

Electronic Communications Networks and Services; Consequence on the NGN standardization activity from the EU ECN&S regulatory view point

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Foreword

This Special Report (SR) has been produced by Advisory Committee Operational Co-ordination Group (OCG).

NOTE: The SR type of deliverable was chosen to publish the contents of the document because the information is not specifically technical and is an integration of information from many sources. The current version of the present document was published after endorsement by the ETSI Operational Co-ordination Group, which represents all technical bodies of ETSI.

Introduction

The application of Article 17 of the Framework Directive (2002/21/EC [1.1]) led to the production of studies like SR 002 211 [i.2] carried out by ETSI, and other European Standardization Organizations (ESOs). The development of NGN concepts and other future trends is impacting widely and deeply the future of the e-Communications Networks and Services, introducing major influence of other sectors, like IT, Broadcasting and other consumer's close products and services.

European authorities started a revision of the relevant regulatory documents. It is urgent that the appropriate TBs within ESOs are aware of the regulatory requirements and take them appropriately into account when developing standards for the NGN. The present document results from a number of fundamental presentations offered during the ECN&S meetings by the end of 2005 and beginning of 2006 and should evolve with contributions from ESO TBs and feed-back from CEU and European National Regulatory Authorities (NRAs).

The present document aims at identifying:

- the consequences of NGN standardization from the regulatory view point;
- standards which are produced to achieve public interest objectives;
- areas where further studies are needed.

1 Scope

The present document is intended for both regulators and technical groups. It looks at the NGN from the technical regulatory point of view. It assesses how the EU Regulatory Framework applies to the NGN as specified by ETSI TISPAN in collaboration with 3GPP (e.g. for IMS), TC LI and ITU-T. The present document refers to the Release 1 of NGN which does not include IPTV nor does it include content matters.

Regarding VoIP, the present document only looks at Voice over NGN. Only the NGN specific regulatory requirements are considered in the section. Outside the scope are requirements which apply to any networks (e.g. EMC).

2 References

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] Directive 2002/21/EC of the European Parliament and of the council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive).
- [i.2] ETSI SR 002 211: "Electronic communications networks and services; Candidate list of standards and/or specifications in accordance with Article 17 of Directive 2002/21/EC".

- [i.3] ETSI ES 282 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture".
- [i.4] ETSI ES 282 007: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS); Functional architecture".
- [i.5] ITU-T Recommendation Y.2001: "Next Generation Networks - Frameworks and functional architecture models; General overview of NGN".
- [i.6] ITU-T Recommendation Y.2012: "Functional requirements and architecture of the NGN".
- [i.7] ITU-T Recommendation Y.2011: "General principles and general reference model for Next Generation Networks".
- [i.8] ETSI TS 181 006: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Direct Communication Service in NGN; Service Description [Endorsement of OMA-ERELD-PoC-V1]".
- [i.9] ETSI ES 282 004: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture; Network Attachment SubSystem (NASS)".
- [i.10] ETSI TS 123 002: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Network architecture (3GPP TS 23.002 version 6.10.0 Release 6)".
- [i.11] ITU-T Recommendation Y 2091: "Terms, Definitions and High-Level Terminological Framework for Next Generation Networks".
- [i.12] ETSI TR 180 000: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Terminology".
- [i.13] IETF RFC 3261: "SIP: Session Initiation Protocol".
- [i.14] ETSI TR 180 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Release 1; Release definition".
- [i.15] ETSI TS 181 005: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); Service and Capability Requirements".
- [i.16] ETSI TS 122 101: "3G Universal Mobile Telecommunications System (UMTS); Service aspects; Service principles".
- [i.17] ITU-T Recommendation M.3050.1: "Enhanced Telecommunications Operations Map - The Business Process Framework".
- [i.18] ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Vocabulary for 3GPP Specifications (3GPP TR 21.905 version 7.4.0 Release 7)".
- [i.19] ITU-T Recommendation Y.110: "Global Information Infrastructure principles and framework architecture".
- [i.20] ETSI TR 101 878: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 5; Service Capability Definition; Service Capabilities for a Multi Media Call".
- [i.21] ETSI TS 102 261: "Open Network Services and Architecture (ONSA); Abstract architecture and reference points definition; Mapping of functional architectures and requirements for NGN".
- [i.22] ITU-T Recommendation X.115: "Definition of address translation capability in public data networks".
- [i.23] Void.
- [i.24] Void.

- [i.25] IETF RFC 3966: "The tel URI for Telephone Numbers".
- [i.26] ETSI TS 102 424: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Requirements of the NGN network to support Emergency Communication from Citizen to Authority".
- [i.27] ETSI TS 182 006: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS); Stage 2 description (3GPP TS 23.228 v7.2.0, modified)".
- [i.28] ETSI TS 123 228 (V7.2.0) modified: "IP Multimedia Subsystem (IMS); Stage 2 description".
- [i.29] ETSI TS 133 203: "3G security; Access security for IP-based services".
- [i.30] ETSI ES 282 010: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Charging management [Endorsement of 3GPP TS 32.240 Release 7, 3GPP TS 32.260 Release 7, 3GPP TS 32.297 Release 7, 3GPP TS 32.298 Release 7 and 3GPP TS 32.299 Release 7, modified]".
- [i.31] ETSI TS 182 009: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Architecture to support emergency communication from citizen to authority [Endorsed document 3GPP TS [23.167](#), Release 7]".
- [i.32] ETSI TS 183 021: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Release 1; Endorsement of 3GPP TS 29.162 Interworking between IM CN Sub-system and IP networks".
- [i.33] ETSI TS 129 162: "Interworking between the IM CN subsystem and IP networks".
- [i.34] ETSI TS 123 218: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); IP Multimedia (IM) session handling; IM call model; Stage 2 (3GPP TS 23.218)".
- [i.35] Treaty of Maastricht (<http://en.wikipedia.org/wiki/Three-pillars-of-the-European-Union>).
- [i.36] ETSI ES 282 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Sub-System (RACS): Functional Architecture".
- [i.37] ITU-T Recommendation Y.2205: "Next Generation Networks - emergency telecommunications - Technical considerations".

3 Definitions and abbreviations

3.1 Definitions

Wherever possible, the present document refers to existing terminology from ETSI and ITU-T sources. The terms and definitions and a framework relevant to providing a general understanding of Next Generation Networks are provided in the ITU-T Recommendation Y.2091 [i.11] and in TR 180 000 [i.12].

access network: collection of network entities and interfaces that provides the underlying IP transport connectivity between the device and the NGN entities

administrative domain: collection of physical or functional entities under the control of a single administration

core network: portion of the delivery system composed of networks, systems equipment and infrastructures, connecting the service providers to the access network

customer: the customer buys products and services from the Enterprise or receives free offers or services

domains: describes the infrastructure owned by single operators

domain (General): collection of physical or functional entities which are owned and operated by a player and can include entities from more than one role

identity: attributes by which an entity or person is described, recognized or known

networks: terms listed here describe the connectivity infrastructure surrounding an NGN

player: organization, or individual, which undertakes one or more roles

role: business activity which fits in a value chain

subscriber: person or organization responsible for concluding contracts for the services subscribed to and for paying for these services

service domain: collection of physical or functional entities offering IP based services under the control of an NGN Service Provider which share a consistent set of policies and common technologies

user, end user: the user is the actual user of the products or services offered by the Enterprise

User Equipment (UE): one or more devices allowing user access to network services delivered by NGN

user domain: collection of physical or functional entities under the control of an end user that share a consistent set of policies and common technologies

user profile: set of information necessary to provide a user with a consistent, personalized service environment, irrespective of the user's location or the terminal used (within the limitations of the terminal and the serving network)

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3GPP	Third Generation Partnership Project
ACR&CB	Anonymous Call Rejection & Call Barring
AF	Application Function
ALG	Application Level Gateway
AoC	Advice of Charge
ARF	Access Relay Function
AS	Application Server
ASF	Application Server Function
B2B	Business-to-Business
CDR	Call Detail Record
CLIP/OIP	Calling Line Identification Presentation / Originating Identification Presentation
CLIR/OIR	Calling Line Identification Restriction / Originating Identification Restriction
CoIX	Connectivity-oriented Interconnection
COLP/TIP	Called Line Identification Presentation / Terminating Identification Presentation
COLR/TIR	Called Line Identification presentation Restriction / Terminating Identification presentation Restriction
CS	Circuit Switched
DoS	Denial of Service
ECN	Electronic Communication Network
ECS	Electronic Communication Service
EMC	Electro Magnetic Compatibility
ENUM	Electronic Numbering
eTVRA	Threat, Vulnerability and Risk Assessment for eEurope
FBI	Fixed Broadband Access to IMS
FMC	Fixed Mobile Convergence
GPRS	General Packet Radio Service
HSPA+	HSPA Evolution
HSS	Home Subscriber Server
IBCF	Interconnection Border Control Function
I-BGF	Interconnect Border Gateway Function
I-CSCF	Interrogating Call Session Control Function
ICT	Information and Communication Technologies

IM CN	IP Multimedia Core Network
IMS	IP Multimedia Subsystem
IMS-MGW	IMS Media Gateway
IM-SSF	IP Multimedia Service Switching Function
IP	Internet Protocol
IP-CAN	IP Connectivity Access Network
IPTV	Internet Protocol TeleVision
ISDN	Integrated Service Digital Network
ITU	International Telecommunication Union
ITU-T	ITU Telecommunication Standardization Sector
IWF	InterWorking Function
I-WLAN	Interworking WLAN
LI	Lawful Interception
LTE	Long Term Evolution
MCID	Malicious Call IDentification
MGCF	Media Gateway Control Function
MM	MultiMedia
MMS	Multimedia Messaging Service
MRFC	Media Resource Function Control
MRFP	Multimedia Resource Function Processor
NAPT	Network Address and Port Translator
NASS	Network Attachment SubSystem
NAT	Network Address Translation
NGN	Next Generation Network
OSA SCS	Open Services Architecture Service Capability Server
PBX	Private Branch Exchange
PCC	Policy and Charging Convergence
PCRF	Policy and Charging Rules Function
P-CSCF	Proxy Call Session Control Function
PDBF	Profile DataBase Function
PDF	Policy Decision Function
PES	PSTN/ISDN Emulation Subsystem
PS	Packet Switched
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RACS	Resource Admission Control Subsystem
RTSP	Real Time Streaming Protocol
SAE	System Architecture Evolution
SBLP	Service Based Local Policy
S-CSCF	Serving Call Session Control Function
SDP	Session Description Protocol
SGF	Signalling Gateway Function
SIP AS	SIP Application Server
SIP	Session Initiation Protocol
SLF	Subscription Locator Function
SMS	Short Message Service
SoIX	Service-oriented Interconnection
TDM	Time Division Multiplex
TISPAN	Telecoms and Internet converged Services and Protocols for Advanced Networking
TLS	Transport-Layer Security
T-MGF	Trunking Media Gateway Function
TV	TeleVision
UE	User Equipment
UPSF	User Profile Server Function
VCC	Voice Call Continuity
WAP	Wireless Access Protocol
WLAN	Wireless Local Area Network

4 Description of the NGN

NGN is a term widely used by telecommunication operators to represent a number of current and future structural changes in the telecommunication sector. The main difference between NGNs and today's PSTNs is a shift from circuit-switched networks that are traditionally used for voice service to packet-based networks providing a range of services including voice, video and data. These networks are applicable to various service characteristics. Traditional voice networks are based on circuit-switching and offer end-to-end quality of service.

The aim of the NGN is to offer more consistent speech quality service than may be achieved on the Internet when best effort service is used. Although, in many cases a quality of an Internet connection is good and the "self management" provides great resilience. NGN can be seen as a logical evolution from separate network infrastructures into a unified network for electronic communications based on IP. Participants from the telecommunication industry consider NGN as a progression of current technology leading to a multi-service, secure, packet-based global network, which will be able to offer quality of service and ease of access for end-users (see Bibliography).

The possible migration to Next Generation Networks (NGN) is nowadays becoming an important issue for the major telecommunication players. The eventual total switch-off of the traditional PSTN is expected to happen in the next ten years.

There are numerous views of what constitutes NGNs and different operators that have begun the process of migration or development refer to their networks differently. NGNs can be developed using a number of transmission technologies, including fibre, cable, fixed, mobile wireless, or further technology upgrades to the existing copper based networks. This represents the shift from a "one network-one service" approach, to a "one network-many services" one.

The transition to NGN driven by several forces, or enabling factors, is summarized as follows:

- structural changes on the ICT market;
- new users' needs and requirements;
- technology evolution;
- competition in the electronic communications market.

The transition to NGN also offers different opportunities at different levels of the telecommunication market:

For operators, NGN is considered essential for strategically positioning networks to compete in the increasingly converged world of services and content where voice is no longer the sole source of revenue.

At a market level, NGN is partially driven by the increased demand for ubiquitous, integrated data, voice and video, mobile and fixed broadband, alongside the increasing role of mobile services in the broadband domain. Operators and investors seek increased revenue and profitability, greater productivity and broader service offerings. These trends are facilitating the integration of separate and distinct mobile and fixed technologies (optimized for one service) to enable the seamless distribution of services over fixed and mobile broadband networks, i.e. transport services, and to create a unified IP-based multiservice network. In other words, NGN can be viewed as a "communication network that allows unfettered access to all communication products and services, irrespective of the service provider or network connection".

4.1 NGN Functional Architecture

The functional architecture of the ETSI TISPAN NGN Release 1 is provided in the ES 282 001 [i.3]. TISPAN IMS (IP Multimedia Subsystem) functional architecture is defined in ES 282 007 [i.4]. ITU-T NGN frameworks and functional architecture is provided in ITU-T Recommendation Y.2001 [i.5] and ITU-T Recommendation Y.2012 [i.6].

Both the ETSI as well as the ITU-T NGN architectures are in line with regards to the separation between transport and services defined in ITU-T Recommendation Y.2011 [i.7].

The separation of services from transport allows them to be offered separately and to evolve independently. The separation is represented by two distinct blocks called "strata of functionality" by ITU-T and "layers" by ETSI TISPAN. For the purpose of the present document the term "layers" will be used later in the text. The transport functions reside in the transport layer and the service functions related to applications reside in the service layer.

A set of transport functions are solely concerned with conveyance of digital information, of any kind, between any two geographically separate points. The transport functions provide connectivity.

A set of application functions is related to the service to be invoked. In this layer services may be, e.g. voice services (including telephone service), data services (including but not limited to Web-based services), or video services (including but not limited to movies and TV programmes), or some combination thereof (e.g. multimedia services such as video telephony and gaming).

The following section provides an overview of the NGN functional architecture based on the ES 282 001 [i.3].

The service layer comprises the following components:

- the core IP Multimedia Subsystem (IMS);
- the PSTN/ISDN Emulation Subsystem (PES);
- other multimedia subsystems (e.g. streaming subsystem, content broadcasting subsystem etc.); and applications;
- common components (i.e. used by several subsystems) such as those required for accessing applications, charging functions, user profile management, security management, routing data bases (e.g. ENUM), etc.

This subsystem-oriented architecture enables the addition of new subsystems over the time to cover new demands and service classes. It also provides the ability to import (and adapt) subsystems defined by other standardization bodies.

IP-connectivity is provided to NGN user equipment by the transport layer, under the control of the Network Attachment Subsystem (NASS) and the Resource and Admission Control Subsystem (RACS). These subsystems hide the transport technology used in access and core networks below the IP layer.

Each subsystem is specified as a set of functional entities and related interfaces. As a result implementers and operators may be tempted to combine functional entities where this makes sense in the context of their business models. Where functional entities are combined the interface between them is internal, is hidden and un-testable. It is a major task for regulation to ensure open interfaces so that fundamental principles, e.g. access for service providers to access functions or unrestricted access of users to various service offerings, of the NGN concept as defined in Y.2001 [i.5] can be met.

Figure 1 provides an overview of the NGN architecture.

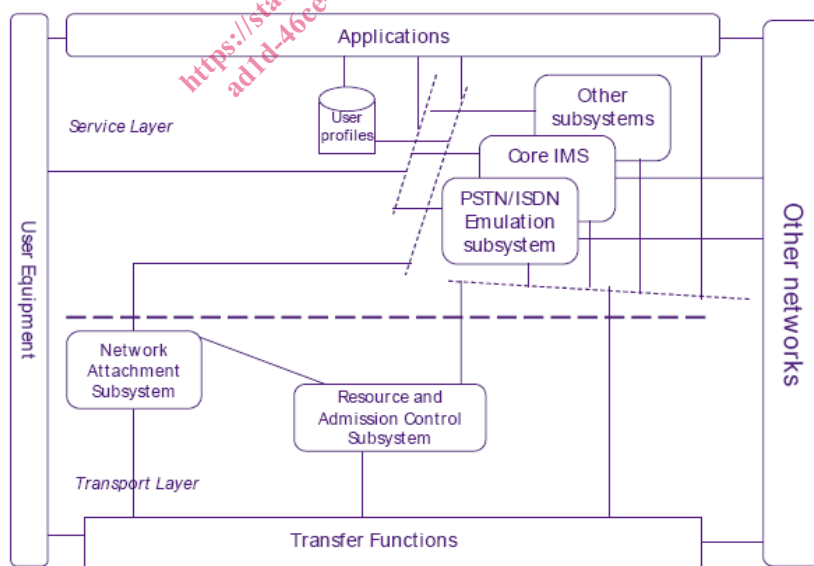


Figure 1: TISPAN NGN overall architecture

The functional entities that make up a subsystem may be distributed over network/service provider domains (see figure 2). The network attachment subsystem may be distributed between a visited and a home network. Service-layer subsystems that support nomadism may also be distributed between a visited and a home network.