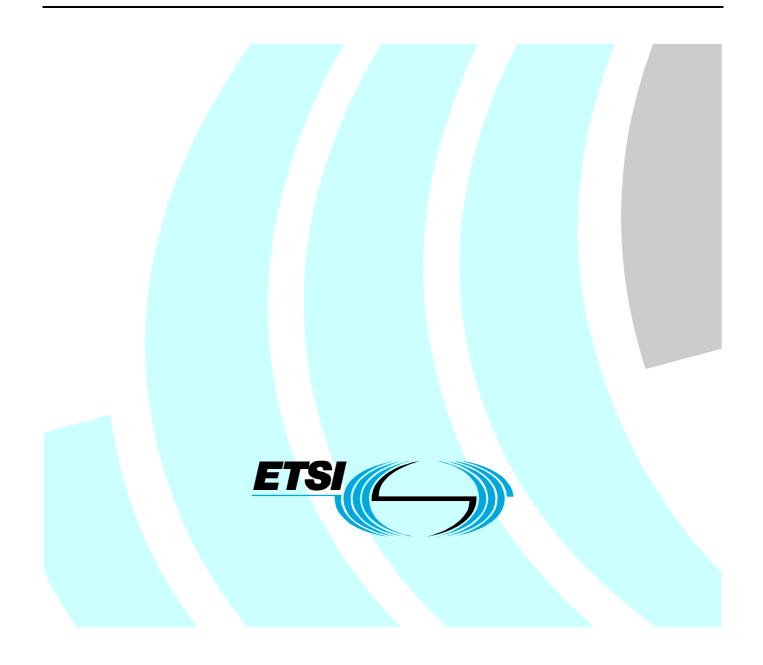# ETSI TS 102 250-5 V2.2.1 (2011-04)

Technical Specification

Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in mobile networks; Part 5: Definition of typical measurement profiles

ETSI

Reference

RTS/STQ-00177m

Keywords

3G, GSM, network, QoS, service, speech

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or
perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF).
In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive
within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.
Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Copyright Notification

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Speech and multimedia Transmission Quality (STQ).

The present document is part 5 of a multi-part deliverable covering the QoS aspects for popular services in mobile networks, as identified below:

> Part 1: "Assessment of Quality of Service";
>
> Part 2: "Definition of Quality of Service parameters and their computation";
>
> Part 3: "Typical procedures for Quality of Service measurement equipment";
>
> Part 4: "Requirements for Quality of Service measurement equipment";
>
> **Part 5: "Definition of typical measurement profiles"**;
>
> Part 6: "Post processing and statistical methods";
>
> Part 7: "Network based Quality of Service measurements".

Part 1 builds an umbrella document for this multi-part deliverable. It summarizes the basics of Quality of Service, always seen from the user's perspective. Differences to Quality of Experience (QoE) are also discussed. In extension to generic definitions, specific definitions for this multi-part deliverable are stated here. Furthermore, it gives guidance to assure that QoS assessments can be conducted in a meaningful way and proposes an according process.

Part 2 defines QoS parameters and their computation for popular services in mobile networks. The parameter definition is split into several parts. It contains an abstract definition which gives a generic description of the parameter, an abstract equation and the corresponding user and technical trigger points.
The harmonized definitions given in part 2 are considered as prerequisites for the comparison of QoS measurements and measurement results.

Part 3 describes the measurement procedures needed to perform the measurements of QoS parameters in line with the definitions given in part 2, applying the test profiles defined in part 5.

Part 4 defines the minimum requirements of QoS measurement equipment for mobile networks in the way that the values and trigger points needed to compute the QoS parameter as defined in part 2 can be measured following the procedures defined in part 3. Test equipment fulfilling the specified minimum requirements will allow performing the proposed measurements in a reliable and reproducible way.

The present document specifies typical measurement profiles which are required to enable benchmarking of different mobile networks both within and outside national boundaries.

Part 6 describes procedures to be used for statistical calculations in the field of QoS measurement of mobile networks using probing systems.

Part 7 describes how Quality of Service measurements should be done inside the network without direct access to the end point terminal.

Introduction

All the defined quality of service parameters and their computations are based on field measurements. That indicates that the measurements were made from customers point of view (full end-to-end perspective, taking into account the needs of testing).

It is assumed that the end customer can handle his mobile and the services he wants to use (operability is not evaluated at this time). For the purpose of measurement it is assumed:

- that the service is available and not barred for any reason;

- routing is defined correctly without errors; and

- the target subscriber equipment is ready to answer the call.

Further preconditions may apply when reasonable.

The present document describes a set of typical measurement profiles which are precisely defined to allow for comparability between different measurements, possibly performed by different parties.

It is necessary to have these profiles so that when a specific set of measurements are carried out then users are comparing "like for like" performance.

1   Scope

The present document specifies test profiles which are required to enable benchmarking of different mobile networks both within and outside national boundaries. It is necessary to have these profiles so that when a specific set of tests is carried out then customers are comparing "like for like" performance.

All timeouts (as part of the profiles) given in the present document are examples from proven experience. It should be noted that most timeouts given in the present document do with respect to failure ratios as defined in [1] have a direct impact on measurement results. A timeout value might for example directly relate to the stop trigger point in the sense of the timeout reached event being the point in time where a certain state has not been reached.

2   References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

> NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1   Normative references

The following referenced documents are necessary for the application of the present document.

> [1]   ETSI TS 102 250-2: "Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in GSM and 3G networks; Part 2: Definition of Quality of Service parameters and their computation".

> [2]   ETSI TS 124 008: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (3GPP TS 24.008 version 9.6.0 Release 9)".

> [3]   IETF RFC 3481: "TCP over Second (2.5G) and Third (3G) Generation Wireless Networks".

> [4]   ETSI EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

2.2   Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

Not applicable.

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following terms and definitions apply:

1 kByte: 1 024 Byte

1 MByte: 1 024 kByte

Session: continuous usage of a given service, e.g. a speech call or a data session

3.2   Abbreviations

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

AMR	Adaptive Multi-Rate
BCP	Best Current Practice
DL	Down Link
DNS	Domain Name Server
FQDN	Fully Qualified Domain Name
FTP	File Transfer Protocol
GPRS	General Packet Radio Service
GR	GPRS Register
GSM	Global System for Mobile communications
HLR	Home Location Register
HTML	Hypertext Markup Language
HTTP	Hyper Text Transfer Protocol
ICMP	Internet Control Message Protocol
IE	Information Element
IMAP	Internet Messaging Access Protocol
IP	Internet Protocol
MD5	Message-Digest algorithm 5
MMS	Multimedia Messaging Service
MO	Mobile Originated
MOC	Mobile Originated Call
MT	Mobile Termination
PDP	Pack Data Protocol
PEP	Performance Enhancement Proxy
POP3	Post Office Protocol version 3
PSD	Packet Switched Data
QoE	Quality of Experience
QoS	Quality of Service
SDS	Short Data Service
SGSN	Serving GPRS Support Node
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TETRA	TErrestrial Trunked RAdio
UDP	User Datagram Protocol
UE	User Equipment
UL	Up Link
UMTS	Universal Mobile Telecommunication System
VT	Video Telephony
WAP	Wireless Application Protocol
XML	Extensible Markup Language

4   Measurement profiles

Measurement profiles are required to enable benchmarking of different networks both within and outside national boundaries. It is necessary to have these profiles so that when a specific set of tests is carried out then customers are comparing "like for like" performance.

It is recognized that many factors will affect comparability:

- number of sessions;

- sessions duration;

- time between sessions;

- demanded QoS settings for data services;

- protocol settings (like TCP/IP settings for data services or AMR-settings for speech services);

- usage profile during the session;

- fixed network test equipment like test servers for data sessions;

- user profile stored in the HLR or the GR;

- geographic location;

- type of location (indoor, hotspot, city, suburban, rural, train, etc.);

- speed when mobile;

- type of vehicle;

- type of antenna;

- handset type;

- handset hardware and firmware version;

- service being tested and limitations of service;

- network configuration;

- mobile users' population density.

For the points mentioned above where there is no recommendation or requirement in the present document, the settings experienced by a regular user of the service under test in the network under test shall be used as a guideline.

As far as possible all particular values, e.g. timeout values, are named preserving the name of the respective Quality of Service parameters as defined in TS 102 250-2 [1].

4.1   Classification of measurement environments

For interpretation and comparability of test results it is important to know in which measurement environment the tests were performed. The environment classifications described below shall be used. Since the type of the measurement locations may be interpreted differently, the particular understanding of the location type determining a category shall be described in the results report.

Table 1: Stationary Tests

Category	Location Type	Additional information
S1O:	airports/railway stations/shopping centres and malls business districts and exhibition areas	outdoor measurement
S1I:	airports/railway stations/shopping centres and malls business districts and exhibition areas	indoor measurements

Table 2: Drive Tests/Walk Tests

Category	Location Type	Additional information
D1:	Train Measurements	
D2:	Urban Areas (medium cities)	
D3:	Highways	
D4:	Rural Areas (country roads)	
D5:	Large cities	
W1:	Walk Tests (indoor measurements)	
W2:	Walk Tests (outdoor measurements)	
NOTE:	Drive tests may be performed by in car using external antenna with an appropriate attenuation.	

4.2 Service profiles

This clause describes recommended service profiles used for testing.

4.2.1 Telephony

The service profiles defined for telephony might be applicable for different scenarios, e.g. mobile-to-mobile or mobile-to-fixed, and the respective results should not be compared directly, if so.

To achieve comparable statistics when performing a benchmark, there should be no fixed pause between calls. Instead, a fixed call window is defined in which the call has to be performed. If the call fails or drops, the next call attempt shall only be made when the next call window arrives.

A minimum pause interval between two call attempts should be applied to prevent network related problems between connection release and the next establishment (e.g. signalling in the PSD or mobility management).

4.2.1.1 Speech Telephony

The following call durations shall be used:

- CD1:   10 seconds   for call setup testing;

- CD2:   120 seconds   for typical tests, default call duration;

- CD3:   300 seconds   for stability tests;

- CD4:   The call duration for e.g. TETRA is for further study.

Call Window: Call duration + 30 seconds, (for the setup and release phases) + 30 seconds (for the minimum pause interval), for the default call duration this results in 180 seconds.

Timeout values:

- Telephony {Service Non-Accessibility | Setup Time} Timeout: 20 seconds.

4.2.1.2 Video Telephony

Video Telephony should be tested in mobile-to-mobile scenarios. The following call durations shall be used:

- CD1: 10 seconds for call setup testing;

- CD2: 120 seconds for typical tests, default call duration;

- CD3: 300 seconds for stability tests.

Call Window: Call duration + 30 seconds (for the setup and release phases) + 30 seconds (for minimum pause interval), for the default call duration this results in 180 seconds.

Timeout values:

- VT Service {Non-Accessibility | Access Time} Timeout: 20 seconds;

- VT Audio/Video Setup {Failure Ratio | Time} Timeout: 30 seconds.

4.2.1.3 Group Call

Group Calls should be tested in mobile-to-mobile(s) scenarios. The following call durations shall be used:

- CD1: 20 seconds for typical tests, default call duration;

- CD2: 60 seconds for stability tests.

Call Window: Call duration + 30 seconds (for the setup and release phases), + 30 seconds (for minimum pause interval), for the default call duration this results in 80 seconds.

Timeout values:

- Group Call Service Non-Accessibility Timeout: 5 seconds;

4.2.2 Messaging Services

For all messaging services it is important that the recipient of a message is not interrupted by the next message while retrieving the previous one. For this reason it is important that the interval between sending two messages is larger than the 95 % percentile of the end-to-end duration, unless measures are taken to avoid this kind of interference.

It should be noted, that mobility of either the sender of a message or the receiver of a message or both of a message can have an impact on the results. Therefore it is recommended that measurements are not only performed stationary, but also with mobility of one or both participants. In all cases the used scenario has to be stated.

4.2.2.1 {SMS | SDS}

{SMS | SDS} should be tested in mobile-to-mobile scenarios and without concatenation. Thus the user data should be chosen in a way that it will fit into a single message.

The interval between two consecutive SMS shall be 70 seconds.

The transmission window of measurements shall be 175 seconds.

Timeout-values:

- {SMS | SDS} Service Non-Accessibility Timeout: 65 seconds;

- {SMS | SDS} Completion Failure Ratio Timeout: 175 seconds;

- {SMS | SDS} Receive Confirmation Failure Ratio Timeout: for further study;

- {SMS | SDS} Consumed Confirmation Failure Ratio Timeout: for further study.

4.2.2.2 Concatenated {SMS | SDS}

For further study.

4.2.2.3 MMS

MMS should be tested end-to-end. That means a MMS send by A-Party should be received by B-Party using also a mobile phone. The advantage of this testing is, that the MO direction at A-Party and the MT direction at B-Party can be measured. Both directions together are the end-to-end parameters described in TS 102 250-2 [1].

The following MMS sizes shall be used:

- MMS1: 2 kByte;

- MMS2: 28 kByte;

- MMS3: 90 kByte.

If the MMS is not delivered at the destination after the MMS end-to-end Failure Ratio Timeout, the MMS delivery is considered failed. MMS delivered after this time is not taken into account for end-to-end delay, but into end-to-end failure ratio.

Timeouts for MMS over GPRS:

The timeouts for MMS Send, Retrieval and end-to-end Failure are dependent on the MMS size. For GPRS all MMS uploads with less than 5 kbits and all MMS downloads with less than 10 kbits are considered to be cut-off.

MMS Send Failure Ratio (MO) Timeout: $(195 + \text{Size[kByte]} \times 8 \times 2/10)$ [seconds].

MMS Retrieval Failure Ratio (MT) Timeout: $(195 + \text{Size[kByte]} \times 8 \times 1/10)$ [seconds].

The fixed part of 195 seconds incorporate the time for PDP context activation and WAP activation and shall be used as a whole, i.e. the single timeouts for PDP context and WAP activation shall not be considered.

MMS end-to-end Delivery Failure Ratio Timeout: $(590 + \text{Size[kByte]} \times 8 \times 2/10 + \text{Size[kByte]} \times 8 \times 1/10)$ [seconds].

The fixed part of 590 seconds incorporate the time for PDP context activations, WAP activations and notification and a security margin. It shall be regarded as a whole, i.e. the single timeouts shall not be considered.

MMS Notification Failure Ratio Timeout: 120 seconds.

Timeouts for MMS over UMTS:

- The timeouts for MMS Send, Retrieval and End-to-end Failure are dependent on the MMS size.

- The respective required minimum upload and download data rate is for further study.

- MMS Send Failure Ratio (MO) Timeout: for further study.

- MMS Retrieval Failure Ratio (MT) Timeout: for further study.

- MMS end-to-end Delivery Failure Ratio Timeout: for further study.

- MMS Notification Failure Ratio Timeout: 120 seconds.

4.2.3 Data services

4.2.3.1 Circuit switched

Circuit switched data services shall be tested for 100% MOC. Call duration shall be either 300 seconds or is defined by the usage profile used during the data session. The pause interval between call attempts shall be 30 seconds. The usage profile used during the data session is defined in clause 4.3.

4.2.3.2 Packet switched

Packet switched data services shall be tested for 100% MOC sessions. Session duration shall be either 300 seconds or is defined by the usage profile used during the data session. The pause interval between session setup attempts shall be 30 seconds. The usage profile used during the data session is defined in clause 4.3.

NOTE: In order to ensure comparable results in benchmark testing (on changing access technologies) the number of measurements per time on the compared channels should be equal (by using test windows or regular intermediate results) or the individual measurements should be appropriately weighted in the aggregation.

4.2.3.2.1 Service-independent timeout values

- Attach Timeout: 75 seconds.

It might occur that the user equipment sends more than one attach request towards the SGSN, since retries are necessary. A maximum of four retries are possible (timer T3310 expires after 15 seconds for each attempt, see TS 124 008 [2].

- PDP Context Activation Timeout for GSM and 3G networks: 150 seconds.

It might occur that the user equipment sends more than one PDP context activation request towards the SGSN, since retries are necessary. A maximum of four retries are possible (timer T3380 expires after 30 seconds for each attempt, see TS 124 008 [2]).

- PDP Context Activation Timeout for TETRA networks: 120 seconds.

The timer PDP_WAIT_TIMER expires after 30 seconds for each attempt, see EN 300 392-2 [4]. Note that the number of retries "RETRY_ACTIVATION = 3" is fixed in the TETRA standard. Therefore the timeout interval for the PDP context activation procedure is 120 seconds, i.e. if the PDP context activation procedure was not completed after 120 seconds it is considered as failure.

4.2.3.2.2 Service-dependent timeout values

Timeout values for an FTP (ULandDL) service are:

- Service Accessibility Timeout: 150 seconds + IP-Service Access Timeout.
- Setup Time Timeout: 150 seconds + IP-Service Access Timeout.
- IP-Service Access Timeout: 30 seconds.
- Data Transfer Cut-off Timeout:
  - Over GPRS:
    - UL: File size[kByte] $\times$ 8 $\times$ 2/19;
    - DL: File size[kByte] $\times$ 8 $\times$ 1/10.
  - Over UMTS:
    - ULandDL: File size[kByte] $\times$ 8 $\times$ 1/50.
  - Dual mode: The average between the timeout over GPRS and UMTS shall be considered.

Timeout values for an HTTP service are:

- Service Accessibility Timeout: 150 seconds + IP-Service Access Timeout.
- Setup Time Timeout: 150 seconds + IP-Service Access Timeout.
- IP-Service Access Timeout: 30 seconds.
- Data Transfer Cut-off Timeout:

- Over GPRS:

  - UL: File size[kByte] $\times$ 8 $\times$ 2/10;

  - DL: File size[kByte] $\times$ 8 $\times$ 1/10.

- Over UMTS:

  - ULandDL: File size[kByte] $\times$ 8 $\times$ 1/50.

- Dual mode: The average between the timeout over GPRS and UMTS shall be considered.

Timeout values for an E-Mail (IMAP, POP3 and SMTP) service are:

- Service Accessibility Timeout: 150 seconds + IP-Service Access Timeout.

- Setup Time Timeout: 150 seconds + IP-Service Access Timeout.

- IP-Service Access Timeout: 60 seconds.

- Data Transfer Cut-off Timeout:

  - Over GPRS:

    - UL: File size[kByte] $\times$ 8 $\times$ 2/10;

    - DL: File size[kByte] $\times$ 8 $\times$ 1/10.

  - Over UMTS:

    - ULandDL: File size[kByte] $\times$ 8 $\times$ 1/50.

  - Dual mode: The average between the timeout over GPRS and UMTS shall be considered.

Timeout values for a streaming service are:

- Streaming Service Access Timeout: 30 seconds.

- Stream Reproduction Start Timeout (initial buffering):   60 seconds.

- Rebuffering Timeout (Single):   30 seconds.

- Rebuffering Timeout (Total):   75 % of session time.

NOTE 1: It might occur that a streaming client goes from rebuffering back to playback within the Rebuffering Timeout (Single), but goes back to one or more rebuffering periods afterwards. The Rebuffering Timeout (Total) defines a limit in terms of a maximum of allocated time for all rebuffering periods.

- Max Allowed Rebuffering Frequency: 20 rebuf/min.

NOTE 2: The streaming client might go into recurrent rebufferings. If the number of rebuffering occurrences within a minute exceeds this limit the session is aborted.

- Teardown Timeout: 30 seconds.

4.3   Usage Profiles for Data Sessions

For data session measurements, the client application, e.g. web browser, FTP client or mail client, as well as the server application, e.g. web server, FTP server or mail server, should behave similar to the majority of client applications used by the customer and server application used by the data service providers.

Also, the operating system on both sides, namely the client- and the server side, should be chosen with respect to the operating system commonly used by the customer and the data service provider, respectively.

In case a network operating company whose network is to be measured provides the customer with some client application, it should be ensured that any change introduced by such application to the client operating system should have been applied prior to the measurement, as well. This is especially true for changes which would have an impact on the measurement results, for example changes to the operating system's TCP stack. Such client applications are for example provided in order to allow the customer a single point of access to network related configurations and to data service clients, e.g. web browser, mail client, etc. Furthermore, such client application might optimize operating system parameters, including tuning of e.g. TCP settings, with respect to the connection type and technology to be used.

NOTE 1:   In some cases it is desirable not to install such client application itself since this might have some unwanted impact on the measurement. For example, if such application would generate unwanted network traffic in order to check for updates or if the application would continuously try to connect to the mobile device preventing some measurement application form controlling the device.

NOTE 2:   The use of different operating systems as well as the use of operating systems with different TCP parameter settings in general might have a large impact on the results obtained. With respect to the operating systems, this is due to the different implementations of the TCP/IP stack. This needs to be considered in case of benchmarking exercises where the client and/or server operating systems and/or the changes applied on the client sides of the compared networks are not the same. In any case, the settings of the TCP stack of both, the client and the server operating system should be recorded in order to allow for better interpretation and in-depth evaluation of the measurement data.

NOTE 3:   Proxy servers installed in the networks IP core network may act as the TCP peer instead of the application server the tests are performed against. In benchmarking scenarios, the existence of different Proxy servers might have an additional impact on the results, which should be considered when comparing them.

NOTE 4:   A reference for optimized TCP parameters over cellular networks, like second (2.5G) and third (3G) generation wireless networks, is the RFC 3481 [3] which is of the Best Current Practice (BCP) category in the IETF published in February of 2003.

NOTE 5:   Some of the client applications referred to above might also change the way a data service is accessed from the client side, for example by introducing some client to the customer's operating system which changes the transport protocol between the customers operating system and some proxy server. In such case, the trigger points as defined in TS 102 250-2 [1] might not be measurable anymore and should therefore be mapped to the application layer. Especially in case of benchmarking exercises where different operating systems are used on the client side, such mapping might have an additional influence on the measurements. The definition of such trigger point mappings for the different operations systems is not in the scope of the present document.

For all tests a dedicated test server should be used as a well defined reference. Under no circumstances should a commercial server be used, since the content on such a server may change over time. This makes later reproduction of the results impossible.

In order to avoid issues with DNS host name resolution like including effects of DNS caching strategies of the used operating system into the measurement,, the test server should either be identified by an IP address and not by its FQDN or it shall be ensured that the local Resolver will contact a remote DNS name server in case a host name resolution is requested by an application. Furthermore, the DNS name server should be able to perform the resolution within its local zone, in case DNS lookup time is to be included into any quality of service parameter to get calculated. The later is needed in order to exclude effects of DNS caching strategies of the DNS name server(s) involved into the measurement.

The measurement of data services should take place against a reference server only used for testing purposes. The reference server should be connected to the public internet with a link capable of carrying the accumulated traffic of all mobiles testing against that server (e.g. if a benchmark with 4 networks is performed, the server should be able to deliver at least 4 times the maximum nominal speed of a single wireless link). There should be no bias concerning the IP connectivity to this server from a specific operator (e.g. bandwidth or hop-count).

The capabilities of the test UE shall be stated in the results report.

4.3.1 Web browsing using HTTP

For the measurement of web browsing the reference server should contain a static version of the Copernicus reference webpage.

The browser used for testing should behave similar to the browser used by most of the customers. It should be able to support the same HTTP capabilities and headers and open the same number of parallel download threads to download the content as the reference browser.

After one test cycle (one download of the reference page), the complete data representation of the reference page content shall be cleared from the local cache of the browser. Furthermore, it should be made sure, that all TCP connections between the server and the client are closed (no HTTP keept alive). There should be a pause of at least 6 seconds between the cycles.

NOTE: Any data related to Performance Enhancement Proxy (PEP) settings, like JavaScript scripts or Cookies need to be prevented from getting cleared from the browser's cache.

For the test, only HTTP download should be used. HTTP upload shall not be used.

Testing of content integrity is not mandatory for this test, but highly recommended.

4.3.2 E-Mail access

E-Mail Access should take place against a reference mail server.

For the measurement of e-Mail services reference content should be used.

A reference e-mail shall have a body containing only the string "Test" and attachment(s) chosen from the following reference content building blocks with respect to expected data rates of the network under test.

Available building blocks are (files to be used as attachments): 100 kByte, 200 kByte, 500 kByte, 1 MByte, 2 MByte, 5 MByte and 10 MByte.

NOTE: See also the table in annex C for typical upload or download times versus file size and used data rate.

These files contain random data to exclude optimizer/accelerator effects and are available on the ETSI server.

A cycle should consist of mail upload using SMTP and mail download using IMAP or POP3. Both upload and download should represent typical user behaviour.

After a test cycle, all TCP connections to the server should be disconnected.

Testing of content integrity is mandatory for this test.

4.3.3 File Transfer using FTP

FTP testing should take place against a reference FTP server. The server should support the standard FTP commands and both active and passive mode transfer of data. There should be no bandwidth limitation on application level.

In case of multisession scenarios, the reader shall be aware of the resulting effects with respect to the QoS parameters measured for each single session. With that, any use of multisession scenarios shall be stated in the results report.

In case of downloading a chunked single file via multiple data connections simultaneously, the reader shall be aware of the resulting effects with respect to the QoS parameters measured. With that, any use of a simultaneous download of a chunked single file via multiple data connections as well as the number of chunks used to transfer the file during this session shall be stated in the results report.

4.3.4 File Sharing using UDP

To be decided.

4.3.5   Synthetic tests

4.3.5.1   UDP

To be decided - Reference to iPerf.

4.3.5.2   ICMP

To be decided - Reference to TPING.

4.3.5.3   TCP

To be decided - Reference to TPING.

Annex A (informative):
Reference {SMS | SDS}

Content integrity of single messages for the {SMS | SDS} is ensured by mechanisms on lower protocol layers of GSM, UMTS and TETRA networks, respectively. Thus, there is - from an end-to-end testing perspective - no need to implement content integrity checking mechanisms on top of the {SMS | SDS}. Therefore, no reference message is provided by the present document.

Annex B (informative):
Content integrity checking

Content integrity checking can be achieved by placing meta-information about the expected content in the retrieved documents and check if the content description matches the received content. If the description is put in the text payload of the content, it should survive compression and transcoding of the content during transportation from the server to the client.

B.1   HTTP

The text of the main reference page should contain the following description language in the main file of a test webpage (typically index.html). The text should substitute text present before in order to keep the length of the reference page constant. In order to avoid misinterpretation of the content description by common client software, established standards like XML or HTML should be avoided.

The structure of the reference description is as follows:

   (% TAGNAME VALUE,[VALUE] %)

Before each IE, an opening mark should be used, followed by a blank. The opening mark is a "(%" (Bracket-Open, followed by a Percent-Sign). The IE itself is identified by a tag called TAGNAME. Below is a list of all valid TAGNAMES. Each IE has one or more parameters, called VALUES, separated by a comma. After the IE and its parameters a closing mark should be used. The closing mark is a "%)" (Percent-Sign, followed by a Bracket-Close). The opening and closing tags are separated from the TAGNAME and its parameters by a single blank space. The complete element should not be included within any HTML-format construct but should be place in pure text payload.

TAGNAME   PARAMETERS

NAME   <RESOURCENAME>, <APPROVED>

This IE contains the name of the reference webpage. The first parameter <RESOURCENAME> describes the reference page. The second parameter <APPROVED> is set to 0 for a resource not approved by ETSI and set to 1 for an ETSI approved resource.

VERSION   <VERSIONNUMBER>

This IE contains a unique version number of this specific resource.

TSIZE   <TBYTES>

This IE contains the accumulated size of all objects of the complete resource in bytes.

OBJECTS   <NUMBER>

This IE contains the accumulated number of objects belonging to this specific page.

OBJECT   <OID>,<OFNAME>,<ONAME>,<OSIZE>, <OREQUIRED>

For each object of the resource (identified by a separate file) a OBJECT tag should be available. Each OBJECT tag has 5 mandatory parameters:

- <OID>   contains a unique identifier per object on this page, starting the count from 1 for the main index-file that includes the content description.

- <OFNAME>   contains the filename of the referenced object.

- <ONAME>   contains a description of the object.

- <OSIZE>   contains the original size of the object in bytes.

- <OREQUIRED> is set to 1 if the object relevant for customer perception. If the object may be removed while in transit, the value should be set to 0 (e.g. for advertisements).

INFO   <TEXT>

This IE contains additional information about the resource.

B.2   FTP

Content integrity checking of a object transferred by FTP should be done by the use of MD5 checksums (16 bytes long). Two methods are supported:

Method 1:

In the same directory of the FTP server where the reference file is located lays a second file containing the MD5 checksum of the reference file (identified by the same name, but a file name extension.MD5). By downloading both files, the test client can determine the content integrity of the reference file by calculating its MD5 checksum and comparing it to the value contained in the checksum file.

To identify that method 1 is used the filename of the reference file starts with the fragment "CIC_M1_" followed by the name of the file plus extension.

    EXAMPLE 1:   DEMO.TXT becomes CIC_M1_DEMO.TXT and CIC_M1_DEMO.MD5.

Method 2:

The MD5 checksum of the file is appended to the original reference file, increasing its size by 16 bytes. For content integrity check, the test client cuts the last 16 bytes of the downloaded file and calculates the MD5 checksum of the remaining fragment. This checksum can be compared to the checksum received with the last 16 bytes of the file.

To identify that method 2 is used the filename of the reference file starts with the fragment "CIC_M2_" followed by the name of the file plus extension.

    EXAMPLE 2:   DEMO.TXT becomes CIC_M2_DEMO.TXT.

B.3   MMS

For further study.

Annex C (informative):
Transfer times versus used data rate and content size

Table C.1: Transfer times versus used data rate and content size

		Size						
		100 kBytes (102 400 bytes)	**200 kBytes** (204 800 bytes)	**500 kBytes** (512 000 bytes)	**1 MBytes** (1 048 576 bytes)	**2 MBytes** (2 097 152 bytes)	**5 MBytes** (5 242 880 bytes)	**10 MBytes** (10 485 760 bytes)
Data rate	**10 kbit/s**	81,92 s	163,84 s	409,6 s	838,9 s	1 677,7 s	4 194,3 s	8 388,6 s
	20 kbit/s	40,96 s	81,92 s	204,8 s	419,4 s	838,9 s	2 097,1 s	4 194,3 s
	40 kbit/s	20,48 s	40,96 s	102,4 s	209,7 s	419,4 s	1 048,6 s	2 097,2 s
	80 kbit/s	10,24 s	20,48 s	51,2 s	104,9 s	209,7 s	524,3 s	1 048,6 s
	160 kbit/s	5,12 s	10,24 s	25,6 s	52,4 s	104,9 s	262,1 s	524,3 s
	320 kbit/s	2,56 s	5,12 s	12,8 s	26,2 s	52,4 s	131,1 s	262,1 s
	640 kbit/s	1,28 s	2,56 s	6,4 s	13,1 s	26,2 s	65,5 s	131,1 s
	1 280 kbit/s	0,64 s	1,28 s	3,2 s	6,6 s	13,1 s	32,8 s	65,5 s
	2 560 kbit/s	0,32 s	0,64 s	1,6 s	3,3 s	6,6 s	16,4 s	32,8 s
	5 120 kbit/s	0,16 s	0,32 s	0,8 s	1,6 s	3,3 s	8,2 s	16,4 s
	10 240 kbit/s	0,08 s	0,16 s	0,4 s	0,8 s	1,6 s	4,1 s	8,2 s
	20 480 kbit/s	0,04 s	0,08 s	0,2 s	0,4 s	0,8 s	2,1 s	4,1 s

Annex D (informative):
Bibliography

- ETSI EG 201 212: "Electrical safety; Classification of interfaces for equipment to be connected to telecommunication networks".

- ETSI EN 300 429: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for cable systems".

History

Document history		
V1.1.1	September 2004	Publication
V1.2.1	May 2005	Publication
V1.3.1	November 2005	Publication
V1.4.1	August 2007	Publication
V1.5.1	May 2008	Publication
V1.6.1	June 2009	Publication
V2.2.1	April 2011	Publication