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TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SERIES Q: SWITCHING AND SIGNALLING

Testing specifications – Testing specifications for next generation networks

IMS/NGN performance benchmark – Part 3: Traffic sets and traffic profiles

Recommendation ITU-T Q.3932.3

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Recommendation ITU-T Q.3932.3

IMS/NGN performance benchmark – Part 3: Traffic sets and traffic profiles

Summary

Recommendation ITU-T Q.3932.3 provides the third part of a multi-part deliverable covering the IMS/NGN performance benchmark, as identified below:

Part 1: Core concepts;

Part 2: Subsystem configurations and benchmarks;

Part 3: Traffic sets and traffic profiles;

Part 4: Reference load network quality parameters.

The metrics measured and reported are for the performance of this subsystem under a communications application load.

The benchmark is defined for the IMS network as a whole, as well as for several subsystems of an IMS network. The benchmark is designed so that nodes composing a subsystem can also be benchmarked alone.

The initial benchmark test data defined in the present document include:

- traffic set;
- traffic-time profile;
- benchmark test procedure.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Q.3932.3	2015-06-13	11	11.1002/1000/12496

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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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IMS/NGN performance benchmark – Part 3: Traffic sets and traffic profiles

1 Scope

This Recommendation provides the third part of a multi-part deliverable covering the IMS/NGN Performance Benchmark, as identified below:

Part 1: Core concepts;

Part 2: Subsystem configurations and benchmarks;

Part 3: Traffic sets and traffic profiles;

Part 4: Reference load network quality parameters.

The metrics measured and reported are for the performance of this subsystem under a communications application load.

The benchmark is defined for the IMS network as a whole, as well as for several subsystems of an IMS network. The benchmark is designed so that nodes composing a subsystem can also be benchmarked alone.

The initial benchmark test data defined in this Recommendation include:

- traffic set;
- traffic-time profile;
- benchmark test procedure.

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 Q.3930] Recommendation ITU-T Q.3930 (2012), *Performance testing of distributed systems – Concepts and terminology*.

[ITU-T Q.3931.2] Recommendation ITU-T Q.3931.2 (2011), *Performance benchmark for the PSTN/ISDN emulation subsystem of an IP multimedia system – Part 2: Subsystem configurations and benchmarks*.

[ITU-T Q.3932.1] Recommendation ITU-T Q.3932.1 (2015), *IMS/NGN performance benchmark – Part 1: Core concept*.

[ITU-T Q.3932.2] Recommendation ITU-T Q.3932.2 (2015), *IMS/NGN performance benchmark – Part 2: Subsystem configurations and benchmarks*.

[ITU-T T.38] Recommendation ITU-T T.38 (2010), *Procedures for real-time Group 3 facsimile communication over IP networks.*

[ITU-T V.152] Recommendation ITU-T V.152 (2010), *Procedures for supporting voice-band data over networks.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the IMS benchmarking definitions as described in [ITU-T Q.3930].

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AKA	Authentication and Key Agreement
BC	Bearer Capability
CC	Completion of Communications
CCBS	Completion of Calls to Busy Subscriber
CCNR	Completion of Calls to No Reply
CFB	Call forwarding busy
CFNR	Call Forwarding Not Reply
CFU	Call Forwarding Unconditional
CPU	Central Processor Unit
DO	Design Objective
DOC	Design Objective Capacity
GW	Gateway
IHS	Inadequately Handled Scenarios
IMS	IP Multimedia Subsystem
ISDN	Integrated Services Digital Network
MEM	Memory usage
PI	Progress Indicator
PSTN	Public Switched Telephone Network
SApS	Scenario Attempts per Second
SIMS	Simultaneous Scenarios
SIP	Session Initiation Protocol
SIPP	Simple Internet Protocol Plus
SUM	Subscription Management
SUT	System Under Test
TLS	Transport Layer Security
TRT	Total Round-trip Time
UDI	Unrestricted Digital Information
UDUB	User Determined User Busy

UE User Equipment

XML extensible Markup Language

5 Conventions

None.

6 Benchmark tests

[ITU-T Q.3932.1] and [ITU-T Q.3932.2] have defined the framework for defining and executing an IMS/NGN performance benchmark. This Recommendation specifies a benchmark test, which may be implemented and performed as-is, or which may serve as an example for future benchmark tests developed by a service provider or system under test (SUT) implementer.

6.1 Benchmark test goals

A benchmark test may be used either for comparison (e.g., comparing the performance of two products), or for prediction (e.g., the configuration specified for a benchmark test is similar enough to a service provider's requirements that the result of the test can be used as an estimate of the performance of their deployed system).

In order to accomplish these goals, a suite of benchmark tests must cover a range of scenarios that are representative of the real world. Given the early nature of the IMS/NGN deployments, the data required to construct these scenarios is still in the process of being collected. For that reason, the benchmark test described here is more useful for prediction than for comparison.

It is expected that the benchmark test specified in this part of the standard will have to be supplemented by additional benchmark tests that follow the framework of the standard, but which are parameterized differently.

Additionally, while the primary metric collected by this benchmark test is the design objective capacity (DOC) of the SUT, as experience is gained both with IMS/NGN deployments and with this benchmark, additional metrics will be defined.

6.2 Initial benchmark traffic set and traffic-time profile

As described in detail in [ITU-T Q.3932.1], a benchmark test measures the behaviour of a SUT for a specified traffic set and traffic-time profile. A traffic set is composed of a mixture of test scenarios, whose relative frequency of occurrence is specified by traffic set parameters; the traffic-time profile is a specification of how the average arrival rate of test scenarios evolves over the execution of the benchmark test.

Tables 1 and 2 represent a generic IMS/NGN traffic set and profile covering the fourteen major use-cases defined in [ITU-T Q.3931.2] and [ITU-T Q.3932.2]. See also Figure 1, which shows an IMS benchmark traffic profile example.

The percentage of system load for each scenario has not been defined, because the load depends on the number of selected use cases.

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
Registration/ De-registration [ITU-T Q.3932.2], clause 7.1:	Use case 1 – scenario 1 Successful initial registration with unprotected REGISTER requests on the session initiation protocol (SIP) default port values as specified in [b-IETF RFC 3261]	UC1_SC1			
	Use case 1 – scenario 2 Successful initial registration with IMS AKA as a security mechanism	UC1_SC2			
	Use case 1 – scenario 3 Successful initial registration with SIP digest without TLS as a security mechanism	UC1_SC3			
	Use case 1 – scenario 4 Successful initial registration with SIP digest with TLS as a security mechanism	UC1_SC4			
	Use case 1 – scenario 5 Successful initial registration with NASS-IMS bundled authentication as a security mechanism	UC1_SC5			
	Use case 1 – scenario 6 Successful initial registration with GPRS-IMS bundled authentication as a security mechanism	UC1_SC6			
	Use case 1 – scenario 7 Re-registration – user currently registered	UC1_SC7			

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Use case 1 – scenario 8 re-registration – user currently registered	UC1_SC8			
	Use case 1 – scenario 9 re-registration – user roaming	UC1_SC9			
	Use case 1 – scenario 10 UE initiated de-registration	UC1_SC10			
MMTel fixed access to MMTel fixed access [ITU-T Q.3932.2], clause 8.1:	Successful call – this scenario represents the case when the call establishment is performed correctly. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC2_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Successful call – this scenario represents the case when the call establishment is performed correctly. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the called user	UC2_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call with fax with 33.6 kbit/s (super G3 fax) This scenario represents the case when in the active call state the fax transfer on the media is performed correctly and the echo cancellers in the gateway (GW) are not activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly	UC2_SC3		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call with fax with 14.4 kbit/s This scenario represents the case when in the active call state the fax transfer on the media is performed correctly and the echo cancellers in the GW are activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly	UC2_SC4		Poisson, mean selected by traffic-time profile	
	Basic call – fax with 14.4 kbit/s using ITU-T V.152. This scenario represents the case when in the active call state the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC2_SC5		Poisson, mean selected by traffic-time profile	
	Basic call – fax with 14.4 kbit/s using the ITU-T T.38 in an audio m-line codec This scenario represents the case when in the active call state the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the called user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC2_SC6		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Called user is user busy. This scenario represents the case, when the called user is user determined user busy (UDUB). The network initiates call clearing to the calling user	UC2_SC7		Poisson, mean selected by traffic-time profile	
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC2_SC8		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC2_SC9		Poisson, mean selected by traffic-time profile	
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC2_SC10		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC2_SC11		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC2_SC12		Poisson, mean selected by traffic-time profile	
IMS/PES – IMS/PES [ITU-T Q.3932.2], clause 8.2	ISDN – ISDN scenario 1.1 Basic call with BC = speech – enblock sending This use case represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the calling user	UC3_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	ISDN – ISDN scenario 1.2 Basic call with BC = speech – enblock sending This scenario represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the called user	UC3_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	ISDN – ISDN scenario 1.3 Basic call – overlap sending with BC = speech This scenario represents the case when the call establishment using overlap sending is performed correctly. The call is released from the calling user	UC3_SC3		Poisson, mean selected by traffic-time profile	
	ISDN – ISDN scenario 1.4 Basic call with BC = 3.1 kHz audio – fax with 33.6 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the calling user	UC3_SC4		Poisson, mean selected by traffic-time profile	
	ISDN – ISDN scenario 1.5 Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the calling user	UC3_SC5		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	ISDN – ISDN scenario 1.6 Basic call with BC = 3.1 kHz with PI#3 This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC3_SC6		Poisson, mean selected by traffic-time profile	
	ISDN – ISDN scenario 1.7 Basic call with BC = 3.1 kHz with PI#3 This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the called user	UC3_SC7		Poisson, mean selected by traffic-time profile	
	ISDN – ISDN scenario 1.8 Basic call with BC = 3.1 kHz – modem ITU-T V.32 bis (4.8 kbit/s, 9.6 kbit/s 14.4 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC3_SC8		Poisson, mean selected by traffic-time profile	
	ISDN – ISDN scenario 1.9 Basic call with BC = 3.1 kHz – modem ITU-T V.34 (up to 33.6 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC3_SC9		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	ISDN – ISDN scenario 1.10 Basic call with BC = UDI – enblock sending This scenario represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the calling user	UC3_SC10		Poisson, mean selected by traffic-time profile	
	ISDN – ISDN scenario 1.11 Basic call with BC = UDI – enblock sending This scenario represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the called user	UC3_SC11		Poisson, mean selected by traffic-time profile	
	ISDN – ISDN scenario 1.12 Called user is UDUB This scenario represents the case when the called user is UDUB. The network initiates call clearing to the calling user with cause value # 17	UC3_SC12		Poisson, mean selected by traffic-time profile	
	ISDN – ISDN scenario 1.13 No answer from the called user This scenario represents the case when there is no answer from the called user ("no user responding"), the network initiates call clearing to the calling user with the cause value # 18	UC3_SC13		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	ISDN – PSTN scenario 2.1 Basic call with BC = speech – enblock sending This scenario represents the case when the call establishment using enbloc sending is performed correctly. The call is released from the calling user	UC3_SC14		Poisson, mean selected by traffic-time profile	
	ISDN – PSTN scenario 2.2 Basic call with BC = speech – enblock sending This scenario represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the called user	UC3_SC15		Poisson, mean selected by traffic-time profile	
	ISDN – PSTN scenario 2.3 Basic call - overlap sending with BC = speech This scenario represents the case when the call is established using overlap sending. The call is released from the calling user	UC3_SC16		Poisson, mean selected by traffic-time profile	
	ISDN – PSTN scenario 2.4 Basic call with BC = 3.1 kHz audio – fax with 33.6 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the called user	UC3_SC17		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	ISDN – PSTN scenario 2.5 Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the called user	UC3_SC18		Poisson, mean selected by traffic-time profile	
	ISDN – PSTN scenario 2.6 Basic call with BC = 3.1 kHz – modem ITU-T V.32 bis (4.8 kbit/s, 9.6 kbit/s 14.4 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC3_SC19		Poisson, mean selected by traffic-time profile	
	ISDN – PSTN scenario 2.7 Basic call with BC = 3.1 kHz – modem ITU-T V.34 (up to 33,6 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC3_SC20		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	ISDN – PSTN scenario 2.8 Called user is UDUB This scenario represents the case, when the called user is UDUB. the network initiates call clearing to the calling user with cause value # 17	UC3_SC21		Poisson, mean selected by traffic-time profile	
	ISDN – PSTN scenario 2.9 No answer from the called user This scenario represents the case when there is no answer from the called user ("no user responding"), the network initiates call clearing to the calling user with the cause value # 18	UC3_SC21		Poisson, mean selected by traffic-time profile	
	PSTN – ISDN scenario 3.1 Basic call. The call is released from the calling user This scenario represents the case when the call establishment is performed correctly. The call is released from the calling user	UC3_SC22		Poisson, mean selected by traffic-time profile	
	PSTN – ISDN scenario 3.2 Basic call. The call is released from the called user This scenario represents the case when the call establishment is performed correctly. The call is released from the called user	UC3_SC24		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	PSTN – ISDN scenario 3.3 Basic call with BC = 3.1 kHz audio – fax with 33.6 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated	UC3_SC25		Poisson, mean selected by traffic-time profile	
	PSTN – ISDN scenario 3.4 Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are deactivated	UC3_SC26		Poisson, mean selected by traffic-time profile	
	PSTN – ISDN scenario 3.5 Basic call with BC = 3.1 kHz audio – modem ITU-T V.90 This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated	UC3_SC27		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	PSTN – ISDN scenario 3.6 Called user is UDUB This scenario represents the case, when the called user is UDUB the network initiates call clearing to the calling user	UC3_SC28		Poisson, mean selected by traffic-time profile	
	PSTN – ISDN scenario 3.7 No answer from the called user This scenario represents the case when there is no answer from the called user ("no user responding"), the network initiates call clearing to the calling user	UC3_SC29		Poisson, mean selected by traffic-time profile	
	PSTN – PSTN scenario 4.1 Basic call. The call is released from the calling user. This scenario represents the case when the call establishment is performed correctly. The call is released from the calling user	UC3_SC30		Poisson, mean selected by traffic-time profile	
	PSTN – PSTN scenario 4.2 Basic call. The call is released from the called user This scenario represents the case when the call establishment is performed correctly. The call is released from the called user	UC3_SC31		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	PSTN – PSTN scenario 4.3 Basic call with fax with 33.6 kbit/s (super G3 fax) This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are deactivated	UC3_SC32		Poisson, mean selected by traffic-time profile	
	PSTN – PSTN scenario 4.4 Basic call with fax with 14.4 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly. The echo cancellers in the GW are activated.	UC3_SC33		Poisson, mean selected by traffic-time profile	
	PSTN – PSTN scenario 4.5 Basic call with BC = 3.1 kHz audio – modem ITU-T V.34 (up to 33.6 kbit/s) This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are deactivated	UC3_SC34		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	PSTN – PSTN scenario 4.6 Basic call with BC = 3.1 kHz audio – modem ITU-T V.32 bis (4.8 kbit/s, 9.6 kbit/s, 14.4 kbit/s) This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are activated	UC3_SC35		Poisson, mean selected by traffic-time profile	
	PSTN – PSTN scenario 4.7 Called user is user busy This scenario represents the case, when the called user is UDUB, the network initiates call clearing to the calling user	UC3_SC36		Poisson, mean selected by traffic-time profile	
	PSTN – PSTN scenario 4.8 No answer from the called user This scenario represents the case when there is no answer from the called user ("no user responding"), the network initiates call clearing to the calling user	UC3_SC37		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
ISDN to MMTel fixed access [ITU-T Q.3932.2], clause 8.3.1	Basic call with BC = ITC_value – enblock sending This scenario represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC4_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call with BC = ITC_value – enblock sending This scenario represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the called user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC4_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call – overlap sending with BC = speech This scenario represents the case when the call establishment uses overlap sending. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC4_SC3		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call with BC = 3.1 kHz audio – fax with 33.6 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC4_SC4		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC4_SC5		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s with ITU-T V.152 This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC4_SC6		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s using the ITU-T T.38 in an audio m-line codec This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC4_SC7		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz – modem ITU-T V.32 bis (4.8 kbit/s, 9.6 kbit/s, 14.4 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC4_SC8		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call with BC = 3.1 kHz – modem ITU-T V.34 (up to 33.6 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC4_SC9		Poisson, mean selected by traffic-time profile	
	Called user is UDUB This scenario represents the case, when the called user is UDUB. The network initiates call clearing to the calling user	UC4_SC10		Poisson, mean selected by traffic-time profile	
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC4_SC11		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC4_SC12		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC4_SC13		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC4_SC14		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request. Ensure that the recall from user A to user B is successful. The call is released from the calling user.	UC4_SC15		Poisson, mean selected by traffic-time profile	
MMTel fixed access to ISDN [ITU-T Q.3932.2], clause 8.3.2	Basic call. The call is released from the calling user This scenario represents the case when the call establishment is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC5_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call. The call is released from the called user This scenario represents the case when the call establishment is performed correctly. The call is released from the called user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC5_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call with BC = 3.1 kHz audio – fax with 33.6 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC5_SC3		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are activated. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC5_SC4		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s with ITU-T V.152 This scenario represents the case when in the active call state (N10) the fax transfer is performed correctly and the echo cancellers in the GW are activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC5_SC5		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz audio – fax with 14.4 kbit/s using the ITU-T T.38 in an audio m-line codec This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC5_SC6		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz – modem ITU-T V.32 bis (4.8 kbit/s, 9.6 kbit/s, 14.4 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC5_SC7		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call with BC = 3.1 kHz – modem ITU-T V.34 (up to 33.6 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC5_SC8		Poisson, mean selected by traffic-time profile	
	Called user is UDUB This scenario represents the case, when the called user is UDUB, the network initiates call clearing to the calling user	UC5_SC9		Poisson, mean selected by traffic-time profile	
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC5_SC10		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC5_SC11		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC5_SC12		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC5_SC13		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request Ensure that the recall from user A to user B is successful The call is released from the calling user	UC5_SC14		Poisson, mean selected by traffic-time profile	
MMTel fixed access to PSTN [ITU-T Q.3932.2], clause 8.3.3	Basic call. The call is released from the called user This scenario represents the case when the call establishment is performed correctly. The call is released from the called user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC6_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call. The call is released from the calling user This scenario represents the case when the call establishment is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC6_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call with fax with 33.6 kbit/s (super G3 fax) This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are deactivated. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC6_SC3		Poisson, mean selected by traffic-time profile	
	Basic call with fax with 14.4 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly. The echo cancellers in the GW are activated. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC6_SC4		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call – fax with 14.4 kbit/s with ITU-T V.152 This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the called user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC6_SC5		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz – modem ITU-T V.32 bis (4.8 kbit/s, 9.6 kbit/s, 14.4 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC6_SC6		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz – modem ITU-T V.34 (up to 33.6 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC6_SC7		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call – fax with 14.4 kbit/s using the ITU-T T.38 in an audio m-line codec This scenario represents the case when in the active call state (N10) the fax transfer is performed correctly and the echo cancellers in the GW are not activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC6_SC8		Poisson, mean selected by traffic-time profile	
	Called user is user busy This scenario represents the case when the called user is UDUB the network initiate call clearing to the calling user	UC6_SC9		Poisson, mean selected by traffic-time profile	
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC6_SC10		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC6_SC11		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC6_SC12		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request Ensure when user B becomes available for CC recall, the CC recall procedure is started. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC6_SC13		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request Ensure when user B becomes available for CC recall, the CC recall procedure is started. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC6_SC14		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
PSTN to MMTel fixed access [ITU-T Q.3932.2], clause 8.3.4	Basic call. This scenario represents the case when the call establishment is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC7_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call. This scenario represents the case when the call establishment is performed correctly. The call is released from the called user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC7_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call – overlap sending This scenario represents the case when the call establishment using overlap sending is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC7_SC3		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call with fax with 33.6 kbit/s (super G3 fax) This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are deactivated. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC7_SC4		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call with fax with 14.4 kbit/s This scenario represents the case when in the active call state (N10) the fax transfer is performed correctly. The echo cancellers in the GW are activated. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC7_SC5		Poisson, mean selected by traffic-time profile	
	Basic call – fax with 14.4 kbit/s with ITU-T V.152 codec This scenario represents the case when in the active call state (N10) the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC7_SC6		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call – fax with 14.4 kbit/s using the ITU-T T.38 in an audio m-line codec This scenario represents the case when in the active call state the fax transfer is performed correctly. The call is released from the calling user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC7_SC7		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz – modem ITU-T V.32 bis (4.8 kbit/s, 9.6 kbit/s 14.4 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC7_SC8		Poisson, mean selected by traffic-time profile	
	Basic call with BC = 3.1 kHz – modem ITU-T V.34 (up to 33.6 kbit/s) This scenario represents the case when in the active call state (N10) the 3.1 kHz transfer is performed correctly. The call is released from the calling user	UC7_SC9		Poisson, mean selected by traffic-time profile	
	Called user is user busy This scenario represents the case when the called user is UDUB, the network initiates call clearing to the calling user	UC7_SC10		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters) The call is released from the calling user	UC7_SC11		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC7_SC12		Poisson, mean selected by traffic-time profile	
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC7_SC13		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request Ensure when user B becomes available for CC recall, the CC recall procedure is started. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC7_SC14		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC7_SC15		Poisson, mean selected by traffic-time profile	
ISDN to VoLTE [ITU-T Q.3932.2], clause 8.4.1	Basic call with BC = ITC_value – enblock sending This scenario represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC8_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call with BC = ITC_value – enblock sending This scenario represents the case when the call establishment using en-bloc sending is performed correctly. The call is released from the called user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC8_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call – overlap sending with BC = speech This scenario represents the case when the call establishment using overlap sending is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC8_SC3		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Called user is UDUB This scenario represents the case when the called user is UDUB. The network initiates call clearing to the calling user.	UC8_SC4		Poisson, mean selected by traffic-time profile	
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC8_SC5		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFB Ensure that when user A calls user B which is UDUB the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC8_SC6		Poisson, mean selected by traffic-time profile	
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC8_SC7		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC8_SC8		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request Ensure that the recall from user A to user B is successful The call is released from the calling user	UC8_SC9		Poisson, mean selected by traffic-time profile	
VolTE to ISDN [ITU-T Q.3932.2], clause 8.4.2	Basic call. The call is released from the calling user This scenario represents the case when the call establishment is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC9_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call. The call is released from the called user This scenario represents the case when the call establishment is performed correctly. The call is released from the called user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC9_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Called user is UDUB This scenario represents the case when the called user is UDUB, the network initiates call clearing to the calling user	UC9_SC3		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC9_SC4		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC9_SC5		Poisson, mean selected by traffic-time profile	
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC9_SC6		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC9_SC7		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC9_SC8		Poisson, mean selected by traffic-time profile	
VoLTE to PSTN [ITU-T Q.3932.2], clause 8.4.3	Basic call. This scenario represents the case when the call establishment is performed correctly. The call is released from the called user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC10_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call. This scenario represents the case when the call establishment is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC10_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Called user is user busy This scenario represents the case when the called user is UDUB, the network initiates call clearing to the calling user	UC10_SC3		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC10_SC4		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC10_SC5		Poisson, mean selected by traffic-time profile	
	CFNR Ensure that when user A calls user B which does not answer the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC10_SC6		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request Ensure when user B becomes available for CC recall, the CC recall procedure is started. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC10_SC7		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC10_SC8		Poisson, mean selected by traffic-time profile	
PSTN to VoLTE [ITU-T Q.3932.2], clause 8.4.4	Basic call. The call is released from the calling user This scenario represents the case when the call establishment is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC11_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call. This scenario represents the case when the call establishment is performed correctly. The call is released from the called user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC11_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call – overlap sending This scenario represents the case when the call establishment using overlap sending is performed correctly. The call is released from the calling user. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters)	UC11_SC3		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Called user is user busy This scenario represents the case when the called user is UDUB the network initiates call clearing to the calling user	UC11_SC4		Poisson, mean selected by traffic-time profile	
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters) The call is released from the calling user	UC11_SC5		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFB Ensure that when user A calls user B which is UDUB the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC11_SC6		Poisson, mean selected by traffic-time profile	
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC11_SC7		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC11_SC8		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request. Ensure that the recall from user A to user B is successful. The call is released from the calling user	UC11_SC9		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
VoLTE to VoLTE [ITU-T Q.3932.2], clause 8.5	Successful call – this scenario represents the case when the call establishment is performed correctly. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC12_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Successful call – this scenario represents the case when the call establishment is performed correctly. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the called user	UC12_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call – fax with 14.4 kbit/s using the ITU-T T.38 in an audio m-line codec This scenario represents the case when in the active call state the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the called user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC12_SC3		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Called user is user busy This scenario represents the case when the called user is UDUB the network initiate call clearing to the calling user	UC12_SC4		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFU Ensure that when user A calls user B the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC12_SC5		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC12_SC6		Poisson, mean selected by traffic-time profile	
	CFNR Ensure that when user A calls user B which does not answer the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC12_SC7		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request Ensure that the recall from user A to user B is successful The call is released from the calling user	UC12_SC8		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request Ensure that the recall from user A to user B is successful The call is released from the calling user	UC12_SC9		Poisson, mean selected by traffic-time profile	
VoLTE to MMTel fixed access [ITU-T Q.3932.2], clause 8.6.1	Successful call – this scenario represents the case when the call establishment is performed correctly. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC13_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Successful call – this scenario represents the case when the call establishment is performed correctly. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the called user	UC13_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Basic call – fax with 14.4 kbit/s using the ITU-T T.38 in an audio m-line codec This scenario represents the case when in the active call state the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the called user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC13_SC3		Poisson, mean selected by traffic-time profile	
	Called user is user busy This scenario represents the case when the called user is UDUB the network initiates call clearing to the calling user	UC13_SC4		Poisson, mean selected by traffic-time profile	
	CFU Ensure that when user A calls user B the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC13_SC5		Poisson, mean selected by traffic-time profile	
	CFB Ensure that when user A calls user B which is UDUB, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC13_SC6		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFNR Ensure that when user A calls user B which does not answer, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC13_SC7		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request. Ensure that the recall from user A to user B is successful The call is released from the calling user	UC13_SC8		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request. Ensure that the recall from user A to user B is successful The call is released from the calling user	UC13_SC9		Poisson, mean selected by traffic–time profile	
MMTel fixed access to VoLTE [ITU-T Q.3932.2], clause 8.6.2	Successful call – this scenario represents the case when the call establishment is performed correctly. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC14_SC1		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	Successful call – this scenario represents the case when the call establishment is performed correctly. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the called user	UC14_SC2		Poisson, mean selected by traffic-time profile	Exponential, mean 120 s
	Basic call – fax with 14.4 kbit/s using the ITU-T T.38 in an audio m-line codec This scenario represents the case when in the active call state the fax transfer on the media and B-channels is performed correctly and the echo cancellers in the GW are not activated. The call is released from the called user. Ensure that in the active call state the data transfer is performed correctly (e.g., testing QoS parameters)	UC14_SC3		Poisson, mean selected by traffic-time profile	
	Called user is user busy This scenario represents the case when the called user is UDUB, the network initiates call clearing to the calling user	UC14_SC4		Poisson, mean selected by traffic-time profile	
	CFU Ensure that when user A calls user B, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC14_SC5		Poisson, mean selected by traffic-time profile	

Table 1 – Initial benchmark traffic set

Use case section	Test scenario	Scenario ID	Scenario % of system load	Scenario arrival distribution	Scenario duration distribution (calls), message size (text messaging)
	CFB Ensure that when user A calls user B which is UDUB, the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters) The call is released from the calling user	UC14_SC6		Poisson, mean selected by traffic-time profile	
	CFNR Ensure that when user A calls user B which does not answer the call is forwarded to user C. Ensure that in the active call state the voice transfer is performed correctly (e.g., testing QoS parameters). The call is released from the calling user	UC14_SC7		Poisson, mean selected by traffic-time profile	
	CCBS User A is located in network A and user B is located in network B. User A has successfully invoked a CCBS request. Ensure that the recall from user A to user B is successful The call is released from the calling user	UC14_SC8		Poisson, mean selected by traffic-time profile	
	CCNR User A is located in network A and user B is located in network B. User A has successfully invoked a CCNR request. Ensure that the recall from user A to user B is successful The call is released from the calling user	UC14_SC9		Poisson, mean selected by traffic-time profile	

Table 2 – Initial benchmark traffic-time profile

Traffic-time profile parameter	Traffic-time profile value	Notes
PX_SimultaneousScenarios (SIMS)	2	Maximum per UE
PX_TotalProvisionedSubscribers	100 000 Subs	Data in [ITU-T Q.3932.2]
PX_PercentRegisteredSubscribers	40%	At test start. The percent of registered subscribers will fluctuate during the test
PX_PercentRoamingSubscribers	None	No roaming
PX_StepNumber	3 steps	DOC underload, DOC, and DOC overload
PX_StepTransientTime	120 seconds	Maximum
PX_StepTime	30 minutes	Minimum
PX_BackgroundLoad	None	
PX_SApSIncreaseAmount	10 SApS	Maximum Report three results, step before, DOC and step after
PX_SystemLoad	DOC	Reported result in scenario attempts per second (SApS)
PX_IHS% inadequately handled scenario attempts (IHSA) maximum	0.1%	Average over a test step

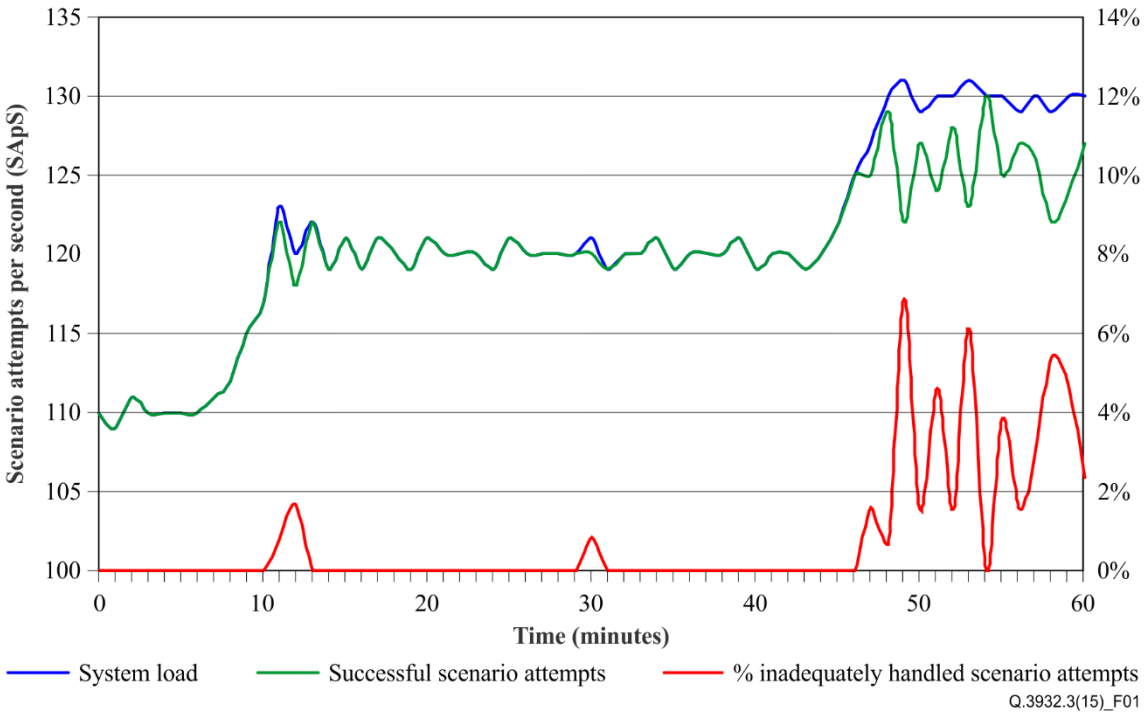

Figure 1 – Example of an IMS benchmark traffic profile

7 Initial benchmark test implementation

This Recommendation does not dictate the specific implementation of a test scenario. The test scenarios can be defined as protocol diagrams. These scenarios are implemented by either a commercial test system provider or as part of a benchmark test run. Example implementations include using the ETSI TTCN3 notation, using an XML notation (e.g., based on the open source SIP), or specifically coding the test in a general programming language. For comparison (and ultimately certification) purposes, a specification of the test system used to implement the traffic-time profile and documentation of the test scenario implementation in the test system with sufficient detail to be independently replicated shall be included as part of the report.

7.1 SUT configuration

The initial benchmark supports a session control subsystem (SUT) configuration as defined in clause 6 of [ITU-T Q.3932.2].

7.2 Preamble

The preamble defines the steps necessary to configure the SUT for a benchmark run. The following steps must be completed before the initial benchmark test run:

1) the SUT must be started from a cold boot;

2) "total provisioned subscribers" must be provisioned in the database;

3) the initial "percent registered subscribers" must be set up.

7.3 Test Execution

The initial benchmark test must contain *StepNumber* stair steps in the profile.

The test execution is valid if the profile has steps in the DOC underload range and at least one step in the DOC overload range.

7.4 Graphs

The following graphs shall be plotted in the benchmark report:

Scenario success rate:

X-Axis: time (s).

Y-Axis 1: SApS for the traffic set.

Y-Axis 2: Percentage of IHSA.

Scenario average transaction response time{for each identified scenario in the traffic set}:

X-Axis: time (s).

Y-Axis 1: SApS for the individual scenario.

Y-Axis 2: For each total round-trip time (TRT) design objective (DO) in the identified scenario, SUM of the TRT for a second divided by the SApS for the second.

Scenario Retransmissions {for each identified scenario in the traffic set that has retransmissions}:

X-Axis: time (s).

Y-Axis 1: SApS.

Y-Axis 2: Number of retransmissions in a second for that scenario.

CPU {on each of SUT node}:

X-Axis: time (s).

Y-Axis 1: SApS.

Y-Axis 2: CPU.

MEM {on each of SUT node}:

X-Axis: time (s).

Y-Axis 1: SApS.

Y-Axis 2: MEM.

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