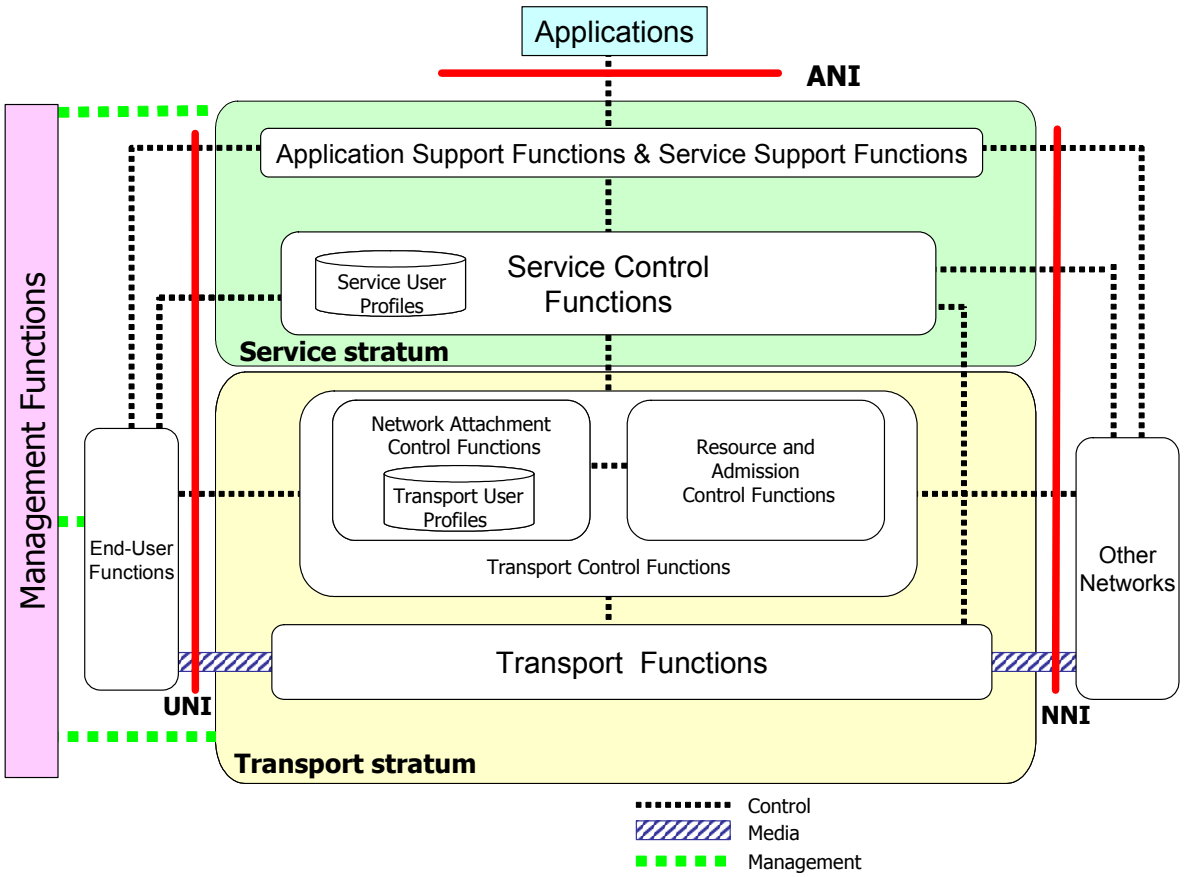


Figure 2 – NGN architecture overview

8.1.1 Transport stratum functions

NOTE – The following text is based on the text in clause 7.1 of [ITU-T Y.2012].

Transport stratum functions include transport functions and transport control functions, per [ITU-T Y.2011].

8.1.1.1 Transport functions

NOTE – The following text is based on the text in clause 7.1.1 of [ITU-T Y.2012].

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 the following functions: access network functions, edge functions, core transport functions, gateway functions and media-handling functions.

8.1.1.2 Transport control functions

NOTE – The following text is based on the text in clause 7.1.2 of [ITU-T Y.2012].

Transport control functions include resource and admission control functions (RACF) and network attachment control functions (NACF). The detailed aspects of the RACF are specified in [ITU-T Y.2111] while the detailed aspects of the NACF are specified in [ITU-T Y.2014].

8.1.2 Service stratum functions

NOTE – The following text is based on the text in clause 7.2 of [ITU-T Y.2012].

This abstract representation of the functional grouping in the service stratum includes:

– service control functions, including service user profile functions; and,

– application support functions and service support functions.

8.1.2.1 Service control functions

NOTE – The following text is based on the text in clause 7.2.1 of [ITU-T Y.2012].

Service control functions include resource control, registration, authentication and authorization functions at the service level for both mediated and non-mediated services, and functions for controlling media resources.

8.1.2.2 Application support functions and service support functions

NOTE – The following text is based on the text in clause 7.2.2 of [ITU-T Y.2012].

Application support functions and service support functions include functions such as the gateway, registration, authentication and authorization functions at the application level.

8.1.3 End-user functions

NOTE – The following text is based on the text in clause 7.3 of [ITU-T Y.2012].

No assumptions are made about diverse end-user interfaces and end-user networks that may be connected to the NGN access network.

8.1.4 Management functions

NOTE – The following text is based on the text in clause 7.4 of [ITU-T Y.2012].

These functions provide the ability to manage the NGN to provide NGN services with the expected quality, security and reliability.

8.1.5 Multicast architecture

NOTE – The following text is based on the text in clause 1 of [ITU-T Y.2017].

[ITU-T Y.2017] describes the multicast functions in NGN taking into account the service requirements, capabilities and functional requirements provided in [ITU-T Y.2236] (NGN multicast service framework).

8.1.6 Accounting and charging functions

NOTE – The following text is based on the text in clause 1 of [ITU-T Y.2233].

[ITU-T Y.2233] provides technical requirements and functional architecture which will allow for accounting and charging capabilities within NGN. It is intended to aid in standardizing protocols and mechanisms to enable accounting and charging for NGN.

Non-technical aspects of charging in NGN and management aspects of accounting and charging in NGN are out of the scope of [ITU-T Y.2233].

8.2 IPTV architecture

8.2.1 Overall architecture

NOTE – The following text is based on the text in clause 1 of [ITU-T Y.1910].

[ITU-T Y.1910] describes the IPTV functional architecture intended to support IPTV services based on the IPTV service requirements and definitions.

The IPTV functional architecture is based on use of existing network components and technologies, as well as on NGN architectures. Three types of architectures are noted in [ITU-T Y.1910], but only two types are covered by this Recommendation:

1) IPTV functional architecture based on the NGN functional architecture, but not based on IMS.
2) IPTV functional architecture based on NGN and its IMS components.

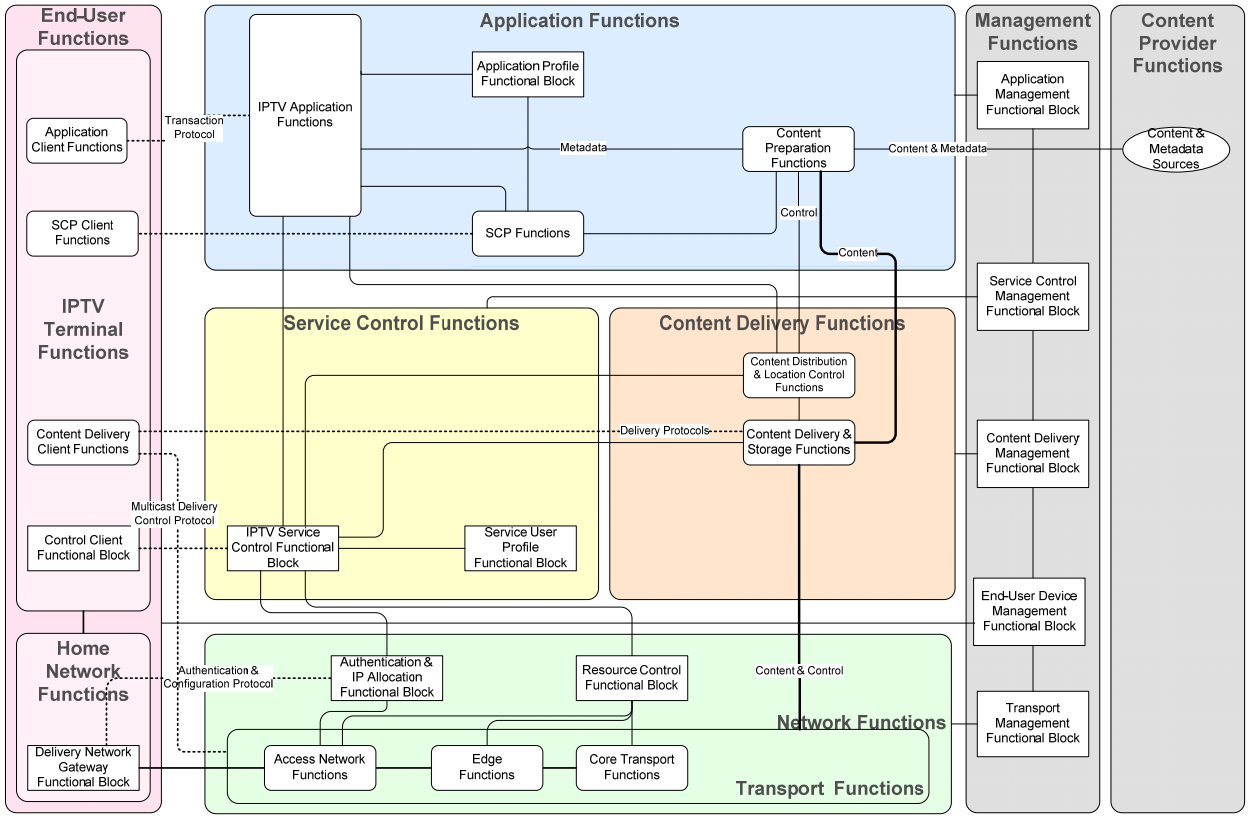


Figure 3 – IPTV architectural overview

8.2.2 Home network architecture

NOTE – The following text is based on the text in clause 1 of [ITU-T H.622.1].

[ITU-T H.622.1] describes the relationship between the home network and IPTV-related entities. It also identifies rules and requirements for functions needed on the home network to support IPTV services. It further sets criteria to verify compliance of home network devices, e.g., IPTV terminal devices, to the identified rules and requirements.

8.2.3 Terminal devices

NOTE – The following text is based on the text in clause 1 of [ITU-T H.720].

[ITU-T H.720] gives the overview of IPTV terminal devices and end systems. It also gives general architecture and functional components of an IPTV terminal device, providing a high-level description of functionality of terminal devices for IPTV services.

8.2.4 Service discovery

NOTE – The following text is based on the text in clause 1 of [ITU-T H.770].

[ITU-T H.770] describes the mechanisms for service provider discovery, service discovery and selection for IPTV services. The mechanisms enable the IPTV terminal devices to provide end users with effective ways for consuming IPTV services. The expected types of IPTV services using service discovery information include linear TV and video on demand.

8.2.5 Content delivery error recovery

NOTE – The following text is based on the text in clause 1 of [ITU-T H.701].

[ITU-T H.701] integrates error recovery in the IPTV architecture, describes specific mechanisms and discusses the applicability of the mechanism to IPTV services and network conditions, and provides recommendations and guidance on their use.

9 Technical specifications

This clause describes functions and related technical specifications for capability set 2 of ITU-T NGN.

9.1 External interfaces of NGN

External interfaces of NGN imply UNI, NNI and ANI. In capability set 2 of NGN, technical specifications of UNI and NNI are defined.

9.1.1 UNI as per [ITU-T Q.3402]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3402].

[ITU-T Q.3402] specifies a service-level profile, i.e., SIP/SDP interface description, between a user and a network, and a transport-level profile, e.g., RTP.

For capability set 2 of NGN, NGN UNI profile covers voice, video and data, such as VoIP, multimedia telephony, DTMF, ITU-T T.38 fax, and multimedia ring-back and ringing tones and announcements.

[ITU-T Q.3402] covers all terminal types, e.g., SIP residential gateway terminal adapters, SIP phones and SIP IP PBXs.

Detailed aspects of the UNI are specified in [ITU-T Q.3402].

9.1.2 NNI as per [ITU-T Q.3401]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3401].

[ITU-T Q.3401] contains a service-level profile, i.e., SIP/SDP interface description, between two network operators (NNI signalling profile), where the two different network operators may support different SIP/SDP profiles (i.e., they differ in terms of SIP extensions, SIP information elements and SDP lines that are supported). A transport-level profile, e.g., RTP, is described. This is necessary and is similar to the description of the media in the service-level signalling.

Detailed aspects of the NNI are specified in [ITU-T Q.3401] and [ITU-T Q.3401 Amd.1].

9.2 NACF-related interfaces

Table 1 shows the NACF-related interfaces which are part of capability set 2 of NGN. For each listed interface, Table 1 identifies the entities between which the interface applies and the ITU-T Recommendation that defines the protocol passing through the interface.

Table 1 – NACF-related reference points/interfaces

Reference point/ interface (Note 1)	Entities	Recommendation defining stage 3 protocol passing through reference point/interface
S-TC1	Service control entity (SCE) and transport location management physical entity (TLM-PE)	[ITU-T Q.3221]
Ru (Note 2)	Policy decision physical entity (PD-PE) and transport location management physical entity (TLM-PE)	[ITU-T Q.3223]
NOTE 1 – See [ITU-T Y.2014] for further details on the corresponding NACF reference points. NOTE 2 – This reference point is the same as the TC-TC1 reference point between NACF and RACF in the NGN architecture [ITU-T Y.2012].		

9.2.1 S-TC1 interface as per [ITU-T Q.3221]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3221].

[ITU-T Q.3221] provides the signalling requirements and protocol for the interface between the service control entities (SCEs) in the service stratum and the transport location management physical entity (TLM-PE) in the network attachment control function block of the next generation network. This protocol can be used to retrieve the location information attached by user equipment. It satisfies the requirements for information flows across the S-TC1 reference point as specified in [ITU-T Y.2014].

Detailed aspects of the interface are specified in [ITU-T Q.3221].

9.2.2 Ru interface as per [ITU-T Q.3223]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3223].

[ITU-T Q.3223] defines the requirements and protocol for the Ru interface (identical to the TC-TC1 interface defined in [ITU-T Y.2012]) between the transport location management physical entity (TLM-PE) in NACF and the policy decision physical entity (PD-PE) in RACF of ITU-T NGN architecture.

Whenever applicable, [ITU-T Q.3223] specifies the requirements for the Ru interface referring to the Diameter base specifications. Whenever needed, extensions to Diameter-based specifications are provided in [ITU-T Q.3223].

9.3 RACF-related interfaces

Table 2 shows the RACF-related interfaces which are part of capability set 2 of NGN. For each listed interface, Table 2 identifies the entities between which the interface applies and the ITU-T Recommendation that defines the protocol passing through the interface.

Table 2 – RACF-related reference points/interfaces

Reference point/ interface (Note 1)	Entities	Recommendation defining stage 3 protocol passing through reference point/interface
Rs (Note 2)	Service control entity (SCE) and policy decision physical entity (PD-PE)	[ITU-T Q.3301.1]
Rp	Transport resource control physical entities (TRC-PEs)	[ITU-T Q.3302.1]
Rw (Note 3)	Policy decision physical entity (PD-PE) and policy enforcement physical entity (PE-PE)	[ITU-T Q.3303.0] [ITU-T Q.3303.1] [ITU-T Q.3303.2] [ITU-T Q.3303.3]
Rc (Note 4)	Transport resource control physical entity (TRC-PE) and transport physical entity (T-PE)	[ITU-T Q.3304.1] [ITU-T Q.3304.2]
Rt	Policy decision physical entity (PD-PE) and transport resource control physical entity (TRC-PE) in access network	[ITU-T Q.3305.1]

Table 2 – RACF-related reference points/interfaces

Reference point/ interface (Note 1)	Entities	Recommendation defining stage 3 protocol passing through reference point/interface
Rd	Policy decision physical entities (PD-PEs) in the same domain	[ITU-T Q.3306.1]
NOTE 1 – See [ITU-T Y.2111] for further details on the corresponding RACF reference points. NOTE 2 – This reference point is the same as the S-TC2, S-TC3, S-TC4 and S-TC5 reference points in the NGN architecture [ITU-T Y.2012]. NOTE 3 – This reference point is the same as the TC-T2, TC-T5, TC-T6 and TC-T9 reference points in the NGN architecture [ITU-T Y.2012]. NOTE 4 – This reference point is the same as the TC-T3 and TC-T4 reference points in the NGN architecture [ITU-T Y.2012].		

9.3.1 RACF-related interface framework as per [ITU-T Q.3300]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3300].

[ITU-T Q.3300] specifies a concrete implementation of the functional architecture defined in [ITU-T Y.2111], including the specification of physical entities involved in resource control signalling, interfaces across which signalling takes place, and the mapping between these entities and interfaces and the corresponding functional entities and reference points in [ITU-T Y.2111].

Detailed aspects of the framework are specified in [ITU-T Q.3300].

9.3.2 Rs interface as per [ITU-T Q.3301.1]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3301.1].

[ITU-T Q.3301.1] provides the stage 3 specification of the protocol at the interface between service control entities (SCEs) and the policy decision physical entity (PD-PE). Functional requirements and stage 2 specifications for this interface are contained in clause 8.1 of [ITU-T Y.2111] and in Supplement 51 to ITU-T Q-series Recommendations. This interface is used to control session-based policy.

Detailed aspects of the interface are specified in [ITU-T Q.3301.1].

9.3.3 Rp interface as per [ITU-T Q.3302.1]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3302.1].

[ITU-T Q.3302.1] defines the resource connection initiation protocol (RCIP), for signalling control information between peer TRC-PEs (Rp interface) in a single operator's network. Requirements for the Rp interface are defined in clause 8.6 of [ITU-T Y.2111] and in Supplement 51 to ITU-T Q-series Recommendations.

Detailed aspects of the interface are specified in [ITU-T Q.3302.1].

9.3.4 Rw interface as per ITU-T Q.3303.x

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3303.0].

Interface Rw defines an interface between a policy decision physical entity (PD-PE) and a policy enforcement physical entity (PE-PE), see also [ITU-T Q.3300]. There are multiple signalling alternatives for Rw defined in the protocol-specific Recommendation in the ITU-T Q.3303.x subseries; see [ITU-T Q.3303.1], [ITU-T Q.3303.2] and [ITU-T Q.3303.3].

Detailed aspects of the interface are specified in [ITU-T Q.3303.0], [ITU-T Q.3303.1], [ITU-T Q.3303.2] and [ITU-T Q.3303.3].

9.3.5 Rc interface as per ITU-T Q.3304.x

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3304.1].

[ITU-T Q.3304.1] and [ITU-T Q.3304.2] provide the stage 3 specifications of the Rc interface. Functional requirements and the stage 2 specifications of the Rc interface are contained in [ITU-T Y.2111]. The Rc interface is the interface between a transport resource control physical entity (TRC-PE) and a transport physical entity (T-PE).

Detailed aspects of the interface are specified in [ITU-T Q.3304.1] and [ITU-T Q.3304.2].

9.3.6 Rt interface as per [ITU-T Q.3305.1]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3305.1].

[ITU-T Q.3305.1] provides the stage 3 specification of the Rt interface. Functional requirements corresponding to this interface are contained in clause 8.5 of [ITU-T Y.2111] and in Supplement 51 to ITU-T Q-series Recommendations. The Rt interface protocol operates between the policy decision and transport control functional elements of the resource and admission control function (RACF) and is used to control network transport resources required to convey the media flow.

Detailed aspects of the interface are specified in [ITU-T Q.3305.1].

9.3.7 Rd interface as per [ITU-T Q.3306.1]

NOTE – The following text is based on the text in clause 1 of [ITU-T Q.3306.1].

[ITU-T Q.3306.1] specifies the protocol used between intra-domain policy decision physical entities (PD-PEs) in the resource and admission control functional block. This interface operates across the Rd reference point as defined in [ITU-T Y.2111]. It is used for inter-communication between PD-PEs that can optionally be deployed in larger domains for scalability reasons.

Detailed aspects of the interface are specified in [ITU-T Q.3306.1].

9.4 IPTV-related specifications

Most protocols used in IPTV services can use existing protocols. IPTV-related specifications defined in ITU-T are as follows, and IPTV-related specifications defined in other SDOs are provided in the bibliography.

9.4.1 IPTV metadata

NOTE – The following text is based on the text in clause 1 of [ITU-T H.750].

[ITU-T H.750] gives the high-level specification of the metadata for IPTV services, its elements and delivery protocols.

The IPTV metadata provides a descriptive and structural framework for managing IPTV services. The IPTV metadata is the information on services and content processed by the service and content delivery infrastructure.

9.4.2 IPTV terminal specification

NOTE – The following text is based on the text in clause 1 of [ITU-T H.721].

[ITU-T H.721] describes and specifies the functionalities of the IPTV terminal devices for IPTV basic services defined in [ITU-T H.720] over a dedicated content delivery network, which takes into consideration such conditions on content delivery as QoS. The expected types of terminal devices are set-top boxes and digital TV sets with embedded IPTV capabilities.

9.4.3 IPTV multimedia framework

NOTE – The following text is based on the text in clause 1 of [ITU-T H.760].

[ITU-T H.760] identifies and describes the relevant standards for interoperability and harmonization among IPTV multimedia application frameworks. Some detailed aspects are identified by [b-ITU-T H.761] and [b-ITU-T H.762].

Appendix I

Table of documents related to NGN capability set 2

(This appendix does not form an integral part of this Recommendation)

Table I.1 shows documents related to NGN capability set 2. It includes ITU-T Recommendations and other relevant SDO documents as NGN capability set 2 arranged by item. In Table I.1, shaded boxes indicate documents which are part of NGN capability set 1 [ITU-T Y.2006].

Table I.1 – Documents related to NGN capability set 2

Category	Sub-category	Items		Stage 1	Stage 2	Stage 3
Environ-ment	Access transport network	xDSL	ADSL	[ITU-T Y.2201]	[b-ITU-T G.992.1] [b-ITU-T G.992.3] [b-ITU-T G.992.5]	
			SHDSL		[b-ITU-T G.991.2]	
			VDSL		[b-ITU-T G.993.1] [b-ITU-T G.993.2]	
		SDH		[ITU-T Y.2201]	[b-ITU-T G.707]	
		Optical access	Point-to-point	[ITU-T Y.2201]	[b-IEEE 802.3ah]	
			BPON		[b-ITU-T G.983.x]	
			GPON		[b-ITU-T G.984.x]	
			EPON		[b-IEEE 802.3ah]	
		HFC (hybrid fiber coaxial) Cable		[ITU-T Y.2201]	[b-ITU-T J.112], [b-ITU-T J.122] (DOCSIS)	
		LANs	10Base-T	[ITU-T Y.2201]	IEEE 802.3	
			Fast Ethernet		[b-IEEE 802.3u]	
			Giga Ethernet		[b-IEEE 802.3z]	
			10 Giga Ethernet		[b-IEEE 802.3ae]	
		Wireless LAN		[ITU-T Y.2201]	[b-IEEE 802.11.x] (WLAN) [b-IEEE 802.16.x] (BWA)	
	Core transport network	NGN core transport functions		[ITU-T Y.2201]	[ITU-T Y.2012]	
	NACF	Network attachment control functions		[ITU-T Y.2201]	[ITU-T Y.2012] [b-ETSI ES 282 004] (NASS) [ITU-T Y.2014]	[ITU-T Q.3221] [ITU-T Q.3223] [b-ETSI TS 183 019] [b-ETSI TS 183 020] [b-ETSI TS 183 059] [b-ETSI TS 183 065] [b-ETSI TS 183 066] [b-ETSI ES 283 034] [b-ETSI ES 283 035]

Table I.1 – Documents related to NGN capability set 2

Category	Sub-category	Items	Stage 1	Stage 2	Stage 3
	RACF	Resource and admission control functions	[ITU-T Y.2201]	[ITU-T Y.2012] [ITU-T Y.2111] [b-ETSI ES 282 003] (RACS)	[ITU-T Q.3301.1] [ITU-T Q.3302.1] (Rp) [ITU-T Q.3303.1], [ITU-T Q.3303.2], [ITU-T Q.3303.3] (Rw) [ITU-T Q.3304.1], [ITU-T Q.3304.2] (Rc) [ITU-T Q.3305.1] (Rt) [ITU-T Q.3306.1] (Rd) [b-ETSI TS 183 017] [b-ETSI TS 183 060] [b-ETSI ES 283 026]
	Network node interface	IP-based networks (NGN, Internet, cable network, broadcast network)	[ITU-T Y.2201]	[ITU-T Y.2012]	[ITU-T Q.3401] [b-ETSI TS 183 021]
		Circuit-based networks (PLMN, PSTN/ISDN)	[ITU-T Y.2201]	[ITU-T Y.2012]	[b-ETSI ES 283 012] (TGCP) [b-ETSI ES 283 049] (TMG) [b-ETSI ES 283 027] (ISUP) [b-ETSI TS 183 022] (MGC)
	User network interface	UNI	[ITU-T Y.2201]	[ITU-T Y.2012]	[ITU-T Q.3402]
Services	Multimedia services	Real-time conversational voice services	[ITU-T Y.2201] [ITU-T Y.2211] [b-ETSI TS 181 002]	[ITU-T Y.2012]	[b-ETSI TS 183 031] (MRP)
		Instant messaging (IM)	[ITU-T Y.2201]	[ITU-T Y.2012]	[b-IETF RFC 3428] [b-IETF RFC 5437] [b-ETSI TS 183 041] (IM)
		P2P interactive MM services	[b-ITU-T F.703] [b-ITU-T F.724] (VideoTel) [b-ITU-T F.733] (MMconf) [b-ITU-T F.741] (Avdem) [b-ITU-T F.742] (DistL) [b-ETSI TS 181 001] (VideoTel)		[b-ITU-T T.140] [b-ITU-T H.323]
	PSTN/ISDN emulation service	PSTN/ISDN emulation service	[ITU-T Y.2201] [ITU-T Y.2262]	[ITU-T Y.2031] [ITU-T Y.2271] [b-ETSI ES 282 002] [b-ETSI TS 182 012]	[b-ETSI TS 183 002] [b-ETSI TS 183 043]

Table I.1 – Documents related to NGN capability set 2

Category	Sub-category	Items		Stage 1	Stage 2	Stage 3
	PSTN/ISDN simulation service	PSTN/ISDN simulation service		[ITU-T Y.2201] [ITU-T Y.2262]	[ITU-T Y.2012] [ITU-T Y.2021] [b-ETSI TS 182 006] [b-ETSI ES 282 007] (IMS)	[b-ETSI TS 183 023] (XML) [b-ETSI TS 183 007] (OIP, OIR) [b-ETSI TS 183 008] (TIP, TIR) [b-ETSI TS 183 006] (MWI) [b-ETSI TS 183 004] (CDIV) [b-ETSI TS 183 005] (CONF) [b-ETSI TS 183 011] (ACR, CB) [b-ETSI TS 183 010] (HOLD) [b-ETSI TS 183 015] (CW) [b-ETSI TS 183 016] (MCID) [b-ETSI TS 183 029] (ECT) [b-ETSI TS 183 042] (CCBS, CCNR) [b-ETSI TS 183 047] (AoC) [b-ETSI TS 183 054] (CUG)
	Public interest service or applications	Lawful interception		(Note)	(Note)	(Note)
		Emergency communi-cation	Individual to authority	[ITU-T Y.2201] [b-ITU-T Y.2205]	[b-ITU-T Y.2171] [b-ITU-T Y.2172] [b-ITU-T Y.2205]	
			TDR, ETS	[b-ITU-T Y.1271] [ITU-T Y.2201] [b-ITU-T E.106] [b-ITU-T E.107]		
	IPTV	Network	General	[ITU-T Y.1901] [b-ETSI TS 181 014] [b-ETSI TS 181 016]	[ITU-T Y.1910] [b-ETSI TS 182 027] (IMS) [b-ETSI TS 182 028] (non IMS)	[b-ETSI TS 183 063] (IMS) [b-ETSI TS 183 064] (non IMS)
			Multicast	[ITU-T Y.2236]	[ITU-T Y.2017]	[b-IETF RFC 3376] (IGMP) [b-IETF RFC 3810] (MLD)
			Content Delivery	[ITU-T Y.1901]	[ITU-T Y.1910]	[b-IETF RFC 2326] (RTSP) [b-IETF RFC 3550] (RTP) [b-ETSI TS 102 034]

Table I.1 – Documents related to NGN capability set 2

Category	Sub-category	Items		Stage 1	Stage 2	Stage 3
			Control	[ITU-T Y.1901]	[ITU-T Y.1910]	[b-IETF RFC 2616] (HTTP) [b-IETF RFC 3926] (FLUTE) [b-IETF RFC 3261] [b-IETF RFC 3265] (SIP) [b-ETSI TS 124 229] (SIP/SDP)
		QoE/QoS	QoS	[ITU-T Y.1901]	[ITU-T Y.2111]	[ITU-T Q.3221] (S-TC1) [ITU-T Q.3301.1] (Rs) [ITU-T Q.3303.1], [ITU-T Q.3303.2], [ITU-T Q.3303.3] (Rw) [b-IETF RFC 3588] (Diameter) [b-ETSI TS 129 229] (Cx)
			QoE	[ITU-T G.1080]		
			Performance	[b-ITU-T G.1081]	[b-ITU-T G.1082]	
		Security		[ITU-T X.1191]		
		End system	Home network	[ITU-T Y.1901]	[ITU-T H.622.1]	
			Terminal device	[ITU-T Y.1901]	[ITU-T H.720] [ITU-T H.701] [ITU-T H.770] [ITU-T H.721]	
			Application	[ITU-T Y.1901]	[ITU-T H.750] [ITU-T H.760] [b-ITU-T H.761] [b-ITU-T H.762]	
Capabi-lities	Transport	Transport connectivity		[ITU-T Y.2201]	[ITU-T Y.2012]	[b-ETSI TS 183 018] [b-ETSI TS 183 060] [b-ETSI TS 183 067]
		Multicast support		[ITU-T Y.2236]	[ITU-T Y.2017]	[b-IETF RFC 3376] (IGMP) [b-IETF RFC 3810] (MLD)
		Service enablers	Session handling	[ITU-T Y.2201] [b-ITU-T Y.2211]	[ITU-T Y.2012] [ITU-T Y.2021] [b-ETSI ES 282 007] (IMS)	[b-ETSI ES 283 003]

Table I.1 – Documents related to NGN capability set 2

Category	Sub-category	Items			Stage 1	Stage 2	Stage 3
	Quality of service	General QoS requirements			[b-ITU-T Y.2113] [ITU-T Y.2201]	[ITU-T Y.2111] [b-ITU-T Y.1291]	[ITU-T Q.3301.1] (Rs) [ITU-T Q.3302.1] (Rp) [ITU-T Q.3303.1], [ITU-T Q.3303.2], [ITU-T Q.3303.3] (Rw) [ITU-T Q.3304.1], [ITU-T Q.3304.2] (Rc) [ITU-T Q.3305.1] (Rt) [ITU-T Q.3306.1] (Rd) [ITU-T Q.3223] (Ru)
		Network QoS classes			[b-ITU-T G.1000] [b-ITU-T G.1010]	[b-ITU-T Y.1541] [b-ITU-T Y.2171]	
	Identification and security	Security requirement			[ITU-T Y.2701] [ITU-T Y.2702]		
	Mobility handling				[ITU-T Q.1706] (nomadism)	[b-ITU-T Q.1707] (nomadism)	
						[b-ITU-T Q.1708] (nomadism)	
	Profile manage-ment	Require-ments for codecs	Audio codecs		[ITU-T Y.2201]	[ITU-T Y.2012]	[b-ITU-T G.711] [b-ITU-T G.722.2] [b-ITU-T G.729]
			Wide band audio codecs	Wide band audio codecs in terminals	[ITU-T Y.2201]	[ITU-T Y.2012]	[b-ITU-T G.722] [b-ITU-T G.722.2] [b-ITU-T G.729.1]
				Wide band audio codecs in networks	[ITU-T Y.2201]	[ITU-T Y.2012]	[b-ITU-T G.722] [b-ITU-T G.722.2] [b-ITU-T G.729.1]
			Video codecs		[ITU-T Y.2201]	[ITU-T Y.2012]	[b-ITU-T H.263] [b-ITU-T H.264]
	Operations and provisioning	OAM requirements			[ITU-T Y.2201]	[b-ITU-T Y.1710] [b-ITU-T Y.1730] [b-ITU-T I.610]	[b-ITU-T Y.1711] [b-ITU-T Y.1731] [b-ITU-T I.610]
NOTE – Because the nature of lawful interception is dependent upon national/regional customs and laws, requirements are dependent upon the regulatory environment of each country.							

Table I.2 – Documents related to general part of NGN capability set 2

Category	Release independent	
	Items	**Recommendation**
Overview	General overview	[ITU-T Y.2001]
	General reference model	[ITU-T Y.2011]
Terminology	NGN terminology	Rec. ITU-T Y.2091

Appendix II

IPTV service categorization

(This appendix does not form an integral part of this Recommendation)

IPTV services listed in [b-ITU-T Y-Sup.5] are categorized into three phases to consider time-to-market:

– Phase 1: IPTV basic services.

– Phase 2: IPTV advanced services.

– Phase 3: IPTV future services.

The IPTV basic services phase, called phase 1, contains services that are already provided commercially in many countries. These services include linear TV and VoD services. The IPTV advanced services phase, called phase 2, contains services that are already provided in some countries, including personal broadcast services. IPTV future services are all services apart from those in phases 1 and 2 and include services that require additional functionalities and capabilities.

IPTV service categorization based on [b-ITU-T Y-Sup.5] is shown in Table II.1. The NGN capability set 2 includes IPTV basic services which are indicated in shaded boxes.

NOTE – In Table II.1, services categorized in phases 2 and 3 are tentative, in other words, corresponding service categorization and target completion date are for further study.

Table II.1 – IPTV service categorization

Services in [b-ITU-T Y-Sup.5]			Phases	Remarks
Distributed content services	Broadcast services	Linear TV	Phase 1	NGN cap 2
		Linear TV with trick mode	Phase 2	
		Pay per view	Phase 1	NGN cap 2
		Electronic programme guide	Phase 1	NGN cap 2
		Personal broadcast service	Phase 2	
		Hybrid: Online and off-air TV delivery	Phase 1	NGN cap 2
		Linear TV with multi-view service	Phase 3	
	On-demand services	Video on demand (VoD)	Phase 1	NGN cap 2
		Near VoD	Phase 1	NGN cap 2
		Reserved delivery service	Phase 2	
		On-demand with multi-view service	Phase 3	
		Music on demand (MoD)	Phase 1	NGN cap 2
	Advertising service	Traditional advertising service	Phase 1	NGN cap 2
		Targeted advertising	Phase 2	
		On-demand advertising	Phase 3	
		Advertising message logging	Phase 3	
	Time-shifting and place-shifting	Time-shifting services	Phase 2	
		Place-shifting services	Phase 3	
	Supplementary content		Phase 3	

Table II.1 – IPTV service categorization

Services in [b-ITU-T Y-Sup.5]			Phases	Remarks
Interactive Services	Information services		Phase 3	
	Commercial services		Phase 3	
	Entertainment services		Phase 3	
	Learning services		Phase 3	
	Medical services		Phase 3	
	Monitoring services		Phase 3	
	Portal services		Phase 3	
	Interactive advertising		Phase 2	
Communication services			Phase 3	
Others	Public interest services	Support for end users with disabilities	Phase 3	
		Emergency communications	Phase 2	
		Community-related information	Phase 3	
	Hosting services	Business-to-business housing	Phase 3	
		User-created content (UCC) housing	Phase 2	
	Presence services	Basic presence service	Phase 3	
		Channel-based presence service	Phase 3	
		Targeted advertising based on presence	Phase 3	
	Session mobility service		Phase 3	

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