International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.3945

(11/2011)

SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN – Testing for NGN networks

Test specifications for next generation network services on model networks – Test set 1

Recommendation ITU-T Q.3945

ITU-T

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ITU-T Q-SERIES RECOMMENDATIONS

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Recommendation ITU-T Q.3945

Test specifications for next generation network services on model networks – Test set 1

Summary

Recommendation ITU-T Q.3945 describes the requirements for the first set of next generation network (NGN) services testing and describes a typical approach to service testing.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Q.3945	2011-11-29	11

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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Recommendation ITU-T Q.3945

Test specifications for next generation network services on model networks – Test set 1

1 Scope

This Recommendation provides the list of NGN services (Annex A) that can be tested on a model network as described in clause 7.

This Recommendation includes test specifications for NGN CS-1 services.

2 References

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

[ITU-T E.800] Recommendation ITU-T E.800 (2008), *Definitions of terms related to quality of service*.

[ITU-T G.168] Recommendation ITU-T G.168 (2012), *Digital network echo cancellers.*

[ITU-T Q.3900] Recommendation ITU-T Q.3900 (2006), *Methods of testing and model network architecture for NGN technical means testing as applied to public telecommunication networks*.

[ITU-T Q.3901] Recommendation ITU-T Q.3901(2008), *Testing topology for networks and services based on NGN technical means.*

[ITU-T Q.3903] Recommendation ITU-T Q.3903 (2008), *Formalized presentation of testing results*.

[ITU-T Y.2006] Recommendation ITU-T Y.2006 (2008), *Description of capability set 1 of NGN release 1*.

[ITU-T Y.2007] Recommendation ITU-T Y.2007 (2010), *NGN capability set 2*.

[ITU-T Y.2012] Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of next generation networks*.

[ITU-T Y Sup.7] Recommendation ITU-T Y Suppl.7 (2008), *ITU-T Y.2000-series – Supplement on NGN release 2 scope.*

[ETSI TR 102 775] ETSI TR 102 775 V1.4.1 (2010), *Speech and multimedia Transmission Quality (STQ); Guidance on objectives for Quality related Parameters at VoIP Segment-Connection Points; A support to NGN transmission planners*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 model network [ITU-T Q.3900]: A network which simulates the capabilities similar to those available in telecommunication networks has a similar architecture and functionality and uses the same telecommunication technical means.

3.1.2 NGN technical means [ITU-T Q.3900]: The NGN basic equipment which serves as a basis for building new generation network solutions, including for application in public telecommunication networks.

3.1.3 QoS experienced/perceived by customer/user (QoE) [ITU-T E.800]: A statement expressing the level of quality that customers/users believe they have experienced.

3.1.4 quality of service (QoS) [ITU-T E.800]: Totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ACB Anonymous Communication Barring

ACR Anonymous Communication Rejection

ANI Application Network Interface

AOC Advice Of Charge

BW Bandwidth

CB Communication Barring

CCBS Completion of Communications to Busy Subscriber

CCNR Completion of Communications by No Reply

CDIV Communication Diversion

CH Communication HOLD

CMR Customized Multimedia Ring

CONF Conference

CP Control Point

CUG Closed User Group

CW Communication Waiting

CWBS Converged Web Browsing Services

ECT Explicit Communication Transfer

FoIP Fax over IP

IPDV IP Packet Delay Variation

IPER IP Packet Error Rate

IPLR IP Packet Loss Rate

IPTD IP Packet Transfer Delay

ISDN	Integrated Services Digital Network
IMS	IP Multimedia Subsystem
MDS	Managed Delivery Services
MoIP	Modem over IP
MOS	Mean Opinion Score
MWI	Message Waiting Indication
NER	Network Effectiveness Ratio
NNI	Network Network Interface
NP	Network Performance
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
PES	PSTN/ISDN Emulation Service
PLMN	Public Land Mobile Network
PoC	Push to talk over Cellular
PoN	Push to talk services over NGN
PSN	Packet Switched Network
PSS	PSTN/ISDN Simulation Services
PSTN	Public Switching Telephone Network
QoE	Quality of Experience
QoS	Quality of Service
SA	Service Availability
SAPS	Session Availability Per Second
SSW	Softswitch
TE	Test Equipment
TIP	Terminating Identification Presentation
TIR	Terminating Identification Restriction
UCC	User-Created Content
UNI	User Network Interface
USN	Ubiquitous Sensor Network
VAD	Voice Active Detection
VAS	Value Added Service
VPN	Virtual Private Network

5 Conventions

None.

6 NGN services classification for testing (test set 1)

[ITU-T Y.2006] divides NGN services into the following main groups:

– Multimedia services.

– The PSTN/ISDN emulation services (PES) provide traditional PSTN services for legacy terminals in packet switched networks (PSNs).

– The PSTN/ISDN simulation services (PSS) provide service features similar to traditional PSTN/ISDN services for NGN terminals. As a rule, these services should be implemented on the IMS network solutions.

– Public interest services provided in accordance with national laws, regional government and international agreements.

– Emergency services.

A list of current NGN services is provided in Annex A of this Recommendation.

The PSS set can include the following services:

– TIP and TIR – Terminating identification presentation and restriction

– OIP and OIR – Originating identification presentation and restriction

– CH – Communication HOLD

– CONF – Conference

– CDIV – Communication diversion

– ECT – Explicit communication transfer

– CUG – Closed user group

– ACR and ACB – Anonymous communication rejection and communication barring

– CCBS and CCNR – Completion of communications to busy subscriber and no reply

– CW – Communication waiting

7 Requirements for the NGN service testing approach

7.1 Model network requirements for providing NGN service testing

For the purposes of service testing, a model network has to be configured. The typical model network scheme has to include several segments. Figure 1 shows the structure of a typical model network.

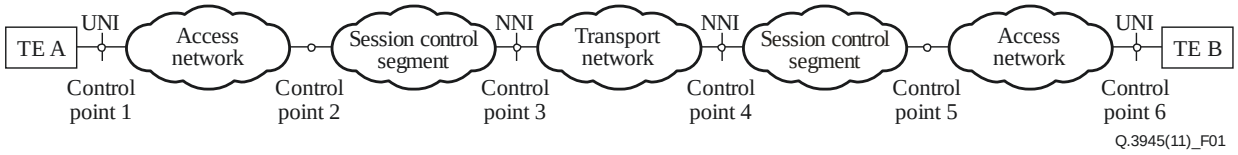

Figure 1 – The structure of a typical model network for service testing

7.2 NGN services test programme

7.2.1 Common service parameters testing

The common set of service parameters is shown in Table 1.

Table 1 – Common requirements of service parameters for testing

#	Service parameters title
1	Service access scenarios testing
2	Logic of service implementing testing
3	Call flow testing for different types of signalling protocols that are used for providing services
3	Access to emergency services testing
4	Customer identification procedure testing
5	Coding testing
6	Numbering and addressing testing
7	Billing and service statistic growth procedure testing
8	Security testing
9	Subscriber profile testing (Subscriber database)
10	Service profile testing (Subscriber database)

7.2.2 NP and QoS parameters of service testing

For each service the set of network performance (NP) and quality of service (QoS) parameters could be determined. These requirements have to be determined for each service in separate ITU-T Recommendations.

The programme of QoS and NP tests have to allow for the service availability (SA) parameters to be determined and have to include the following mandatory set of checks:

– the determination of the network effectiveness ratio (NER) to the bandwidth (BW);

– the latency of service provision (the signalling timer realization);

– the quality of providing services (in MOS/R-factor parameters).

These test values could give an answer in terms of QoE and could be a global composition for understanding quality of service.

The set of checks could find the limit of the value of NP for requested QoS parameters for each network segment (access, transport, session control).

The set of mandatory parameters to evaluate QoS includes:

– duration of call establishment;

– service quality (MOS/R-factor);

– IPTD, IPDV, IPLR, IPER as described in [ETSI TR 102 775]

The set of mandatory parameters to validate NP includes:

– Bandwidth (BW);

– codec;

– VAD (Voice Active Detection);

– echo cancellation [ITU-T G.168];

– de-jitter buffer;

– packet size and packet formation time.

7.3 NGN services test specification

7.3.1 Common characteristics of services testing

7.3.1.1 Service scenarios and the logic of service testing

This clause provides information regarding service scenario testing. The verification of service conformity to service requirements includes the following phases: registration and call establishing using NGN architecture.

The test suite has to be independent of the technology used by the service and the type of user terminal.

A test suite has to concentrate on all possible service scenarios for providing services from different types of networks (e.g., PLMN, PSTN and PSN), and also a roaming scenario.

7.3.1.2 Call flow testing for service realization

The test suite has to include all signalling scenarios of the service for all phases (registering, call establishment, conversation, call release, value added services (VASs)), types and format of signalling messages (the requirements of these parameters are not subject to service test specifications and could be described in separate ITU-T Recommendations).

7.3.1.3 Emergency accessibility testing

This clause should provide the test specifications for services in case of emergency situations.

7.3.1.4 Customer's terminal identification testing

The test suite has to include the set of verification types of the identification mechanism, including measurement parameters (format and content).

A specific diagram has to be provided for each test suite.

7.3.1.5 Coding testing

This clause is intended for services which require a coding and decoding functionality.

Codec parameters for each service could be tested (for instance for voice services and for fax and modem over IP services).

The test suite also has to include the following mandatory aspects:

– the possibility of testing the codec with and without compression;

– testing services which could be used on PSTN networks based on NGN technologies have to be realized with a minimum value of formation packets (latency on signal processing) without reducing voice quality (QoE);

– the specific standards for FoIP, MoIP and VoIP have to be determined separately and test suites have to cover conformity with respect to QoS and NP for each service.

7.3.1.6 Numeration and addressing for providing services

Testing adherence to the requirements for numbering and addressing is to be carried out, to test the numbering format and its correspondence to the standards.

The test suite has to include the following set:

– testing the procedure for customer registration (terminal equipment);

– testing rules of a dial customer's identifier;

– the testing possibility to realize a service for different customers with different identification mechanisms.

When testing, the principle of technological neutrality of a service should be considered – the service should be correctly rendered irrespective of the technologies used on a network (circuit switching or packet switching) and system-network solutions.

Also, the test suite has to include a test set for the information that is being saved for the interconnection with other network operators in preparation for service roaming (service identification, customer identification etc.)

7.3.1.7 The service statistic testing

The test suite should verify traffic requirements collection, storage and analysis of the information on given services that are necessary for the calculation of payment with interacting operators and customers. Two methods, for pre-paid and post-paid, can be used for verifying rate requirements and calculating the volume of the services rendered.

7.3.1.8 Information security testing

The test suite has to include the following checks:

– the security of signalling message exchange;

– the security of payload transfer;

– the security of customer registration and authentication.

The norms for these parameters should be provided as part of the requirements for information security for each telecommunication service.

7.3.1.9 Customer profile testing

The NGN (as in for legacy networks) includes the customer database which provides information for each customer – the customer profile (the customer profile could include, for instance, an accessible set of services and the customer's identification).

7.3.1.10 Service profile testing

Each service realized on the NGN has to include some parameters allowing it to be implemented on the different operators' segments (for instance PSN and CSN). The test suite has to check the format of the service profile and all the types of parameters which are related to the service.

7.3.1.11 QoS and NP testing for a service

For realizing QoS and NP testing, the limit value of these parameters for different segments of the networks could be found. These limit values help to get services without degradation.

A typical measurement scheme which has to be followed to verify QoS, QoE and NP is provided in Figure 2. Three types of parameters are used (variable, fixed and measurement).

Table 2 shows dependence of QoE to QoS and NP. This dependency is an instance and could be changed for each service.

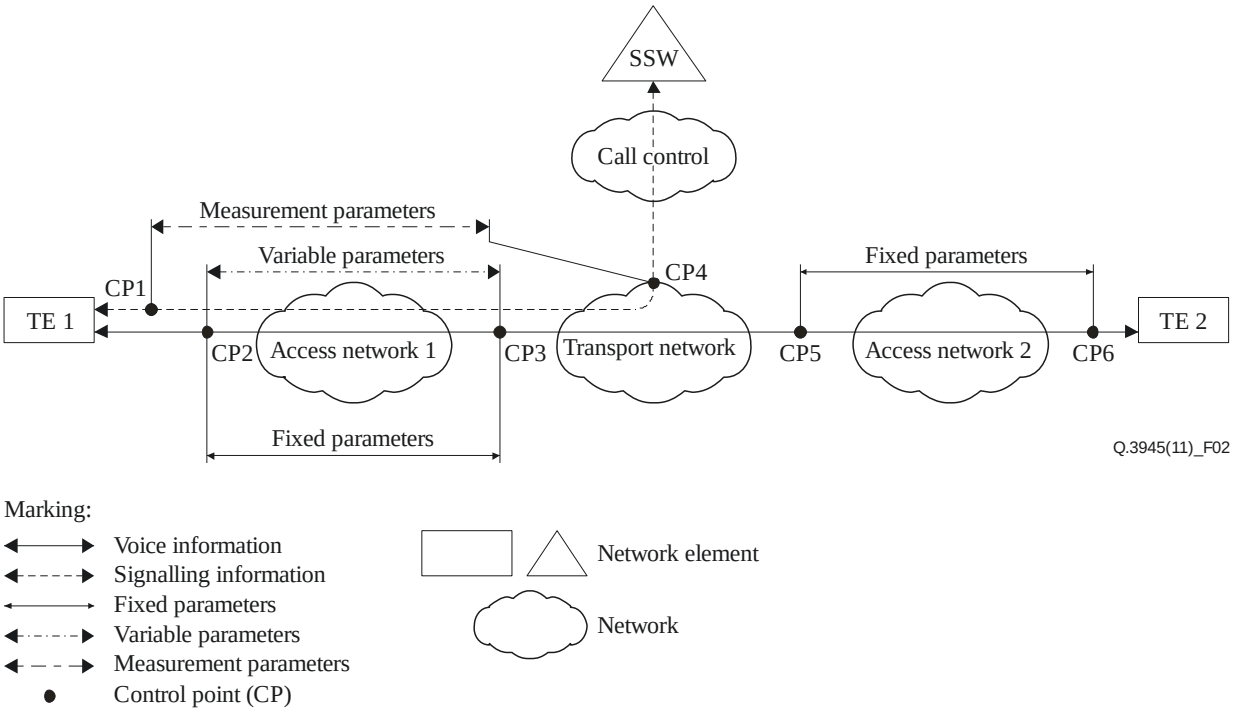

Figure 2 – The typical measurement scheme for QoS, QoE and NP testing

Table 2 – The dependence of QoS, QoE and NP for determining the limit value of NP

QoE parameters	Description	Fixed QoS and NP value	Variable QoS and NP value	Test value
Network effectiveness ratio (NER)	Satisfied calls to total calls	IPTD; IPDV; IPLR; IPER.	Bandwidth (maximum)	SAPS (session availability per second)
Service providing latency	Maximum value of signalling timer	Bandwidth, SAPS	IPTD; IPDV; IPLR; IPER.	Timer value
MOS (R-factor)	MOS (R-factor	Bandwidth; SAPS	1) Service features: Codecs; VAD; ITU-T G.168; Packet size. 2) Equipment parameters: De-jitter buffer 3) Network parameters: IPTD; IPDV; IPLR; IPER.	MOS (R-factor)

8 Formalization of service testing results

The results of service-testing should be formalized in accordance with [ITU-T Q.3903], which describes the requirements for the completion, saving and analysis of the testing results.

Annex A

The full list of NGN capability set 1 and capability set 2 services

(This annex forms an integral part of this Recommendation.)

The full list of NGN capability set 1 and capability set 2 services is shown in Table A.1.

Table A.1 – The full list of NGN capability set 1 and capability set 2 services

Service type	Service group	Service examples	CS 1		CS-2 [ITU-T Y.Sup7]
			CS-1 [ITU-T Y.2006]	CS-2 [ITU-T Y.2007	
Multimedia services	Real-time conversational voice services		+	+	+
	Messaging services	IM	+	+	+
		SMS	+	+	+
		MMS	+	+	+
	Push to talk services over NGN (PoN)	Push to talk over cellular (PoC)	+	+	+
	Point-to-point interactive multimedia services	Interactive real-time voice	+	+	+
		Real-time text	+	+	+
		Real-time video	+	+	+
		Voice telephony with text (white-boarding)	+	+	+
	Collaborative interactive communication services	Multimedia conferencing with file sharing and application sharing	+	+	+
		e-learning	+	+	+
		gaming	+	+	+

Table A.1 – The full list of NGN capability set 1 and capability set 2 services

Service type	Service group	Service examples	CS 1		CS-2 [ITU-T Y.Sup7]
			CS-1 [ITU-T Y.2006]	CS-2 [ITU-T Y.2007	
	Content delivery services	Radio and video streaming	+	+	+
		Music and video on demand	+	+	+
		Financial information distribution	+	+	+
		Professional and medical image distribution	+	+	+
		Electronic publishing	+	+	+
	Push-based services	MMS notification	+	+	+
	Broadcast services	Reporting of alert conditions for emergency community notification	+	+	+
	Information services	Cinema ticket information	+	+	+
		Motorway traffic status	+	+	+
	Location-based services	Tour guide service	+	+	+
		User service	+	+	+
		Assistance service for disabled persons	+	+	+
		Emergency calls	+	+	+
	Presence and general notification services		+	+	+
	Customized multimedia ring services (CMR)	Customized ring back tone service	–	–	+
		Customized ring tone service	–	–	+
		Customized background tone service	–	–	+
	Visual surveillance services	Deliver real-time video, voice and remote control information from one NGN user to another	–	–	+

Table A.1 – The full list of NGN capability set 1 and capability set 2 services

Service type	Service group	Service examples	CS 1		CS-2 [ITU-T Y.Sup7]
			CS-1 [ITU-T Y.2006]	CS-2 [ITU-T Y.2007	
	Multimedia communication centre services	Call centre services to the NGN sub	–	–	+
PSTN/ISDN emulation service	PSTN/ISDN emulation service	Support for legacy terminals connected to the NGN	+	+	+
		Fax-over-IP (FoIP)	+	+	+
		Modem-over-IP (MoIP)	+	+	+
	Originating identification presentation (OIP) and originating identification restriction (OIR)		+	+	+
	Terminating identification presentation (TIP) and terminating identification restriction (TIR)		+	+	+
	Message waiting indication (MWI)		+	+	+
	Communication diversion (CDIV)		+	+	+
	Conference (CONF)		+	+	+
	Anonymous communication rejection (ACR) and communication barring (CB)		+	+	+
	Malicious communication identification (MCID)		+	+	+
	Explicit communication transfer (ECT)		+	+	+
	Communication HOLD (HOLD)		–	+	+
	Communication waiting (CW)		–	+	+
	Completion of communications to busy subscriber (CCBS), completion of communications by no reply (CCNR)		–	+	+
	Advice of charge (AOC)		–	+	+
	Closed user group (CUG)		–	+	+

Table A.1 – The full list of NGN capability set 1 and capability set 2 services

Service type	Service group	Service examples	CS 1		CS-2 [ITU-T Y.Sup7]
			CS-1 [ITU-T Y.2006]	CS-2 [ITU-T Y.2007	
Data communication services	Virtual private network (VPN) services	Exchange of single or multimedia streams among a restricted group of service endpoints	+	+	+
		VPN services in mobile environments	–	–	+
		Multicast VPN services	–	–	+
	Existing data services	Data file transfer	+	+	+
		Electronic mailbox	+	+	+
		Web browsing	+	+	+
	Data retrieval services	Tele-software	+	+	+
	Online services	Online sales for consumers	+	+	+
		E-commerce	+	+	+
		Online procurement for commercial organizations	+	+	+
	Remote control/tele-action services	Home application control	+	+	+
		Telemetry	+	+	+
		Alarms	+	+	+
		Monitoring service (baby, home security and traffic)	+	+	+

Table A.1 – The full list of NGN capability set 1 and capability set 2 services

Service type	Service group	Service examples	CS 1		CS-2 [ITU-T Y.Sup7]
			CS-1 [ITU-T Y.2006]	CS-2 [ITU-T Y.2007	
Public interest service or applications	Emergency communication		+	+	+
	Support for users with disabilities		–	–	+
	Lawful interception		–	+	+
	Service unbundling		–	–	+
	Network or service provider selection		–	–	+
	Prevention of unsolicited bulk telecommunications		–	–	+
	Number portability		–	–	+
	Malicious communication identification		–	–	+
	User identifier presentation and privacy		–	–	+
IPTV	Distributed content services	Broadcast services: – Linear TV; – linear TV with trick mode; – pay per view; – electronic programme guide; – personal broadcast service; – hybrid: online and off-air TV delivery; – linear TV with multi-view service	–	+	+
		On-demand services: – Video on demand (VoD); – near VoD; – reserved delivery service; – on-demand with multi-view service; – music on demand (MoD)	–	+	+

Table A.1 – The full list of NGN capability set 1 and capability set 2 services

Service type	Service group	Service examples	CS 1		CS-2 [ITU-T Y.Sup7]
			CS-1 [ITU-T Y.2006]	CS-2 [ITU-T Y.2007	
		Advertising service: – Traditional advertising service; – targeted advertising; – on-demand advertising; – advertising message logging	–	+	+
		Time-shifting and place-shifting: – Time-shifting services; – place-shifting services	–	+	+
		Supplementary content	–	+	+
	Interactive Services	Information services	–	+	+
		Commercial services	–	+	+
		Entertainment services	–	+	+
		Learning services	–	+	+
		Medical services	–	+	+
		Monitoring services	–	+	+
		Portal services	–	+	+
		Interactive advertising	–	+	+

Table A.1 – The full list of NGN capability set 1 and capability set 2 services

Service type	Service group	Service examples	CS 1		CS-2 [ITU-T Y.Sup7]
			CS-1 [ITU-T Y.2006]	CS-2 [ITU-T Y.2007	
	Communication services		–	–	+
	Others	Public interest services: – Support for end users with disabilities; – emergency communications; – community-related information	–	+	+
		Hosting services: – Business-to-business housing; – user-created content (UCC) housing	–	+	+
		Presence services: – Basic presence service; – channel-based presence service; – targeted advertising based on presence	–	+	+
		Session mobility service	–	+	+
Enterprise network services	Virtual leased line service		+	+	+
	Business trunking application		+	+	+
	Hosted services for enterprises	IP centrex	+	+	+
Converged web browsing services (CWBS)	Advanced web-browsing services in different NGN devices and various network environments with profile-based content adaptation capabilities		–	–	+

Table A.1 – The full list of NGN capability set 1 and capability set 2 services

Service type	Service group	Service examples	CS 1		CS-2 [ITU-T Y.Sup7]
			CS-1 [ITU-T Y.2006]	CS-2 [ITU-T Y.2007	
USN applications and services	Industrial automation		–	–	+
	Home automation		–	–	+
	Agricultural monitoring		–	–	+
	Healthcare		–	–	+
	Environment		–	–	+
	Pollution and disaster surveillance		–	–	+
	Homeland security		–	–	+
Tag-based identification applications and services	Tag-based identification applications and services provide users with access to multimedia information through the users' electronic devices equipped with ID terminals		–	–	+
Managed delivery services (MDS)	Managed delivery services (MDS) are provided by an NGN provider to third-party service providers via an ANI of the NGN, in which comprehensive control capabilities for service delivery are available between third-party service providers and their users		–	–	+

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Printed in Switzerland
Geneva, 2012