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SERIES Q: SWITCHING AND SIGNALLING

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

Testing principles for IMS model networks, and identification of relevant conformance, interoperability and functionality tests

Recommendation ITU-T Q.3904

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Recommendation ITU-T Q.3904

Testing principles for IMS model networks, and identification of relevant conformance, interoperability and functionality tests

Summary

Recommendation ITU-T Q.3904 describes the global overview and main requirements for IP multimedia subsystem (IMS) testing. It could be useful as a basic ITU-T Recommendation for IMS functionality, conformance and interoperability testing on the model networks.

This Recommendation describes the principles of testing, the detailed procedures of testing and the expected results.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Q.3904	2010-06-13	11

Keywords

IP multimedia subsystem (IMS), model networks, next generation networks (NGN), public switched telephone networks (PSTN), testing.

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Testing principles for IMS model networks, and identification of relevant conformance, interoperability and functionality tests

1 Scope

This Recommendation defines IMS conformance, interoperability and functionality tests on the model networks.

As the IMS was developed from ETSI and 3GPP, this Recommendation covers the common types of IMS tests in accordance with ITU-T Recommendations and ETSI specifications. This Recommendation could be used by test labs for verifying IMS solutions.

The functionality tests contained in this Recommendation are a framework of tests which must be extended with parameters depending of the IMS configuration and implementation.

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.

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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, it 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 network equipment which serves as a basis for building new generation network solutions, including application in public telecommunication networks.

4 Abbreviations

This Recommendation uses the following abbreviations:

ABG-FE Access Border Gateway Functional Entity

ABS Automatic Billing System

AG Access Gateway

AGC Access Gateway Controller

AGC-FE Access Gateway Control Functional Entity

AS	Application Server
AS-FE	Application Support Functional Entity
BGC-FE	Breakout Gateway Control Functional Entity
IBC-FE	Interconnection Border Gateway Control Functional Entity
IBG-FE	Interconnection Border Gateway Functional Entity
I-CSCF	Interrogating Call Session Control Function
IP	Internet Protocol
ISDN	Integrated Services Digital Network
MG	Media Gateway
MGC	Media Gateway Controller
MGCF	Media Gateway Controller Function
MGCP	Media Gateway Control Protocol
NGN	Next Generation Networks
NIT	Network Integration/Interconnection Testing
NUT	Network Under Test
P-CSCF	Proxy Call Session Control Function
PS	Proxy-Server (SIP)
PSTN	Public Switched Telephone Network
QoS	Quality of Service
S-CSCF	Serving Call Session Control Function
SCTP	Stream Control Transmission Protocol
SG	Signalling Gateway
SG-FE	Signalling Gateway Functional Entity
SIP	Session Initiation Protocol
SMTP	Simple Mail Transfer Protocol
SP	Signalling Point
SS7	Signalling System 7
STP	Signalling Transfer Point
TCP	Transmission Control Protocol
TE	Terminal Equipment
UDP	User Datagram Protocol
UNI	User Network Interface
URI	Uniform Resource Identifier

5 Conventions

None.

6 General requirements to IMS testing

The IMS testing procedures include several testing methods. They include IMS conformance and interoperability (network integration) tests for basic call and supplementary services and a framework of functionality tests which must be extended with parameters depending on the IMS configuration and implementation.

Testing of the technical means and network solution functionalities are realized in accordance with NGN architecture requirements [ITU-T Y.2012]. Testing methods allow the determination of a set of algorithms and possibilities to test the technical means and network solutions when deploying NGN functional entities [ITU-T Y.2012].

All IMS testing results should be delivered in accordance with [ITU-T Q.3900] and [ITU-T Q.3901] procedure to the knowledge database. The structure and data format are shown in [ITU-T Q.3903].

6.1 Schemes of tests

Tests are spent on the model network corresponding to [ITU-T Q.3900]. The generalized scheme of tests is shown in Figure 1.

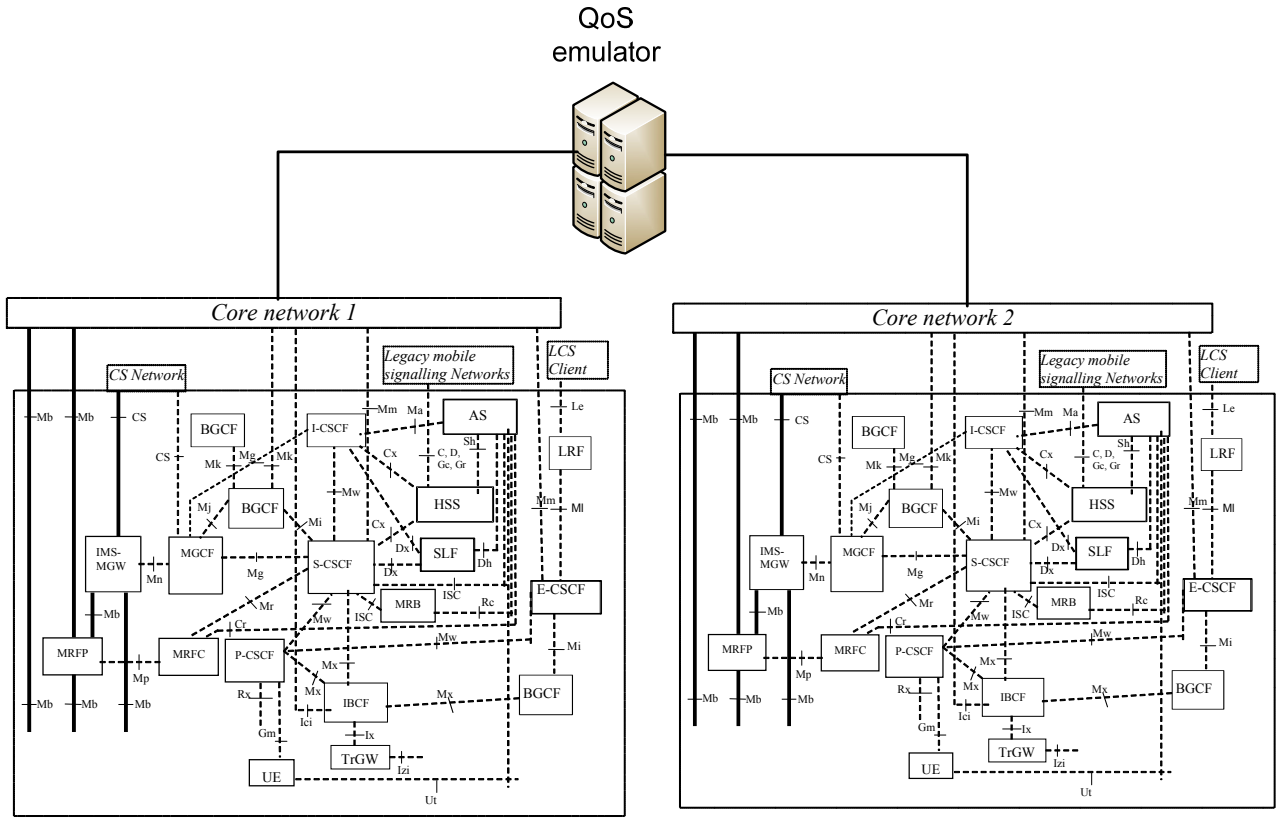

Figure 1 – Generalized scheme of IMS tests on model network

6.2 Test programme

The IMS testing includes the following type of tests:

– Conformance testing of basic call and supplementary services;

– Interoperability testing/network integration tests;

– IMS basic functionality testing.

6.2.1 List of IMS conformance tests

This clause contains a list of technical standards for conformance testing produced by ETSI and 3GPP. The tests are based on the 3GPP Release 7 and Release 8.

Table 1 – Basic call and supplementary services conformance test list

No.	Supplementary service	References to test specifications		
		PICS	TSS&TP	ATS, PIXIT
1	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP)	[ETSI TS 102 790-1]	[ETSI TS 102 790-2]	[ETSI TS 102 790-3]
2	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Part 3: Abstract test suite (ATS) for terminals	TBD	TBD	[ETSI TS 134 229-3]
3	Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR)	[ETSI TS 186 005-1]	[ETSI TS 186 005-2]	[ETSI TS 186 005-3] (Note)
4	Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR)	[ETSI TS 186 006-1]	[ETSI TS 186 006-2]	[ETSI TS 186 006-3] (Note)
5	Communication HOLD (CH)	[ETSI TS 186 007-1]	[ETSI TS 186 007-2]	[ETSI TS 186 007-3] (Note)
6	Conference (CONF)	[ETSI TS 186 010-1]	[ETSI TS 186 010-2]	TBD
7	Subaddressing (SUB)	[ETSI TS 186 012-1]	[ETSI TS 186 012-2]	TBD
8	Communication Diversion (CDIV)	[ETSI TS 186 014-1]	[ETSI TS 186 014-2]	TBD
9	Explicit Communication Transfer (ECT)	[ETSI TS 186 015-1]	[ETSI TS 186 015-2]	TBD
10	Closed User Group (CUG)	[ETSI TS 186 016-1]	[ETSI TS 186 016-2]	[ETSI TS 186 016-3] (Note)
11	Anonymous Communication Rejection (ACR) and Communication Barring (CB)	[ETSI TS 186 017-1]	[ETSI TS 186 017-2]	[ETSI TS 186 017-3] (Note)

Table 1 – Basic call and supplementary services conformance test list

No.	Supplementary service	References to test specifications		
		PICS	**TSS&TP**	**ATS, PIXIT**
12	Malicious Communication Identification (MCID)	[ETSI TS 186 018-1]	[ETSI TS 186 018-2]	[ETSI TS 186 018-3] (Note)
13	Completion of Communications to Busy Subscriber (CCBS) Completion of Communications by No Reply (CCNR)	[ETSI TS 186 021-1]	[ETSI TS 186 021-2]	TBD
14	Communication Waiting (CW)	[ETSI TS 186 022-1]	[ETSI TS 186 022-2]	TBD
NOTE – Abstract Test Suite in TTCN-3, according to [b-ITU-T Z.161].				

No.	SIP/ISUP Interworking	References to test specifications		
		PICS	**TSS&TP**	**ATS, PIXIT**
15	SIP/ISUP Interworking Profile A & B based on Q.1912.5	[ITU-T Q.1912.5B] [ETSI TS 186 002-1]	[ITU-T Q.1912.5C] [ETSI TS 186 002-2]	[ITU-T Q.1912.5E] [ETSI TS 186 002-4]
16	SIP/ISUP Interworking Profile C based on Q.1912.5	[ITU-T Q.1912.5B] [ETSI TS 186 002-1]	[ITU-T Q.1912.5E] [ETSI TS 186 002-3]	TBD [ETSI TS 186 002-5]
17	IMS SIP/ISUP Interworking	[ETSI TS 186 009-1]	[ETSI TS 186 009-2]	[ETSI TS 186 009-3]

No.	IMS NNI Interworking Tests specification	References to test specifications		
		TSS&TP	**Test description**	**ATS, PIXIT**
18	IMS NNI Interworking Tests specification (for plug test events)	[ETSI TS 186 011-1]	[ETSI TS 186 011-2]	[ETSI TS 186 011-3]

6.2.2 Programme of interoperability testing/network integration testing

This clause contains a list of interoperability testing/network integration tests produced by ETSI. The tests are based on the 3GPP Release 7 and Release 8 (Table 2).

Table 2 – List of interoperability/network integration tests

No.	NIT	References to test specifications		
		PICS	TSS&TP	ATS, PIXIT
1	Network Integration Testing between SIP and ISDN/PSTN network signalling protocols Part 1 SIP-ISDN TSS&TP (Rel. 7)	TBD	[ETSI TS 186 001-1]	[ETSI TS 186 001-2]
2	Network Integration Testing between SIP and ISDN/PSTN network signalling protocols Part 2 SIP-ISDN & SIP-SIP (Rel 7)	TBD	TBD	[ETSI TS 186 001-2]
3	Network Integration Testing between SIP and ISDN/PSTN network signalling protocols Part 3 SIP-SIP (TSS&TP) (Rel 7)	TBD	[ETSI TS 186 001-3]	TBD
4	Network Integration Testing between SIP and ISDN/PSTN network signalling protocols Part SIP-SIP (ATS) (Rel 8)	TBD	[ETSI TS 186 001-3]	TBD

6.2.3 Programme of IMS basic functionalities testing

The programme of basic functionality testing of the IMS NUT with instructions of checked functions, and numbers of corresponding tests is shown in Table 3. The functionality tests contained in this Recommendation are a framework of tests which must be extended with parameters depending on the IMS configuration and implementation.

Table 3 – Programme of basic functionality testing of IMS NUT

No.	Group of tests	Functional element of IMS NUT	Checked functions	Reference	Number of tests
1	Check of identification, authentication and registration terminal and/or service user	S-CSCF	Registrating subscribers, providing processing of inquiries about registration from network users, giving information on registration to the system of definition of subscribers position (HSS)	[ITU-T Y.2012] (S-1) [ETSI TS 124 228], [ETSI TS 124 229]	F_I_AUTH-1 F_I_AUTH-2 F_I_AUTH-3 F_I_AUTH-4
		S-CSCF	Sessions management for the subscribers registered in the S-CSCF domain zone, including a deviation in service of users who are not registered	[ITU-T Y.2012] (S-1, S-6), [ETSI TS 124 228], [ETSI TS 124 229]	F_I_AUTH-1, F_I_AUTH-2, F_I_AUTH-3, F_I_AUTH-4
		S-CSCF	Interaction with uniform database under Diameter protocol	[ITU-T Y.2012] (S-1), [ETSI TS 124 228], [ETSI TS 124 229]	F_I_AUTH-1, F_I_AUTH-2, F_I_AUTH-3, F_I_AUTH-4, F_I_AUTH-6, F_I_AUTH-7
		P-CSCF	Support of function of enciphering of sessions between the user and P-CSCF according to [ETSI TS 133 203].	[ITU-T Y.2012] (S-2)	F_I_AUTH-5
		P-CSCF	Registration and authorization of SIP users	[ITU-T Y.2012] (S-2, S-6) [ETSI TS 124 228], [ETSI TS 124 229]	F_I_AUTH-1, F_I_AUTH-2, F_I_AUTH-3, F_I_AUTH-4
		HSS	Registration and data storage about users (profiles of subscribers).	[ITU-T Y.2012] (S-5) [ETSI TS 124 228], [ETSI TS 124 229]	F_I_AUTH-1, F_I_AUTH-2, F_I_AUTH-3, F_I_AUTH-4, F_I_AUTH-6, F_I_AUTH-7
		HSS	Registration and storage of the information on services accessible to the user.	[ITU-T Y.2012] (S-5) [ETSI TS 124 228], [ETSI TS 124 229]	F_I_AUTH-1, F_I_AUTH-2, F_I_AUTH-3, F_I_AUTH-4, F_I_AUTH-6, F_I_AUTH-7

Table 3 – Programme of basic functionality testing of IMS NUT

No.	Group of tests	Functional element of IMS NUT	Checked functions	Reference	Number of tests
		HSS	Interaction with S-CSCF under Diameter protocol	[ITU-T Y.2012] (S-5) [ETSI TS 124 228], [ETSI TS 124 229]	F_I_AUTH-1, F_I_AUTH-2, F_I_AUTH-3, F_I_AUTH-4
		HSS	Verification of the required data and management of access of subscribers to NGN network resources.	[ITU-T Y.2012] (S-5, S-6) [ETSI TS 124 228], [ETSI TS 124 229]	F_I_AUTH-1, F_I_AUTH-2, F_I_AUTH-3, F_I_AUTH-4
		AS	Autentification and authorization of users by services in Radius or Diameter protocol.	[ITU-T Y.2012] (S-6)	F_I_AUTH-6, F_I_AUTH-7
2	Check of granting of telecommunica-tion services	S-CSCF	Realization of SIP proxy server functions, both formed within the limits of domain S-CSCF, and providing processing of the calls redirected from P-CSCF.	[ITU-T Y.2012] (S-1) [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		S-CSCF	The realization of User Agent function, necessary for termination of calls and their generation in relation to a counter SIP proxy server.	[ITU-T Y.2012] (S-1), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		S-CSCF	Processing of inquiries about connections establishment with foreign networks based on IP multimedia subsystem.	[ITU-T Y.2012] (S-1), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		S-CSCF	Management of calls between subscribers of various domains (based on the softswitch system and based on SIP technologies), through corresponding BGC and P-CSCF.	[ITU-T Y.2012] (S-1), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6

Table 3 – Programme of basic functionality testing of IMS NUT

No.	Group of tests	Functional element of IMS NUT	Checked functions	Reference	Number of tests
		S-CSCF	Management of connections establishment with a foreign network based on the IP multimedia subsystem, through the calls and sessions management controller interacting with other IP multimedia subsystem (I-CSCF) under SIP IMS protocol.	[ITU-T Y.2012] (S-1), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		S-CSCF	Management of the calls arriving from nodes of switching based on MGC through BGC under SIP IMS protocol.	[ITU-T Y.2012] (S-1), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		S-CSCF	Management of the calls arriving from communication centres based on a proxy of servers (P-CSCF) under SIP IMS protocol.	[ITU-T Y.2012] (S-1), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		P-CSCF	Management of calls and session establishment between SIP subscribers of one domain zone.	[ITU-T Y.2012] (S-2), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		P-CSCF	SIP requests re-addressing from SIP subscribers of their domain zone to that of the switching node, based on S-CSCF with the requirement to establish a connection with subscribers of another domain zone served in the foreign switching node, based on P-CSCF.	[ITU-T Y.2012] (S-2), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		BGC	Management of communication between switching node based on S-CSCF and switching node based on MGC.	[ITU-T Y.2012] (S-10, S-12), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6

Table 3 – Programme of basic functionality testing of IMS NUT

No.	Group of tests	Functional element of IMS NUT	Checked functions	Reference	Number of tests
		BGC	Definition of calls routing on foreign communication networks.	[ITU-T Y.2012] (S-10, S-12), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		BGC	Direction choice (corresponding MGC) at call routing on the corresponding switching node based on MGC.	[ITU-T Y.2012] (S-10, S-12), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		I-CSCF	Management of interaction with another NGN network.	[ITU-T Y.2012] (S-3), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		I-CSCF	SIP messages translation without transformations on I-CSCF of foreign solution based IP multimedia subsystem.	[ITU-T Y.2012] (S-3), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		I-CSCF	Reception from outside external network of SIP messages and their S-CSCF translation of the domain zone.	[ITU-T Y.2012] (S-3), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6
		I-CSCF	Formation of SIP requests received during transformation of calls, directed from the switching node, based on MGC through BGC towards external NGN networks.	[ITU-T Y.2012] (S-3), [ETSI TS 124 428], [ETSI TS 124 238]	F_I_BC_1, F_I_BC_2, F_I_BC_3, F_I_BC_4, F_I_BC_5, F_I_BC_6

Table 3 – Programme of basic functionality testing of IMS NUT

No.	Group of tests	Functional element of IMS NUT	Checked functions	Reference	Number of tests
3	Check of registration of the tariffing information for different call scenarios	I-CSCF	Creation of detailed records about calls and their transfer to subscribers' profiles database (HSS).	[ITU-T Y.2012] (CCF, CTF), [ETSI TS 124 229], [ETSI TS 132 297]	F_I_CDR-1, F_I_CDR-2, F_I_CDR-3, F_I_CDR-4, F_I_CDR-5, F_I_CDR-6
		I-CSCF	Creation of network uniform calls detailed records (CDR) within P-CSCF and MGC switching nodes.	[ITU-T Y.2012] (CCF, CTF), [ETSI TS 124 229], [ETSI TS 132 297]	F_I_CDR-1, F_I_CDR-2, F_I_CDR-3, F_I_CDR-4, F_I_CDR-5, F_I_CDR-6
		I-CSCF	Transfer of detailed records about calls in the billing system.	[ITU-T Y.2012] (CCF), [ETSI TS 124 229], [ETSI TS 132 297]	F_I_CDR-1, F_I_CDR-2, F_I_CDR-3, F_I_CDR-4, F_I_CDR-5, F_I_CDR-6
		P-CSCF	Creation of detailed records about calls at the domain level and their transfer to subscribers' profiles database (HSS).	[ITU-T Y.2012] (CCF, CTF), [ETSI TS 124 229], [ETSI TS 132 297]	F_I_CDR-1, F_I_CDR-2, F_I_CDR-3, F_I_CDR-4, F_I_CDR-5, F_I_CDR-6
4	Check of registration of the statistical information in the different typical elements which are part of IMS	S-CSCF	Interaction with a communication network control system on SNMP protocol.	–	F_I_STAT_01, F_I_STAT_02, F_I_STAT_03, F_I_STAT_04, F_I_STAT_05, F_I_STAT_06
		P-CSCF	Interaction with a communication network control system on SNMP protocol.	–	F_I_STAT_01, F_I_STAT_02, F_I_STAT_03, F_I_STAT_04, F_I_STAT_05, F_I_STAT_06
		BGC	Interaction with a communication network control system on SNMP protocol.	–	F_I_STAT_01, F_I_STAT_02, F_I_STAT_03, F_I_STAT_04, F_I_STAT_05, F_I_STAT_06
		I-CSCF	Interaction with a communication network control system on SNMP protocol.	–	F_I_STAT_01, F_I_STAT_02, F_I_STAT_03, F_I_STAT_04, F_I_STAT_05, F_I_STAT_06

6.3 Methods of tests

6.3.1 Methods of basic functionality tests

6.3.1.1 Check of terminal and/or service user identification, authentication and registration

Test number	F_I_AUTH-1	
Reference	[ETSI TS 124 228], section 6.3	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.5 of [ITU-T Y.2012] Clause 9.3.3.1.6 of [ITU-T Y.2012]
Test name	Registration/authentication, successful.	
Test purpose	Check that the SUT can provide access to the IMS services after registration/authentication SIP-terminal using the URI (uniform resource identifier) and the corresponding password only.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that the used testing equipment is in an operable condition. 3) In the subscriber database (HSS) a user profile is created. For this user, an initial authentication data profile is created.	
Test procedure	1) Enter the correct password for the user in SIP-terminal settings. 2) Initiate registration of the SIP-terminal user. 3) Check that the registration was successful. 4) Initiate a call from a SIP-terminal. 5) Check if the call was established successfully.	
Expected result	1) Registration of SIP-terminal and the end user has access to the IMS services.	

Test number	F_I_AUTH-2	
Reference	[ETSI TS 124 228], section 6.2	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.5 of [ITU-T Y.2012] Clause 9.3.3.1.6 of [ITU-T Y.2012]
Test name	Registration/authentication, unsuccessful.	
Test purpose	Check that the SUT forbids access to the IMS services after registration/authentication of the SIP-terminal using the URI (uniform resource identifier) and an incorrect password.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that the used testing equipment is in an operable condition. 3) In the subscriber database, a user profile is created. For this user, an initial authentication data profile is created.	
Test procedure	1) Enter an incorrect password for the user in SIP-terminal settings. 2) Initiate registration of the SIP-terminal user. 3) Check if the registration was unsuccessful. 4) Initiate a call from a SIP-terminal. 5) Check if the call was not established.	
Expected result	The registration of the SIP-terminal was unsuccessful and the user does not have access to the basic IMS services.	

Test number	F_I_AUTH-3	
Test name	Registration/authentication in guest network, successful.	
Reference	[ETSI TS 124 228], section 6.3	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.5 of [ITU-T Y.2012] Clause 9.3.3.1.6 of [ITU-T Y.2012]
Test purpose	Check if the SUT can provide access to IMS services from the visited network.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that the used testing equipment is in an operable condition. 3) In the subscriber database, a user profile is created. For this user, an initial authentication data profile is created. The user is connected to the guest IMS network.	
Test procedure	1) Enter the correct password for the user in SIP-terminal settings. 2) Initiate registration of the SIP-terminal user. 3) Check that the registration request was sent to the home-area network. 4) Check that the registration was successful. 5) Initiate a call from a SIP-terminal. 6) Check that the call was established successfully.	
Expected result	1) Registration of a SIP-terminal user was successful and the visited network has access to basic IMS services.	

Test number	F_I_AUTH-4	
Reference	[ETSI TS 124 228], section 6.2	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.5 of [ITU-T Y.2012] Clause 9.3.3.1.6 of [ITU-T Y.2012]
Test name	Registration/authentication in the visited network, unsuccessful	
Test purpose	Check if the SUT rejects access to the IMS services from the visited network with an incorrect password.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that the used testing equipment is in an operable condition. 3) In the subscriber database, a user profile is created with a unique authentication data profile. 4) The user is connected to the visited IMS network.	
Test procedure	1) Enter the incorrect password in SIP-terminal settings. 2) Initiate registration of the SIP-terminal user. 3) Check the registration request in the home network area. 4) Check if the registration was unsuccessful. 5) Initiate a call from a SIP-terminal. 6) Check that call establishment was not successful.	
Expected result	1) Registration of the SIP-terminal user was unsuccessful and the visited network user does not have access to basic IMS services.	

Test number	F_I_AUTH-5	
Reference	[ETSI TS 124 229], section 4.2B	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012]
Test name	Function of the encryption of the signalling information between P-CSCF and SIP-telephone	
Test purpose	Check the realization of the encryption of the signal information between P-CSCF and SIP-telephone.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) The traffic analyser is switched to the Ethernet interface of the local network. This interface has to be configured as a mirror to the P-CSCF. 3) The traffic analyser is configured for analysing the signalling information between P-CSCF and SIP-telephone.	
Test procedure	1) Overview of signaling information between P-CSCF and the SIP-telephone.	
Expected result	1) The encryption procedure is realized between P-CSCF and the SIP-telephone.	

Test number	F_I_AUTH-6
Reference	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.5 of [ITU-T Y.2012] Clause 9.3.3.1.6 of [ITU-T Y.2012]
Test name	Check of terminal user policies, successful
Test purpose	Check if the user terminal has access to the requested service.
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) The terminal user has been successfully registered. 3) The user has policies for access to supplementary services.
Test procedure	1) The end user initiates a request for providing supplementary services. 2) Check if the S-CSCF has a request of supplementary services from the terminal user. 3) Check that the S-CSCF sends a reply of successful activated service, and that the end user receives these requested services.
Expected result	1) The terminal user has additional communication service.

Test number	F_I_AUTH-7
Reference	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.5 of [ITU-T Y.2012] Clause 9.3.3.1.6 of [ITU-T Y.2012]
Test name	Check of terminal user policies, unsuccessful
Test purpose	Check if the user terminal does not have access to the requested service.
Initial condition	1) The user terminal has been unsuccessfully registered. 2) Ensure that the test equipment and the SUT correspond to Figure 1. 3) The user does not have the policies to access the supplementary services.
Test procedure	1) The end user initiates a request for providing supplementary services. 2) Check if the S-CSCF has a request of supplementary services from the terminal user. 3) Check that the S-CSCF sends a reply of unsuccessful activated service, and that the end user did not receive these requested services.
Expected result	1) The terminal user does not have additional communication service.

6.3.1.2 Check of granting of services of telecommunication

Check of granting of telecommunication services is executed according to a matrix presented in Table 4. All tests of the given section are executed for each of the scenarios, defined by the NGN technical means of the calling and called subscribers. For each case, the table identifies the appropriate protocol analyser filter to be included prior to beginning the test procedure.

Table 4 – Scenarios matrix for basic call testing (in accordance with functional NGN architecture [ITU-T Y.2012])

NGN technical means of called subscriber (B) / NGN technical means of calling subscriber (A)	P-CSCF	AGCF (AG)	MGCF (TMG)
P-CSCF	X	X	X
AGCF (AG)	X	X	X
MGCF (TMG)	X	X	X

Test number	F_I_BC_1	
Reference	[ETSI TS 124 428], section A.1	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.3 of [ITU-T Y.2012] Clause 9.3.3.1.10 of [ITU-T Y.2012] Clause 9.3.3.1.12 of [ITU-T Y.2012]
Test name	Release of the call by the calling user	
Test purpose	Ensure that the calling user is able to release the call.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Connect two SIP phones (device A and B, SIP IMS Client) to an IMS-based network. 3) Devices A and B are in service.	
Test procedure	1) Make a call from a telephone with a customer address A to a telephone with a customer address B, having dialled for this purpose up to a sixteen-digit number. 2) Check that the call between telephone A and B is established. 3) Check speech transmission possibility between telephone A and B. 4) Check speech transmission possibility between telephone B and A. 5) The calling user releases the call. 6) Check that all resources used during testing are released.	
Expected result	1) Call establishment is successful. 2) The speech transmission between phones is carried out. 3) All involved resources are released. 4) The calling subscriber listens to an acoustic signal "Busy".	

Test number	F_I_BC_2	
Reference	[ETSI TS 124 428], section A.1	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.3 of [ITU-T Y.2012] Clause 9.3.3.1.10 of [ITU-T Y.2012] Clause 9.3.3.1.12 of [ITU-T Y.2012]
Test name	Release of the call by the called user	
Test purpose	Ensure that the called user is able to release the call.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Connect two SIP phones (device A and B, SIP IMS Client) to an IMS-based network. 3) Devices A and B are in idle condition.	
Test procedure	1) Make a call from a telephone with a customer address A to a telephone with a customer address B, having dialled for this purpose up to a sixteen-digit number. 2) Check that the call between telephone A and B is established. 3) Check speech transmission possibility between telephone A and B. 4) Check speech transmission possibility between telephone B and A. 5) The called user releases the call. 6) Check that all resources used during testing are released.	
Expected result	1) Call establishment is successful. 2) Speech transmission between phones is carried out. 3) All involved resources are released. 4) The calling subscriber listens to an acoustic signal "Busy".	

Test number	F_I_BC_3	
Reference	[ETSI TS 124 428], sections A.1 and B.1	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.3 of [ITU-T Y.2012] Clause 9.3.3.1.10 of [ITU-T Y.2012] Clause 9.3.3.1.12 of [ITU-T Y.2012]
Test name	Call to busy subscriber	
Test purpose	Ensure that the call setup is released if the called user is busy.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Connect two SIP phones (device A and B, SIP IMS Client) to an IMS-based network. 3) The called user is in a connection (busy). 4) Device A is in a condition of expectation of a call.	
Test procedure	1) Carry out a call from a telephone with a customer address A on a telephone with a customer address B, having dialled for this purpose up to a sixteen-digit number.	
Expected result	1) All resources used during the testing phase are released. 2) The calling subscriber listens to an acoustic signal "Busy".	

Test number	F_I_BC_4	
Reference	[ETSI TS 124 428], section A.1	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.3 of [ITU-T Y.2012] Clause 9.3.3.1.10 of [ITU-T Y.2012] Clause 9.3.3.1.12 of [ITU-T Y.2012]
Test name	No reply from the called subscriber.	
Test purpose	Ensure that the call is released if there is no answer from the called party (user is alerted).	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Connect two SIP phones (device A and B, SIP IMS Client) to an IMS-based network. 3) Devices A and B are in idle condition.	
Test procedure	1) Make a call from a telephone with a customer address A to a telephone with a customer address B, having dialled for this purpose up to a sixteen-digit number. 2) The called subscriber does not answer an incoming call. 3) After answer timer expiration, the subscriber connection should be released. 4) Check that all resources used during testing are released. 5) The calling subscriber listens to an acoustic signal "Busy".	
Expected result	1) All resources used during testing are released. 2) The calling subscriber listens to an acoustic signal "Busy".	

Test number	F_I_BC_5	
Reference	[ETSI TS 124 238], section 4	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.3 of [ITU-T Y.2012] Clause 9.3.3.1.10 of [ITU-T Y.2012] Clause 9.3.3.1.12 of [ITU-T Y.2012]
Test name	The calling user is able to release call setup during the alerting state	
Test purpose	Ensure that calling user is able to release call setup during the alerting state (early dialogue).	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Connect two SIP phones (device A and B, SIP IMS Client) to an IMS-based network. 3) Devices A and B are in idle condition.	
Test procedure	1) Make a call from a telephone with a customer address A on a telephone with a customer address B, having dialled for this purpose up to a sixteen-digit number. 2) The called subscriber does not answer an incoming call. 3) Initiate termination by the calling user. 4) Check that all resources used during testing are released.	
Expected result	1) All resources used during testing are released.	

Test number	F_I_BC_6	
Reference	[ETSI TS 124 428], section A.3.2	Clause 9.3.3.1.1 of [ITU-T Y.2012] Clause 9.3.3.1.2 of [ITU-T Y.2012] Clause 9.3.3.1.3 of [ITU-T Y.2012] Clause 9.3.3.1.10 of [ITU-T Y.2012] Clause 9.3.3.1.12 of [ITU-T Y.2012]
Test name	The calling user is dialling an unallocated number	
Test purpose	Ensure that the call is released if the calling user is dialling an unallocated number.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Connect a SIP phone (device A SIP – IMS Client) to an IMS-based network. 3) Device A is in idle state condition.	
Test procedure	1) Carry out a call from a telephone with a customer address A to a telephone with a customer address B, having dialled for this purpose a ten-digit number. 2) Check that all resources used during testing are released. 3) The calling subscriber should listen to an announcement "Unallocated number".	
Expected result	1) All resources used during testing are released. 2) The calling subscriber listens to an acoustic signal "Unallocated number" or a special announcement tone.	

6.3.1.3 Check of registration of the charging information for different scenarios of call

Below are test cases which are examples of a billing system specific to testing, and should be considered as optional test cases.

Test number	F_I_CDR-1	
Reference	[ETSI TS 124 229], sections 4.5.2 and 4.5.3	Clause 8.5.1 of [ITU-T Y.2012] Clause 8.5.2 of [ITU-T Y.2012]
Test name	Identification of IMS services.	
Test purpose	Ensure that the IMS services generate a CDR corresponding to the delivered service.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) The decoded CDR corresponding to the delivered IMS services (the exchange of instant messages, "Presence", etc.) is considered.	
Test procedure	1) The CDR structure declared by the manufacturer contains the data of the used service. 2) Check the correctness of the data reflecting the use of the corresponding IMS service.	
Expected result	1) In CDR, the use of service and the necessary additional parameters (network identification, etc.) are reflected.	

Test number	F_I_CDR-2	
Reference	[ETSI TS 124 229], sections 4.5.2 and 4.5.3	Clause 8.5.1 of [ITU-T Y.2012] Clause 8.5.2 of [ITU-T Y.2012]
Test name	Content identification	
Test purpose	Ensure that the IMS services generate a CDR corresponding to the transferred content.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) The files with the decoded CDR correspond to the transferred content.	
Test procedure	1) The CDR structure declared by the manufacturer contains the data corresponding to the transferred content. 2) Check the correctness of the data.	
Expected result	1) The CDR contains the content and the necessary parameters (type, volume, etc.).	

Test number	F_I_CDR-3	
Reference	[ETSI TS 132 297], section 6.1	Clause 8.5.1 of [ITU-T Y.2012] Clause 8.5.2 of [ITU-T Y.2012]
Test name	IP address identification	
Test purpose	Ensure that the IMS services generate a CDR with the involved IP addresses and used network resources.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) The files with the decoded CDR contain the information of the used network resources (a SIP-telephony, FTP, HTTP, etc.).	
Test procedure	1) The CDR structure declared by the manufacturer contains the defined CDR fields with IP addresses. 2) Check the correctness of the data (subscriber A, subscriber B, server address, etc.).	
Expected result	1) The CDR contains the IP addresses of the parties participating in the IMS service.	

Test number	F_I_CDR-4
Reference	Clause 8.5.1 of [ITU-T Y.2012] Clause 8.5.2 of [ITU-T Y.2012]
Test name	Interaction with ABS.
Test purpose	Check if the SUT transfers the CDR array in the ABS for further processing and charging of a telecommunication service.
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) The workplace providing the ABS functions is connected to the SUT. 3) The CDR is transferred from the SUT in ABS on time (each 15 minutes).
Test procedure	1) Execute a series of various calls. 2) Transfer CDR files from ABS. 3) Display a workplace which is carrying out ABS functions, a sample file containing a CDR array of the last 15-minute period.
Expected result	1) The file with a CDR array containing the identification of the type, and identification of that file has been transferred.

Test number	F_I_CDR-5
Reference	Clause 8.5.1 of [ITU-T Y.2012] Clause 8.5.2 of [ITU-T Y.2012]
Test name	Pre-paid charging
Test purpose	Check that for subscribers of pre-paid services the SUT does not complete the connection if the account does not have sufficient funds.
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) The terminal of the user does not have enough funds in the account for the realization of a call of average duration (2-3 minutes).
Test procedure	1) Execute a call with a duration of 5 minutes. 2) Check that connection has not terminated after 3 minutes. 3) Check that the SUT has created a CDR with the relevant information of that call and that it has been transferred to the ABS.
Expected result	1) The average call duration was achieved, and the ABS reflects correctly the transferred CDR.

Test number	F_I_CDR-6	
Reference	[ETSI TS 124 229], section 4.5	Clause 8.5.1 of [ITU-T Y.2012] Clause 8.5.2 of [ITU-T Y.2012]
Test name	Post-paid charging	
Test purpose	Check, in the case of subscribers using post-paid services, whether the SUT will terminate the connection if the account does not have sufficient funds.	
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) The user terminal does not have enough funds in the account to use the post-paid service within 2-3 minutes.	
Test procedure	1) Execute a call from the user terminal specified with the initial conditions. 2) Check that connection has ended after 2-3 minutes. 3) Check that, in the tested equipment, a CDR is created with the relevant information of that call and that it is transferred to the ABS.	
Expected result	1) The call is finished successfully after the expiration of funds in the account, and the ABS is transferred correctly to the CDR.	

6.3.1.4 Check of registration of the statistical information in the different typical elements which are part of IMS

Below are test cases which are examples of statistics specific to testing, and should be considered as optional test cases.

Test number	F_I_STAT_01
Reference	Clause 11.1.1.4 of [ITU-T M.3060]
Test name	Check performance management of IMS SUT
Test purpose	Check the possibility to control the performance of the various typical elements of the IMS SUT.
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that IMS equipment is working without failures.
Test procedure	1) From the operations interface, the technician enters a command to modify the performance of various typical IMS elements and requests the display of the results.
Expected result	1) The results of the various IMS elements are displayed on the operations interface. The results are presented in intervals of 15 minutes to 2 hours.

Test number	F_I_STAT_02
Reference	Clause 11.1.1.4 of [ITU-T M.3060]
Test name	Indicate and identify the failure in the IMS SUT based on alarms
Test purpose	Indicate and identify the failure in the IMS SUT based on alarms with failure category and conclusion of alarms.
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that IMS equipment is working without failures, alarms are absent.
Test procedure	1) Sequentially, simulate a failure in each of the different IMS entities (S-CSCF, P-CSCF, I-CSCF, BGC, etc.). 2) The alarm on the operations interface is analysed: – The IMS entities; – The failure category; – The time of occurrence of the failure; – The presence of the alarm in a history file. 3) The failure is corrected. 4) The correction of the failure is checked.
Expected result	1) The alarm should contain the information of the failure category (critical, serious or information), time of occurrence and location of the entities. The alarm should be entered in a history file.

Test number	F_I_STAT_03
Reference	Clause 11.1.1.5 of [ITU-T M.3060]
Test name	Check the statistical information of the used resources of the application server and media server (AS, MS)
Test purpose	Check the statistical information of the used resources of the application server and media server (AS, MS).
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that IMS equipment is working without failures, alarms are absent.
Test procedure	1) From the operations interface, request the display of statistics related to the resources of the applications servers and media servers.
Expected result	1) The statistics of the resources used by the application servers and the media servers are displayed on the operations interface.

Test number	F_I_STAT_04
Reference	Clause 11.1.1.1 of [ITU-T M.3060]
Test name	Check if the statistical QoS information of the calls can be displayed
Test purpose	Check if the statistical QoS information of the calls can be displayed.
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that IMS equipment is working without failures, alarms are absent.
Test procedure	1) From the operations interface, enter a command to control the QoS of the calls. 2) A command is entered to display the results to the operations interface. 3) The following parameters are observed: – total number of call arrivals per QoS category; – number of successful calls per QoS category; – number of unsuccessful calls per QoS category.
Expected result	1) The results of the quality of service are displayed on the operations interface.

Test number	F_I_STAT_05
Reference	Clause 11.1.1.1 of [ITU-T M.3060]; [ITU-T Y.1541]; [ITU-T Y.1542]
Test name	Control of QoS parameters
Test purpose	Check that the SUT can control the QoS parameters of the given services.
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that IMS equipment is working without failures, alarms are absent.
Test procedure	1) Initiate a call establishment between TA1 and TA2. 2) Check that the transferred voice information is without distortions and is transferred in both directions from TA1 to TA2 and from TA2 to TA1. 3) Check that the recourses allow the qualitative transfer of voice information. 4) Complete telephone connection between TA1 and TA2. 5) The separate generated CDR files shall contain the results of the establishment and end of a call initiated in point 2. 6) Initiate an establishment of a call with TA1 on TA2. 7) In case of limited recourses, the qualitative degradation of QoS for the voice transfer is reflected in the CDR. 8) Terminate the telephone connection between TA1 and TA2. 9) The separate generated CDR files shall contain the results of the establishment and end of a call initiated in point 6.
Expected result	1) In the received CDR, the information of the quality of services is reflected.

Test number	F_I_STAT_06
Reference	[ITU-T Y.1541]; [ITU-T Y.1542].
Test name	QoS parameters
Test purpose	Ensure that the SUT is able to receive QoS parameters measured from one or several ports, and that those parameters are reflected in the QoS statistics.
Initial condition	1) Ensure that the test equipment and the SUT correspond to Figure 1. 2) Ensure that IMS equipment is working without failures, alarms are absent.
Test procedure	1) Initiate a call from one or several ports. The network elements are able to measure the QoS parameters of the voice traffic. 2) Provide sufficient time to execute the test fully. 3) After the end of the test, the statistical data of the transferred voice traffic should be collected and evaluated.
Expected result	1) Statistical data on QoS parameters.

Bibliography

[b-ITU-T Z.161] Recommendation ITU-T Z.161 (2007), *Testing and Test Control Notation version 3: TTCN-3 core language*.

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