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Technical Specification

**Speech and multimedia Transmission Quality (STQ);
QoS aspects for popular services in GSM and 3G networks;
Part 3: Typical procedures for Quality of Service measurement equipment**

Reference

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Keywords

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Foreword

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

NOTE: Version 2.1.1 of the present document was published with a wrong version number. Please note that the present version 1.4.1 has been re-published to correct this and therefore superceeds the previous versions V1.1.1, V1.2.1 and 2.1.1 which have been withdrawn to avoid confusion.

The present document is part 3 of a multi-part deliverable covering the QoS aspects for popular services in GSM and 3G networks, as identified below:

Part 1: "Identification of Quality of Service aspects";

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 identifies QoS aspects for popular services in GSM and 3G networks. For each service chosen QoS indicators are listed. They are considered to be suitable for the quantitatively characterization of the dominant technical QoS aspects as experienced from the end-customer perspective.

Part 2 defines QoS parameters and their computation for popular services in GSM and 3G networks. The technical QoS indicators, listed in part 1, are the basis for the parameter set chosen. The parameter definition is split into two parts: the abstract definition and the generic description of the measurement method with the respective trigger points. Only measurement methods not dependent on any infrastructure provided are described in the present document. The harmonized definitions given in the present document are considered as the prerequisites for comparison of QoS measurements and measurement results.

Part 3 describes typical procedures used for QoS measurements over GSM, along with settings and parameters for such measurements.

Part 4 defines the minimum requirements of QoS measurement equipment for GSM and 3G 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 to perform the proposed measurements in a reliable and reproducible way.

Part 5 specifies test profiles which are required to enable benchmarking of different GSM or 3G networks both within and outside national boundaries. It is necessary to have these profiles so that when a specific set of tests are carried out then customers are comparing "like for like" performance.

Part 6 describes procedures to be used for statistical calculations in the field of QoS measurement of GSM and 3G networks using probing systems.

Part 7 describes the methodology to be used to get statistical samples that could be representative of the population of all existent calls so the statistical inferences made from the data collected by test calls are statistically correct and the error margin could be calculated.

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;
- the target subscriber equipment is ready to answer the call;
- voice quality values measured should only be employed by calls ended successfully for statistical analysis;
- need to define similar for video calls;
- however, measured values from calls ended unsuccessfully (e.g. dropped) should be available for additional evaluations and therefore, must be stored;
- further preconditions may apply when reasonable.

1 Scope

The present document describes typical procedures used for QoS measurements on mobile communication networks, e.g. GSM or UMTS, along with settings and parameters for such measurements.

Where possible existing ITU-T or ETSI definition are referenced. In some cases ITU-T or ETSI definitions do not exist or are considered as too generic, then a more service and mobile network specific definition is chosen.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

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

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

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

[1] ITU-T Recommendation P.56: "Objective measurement of active speech level".

[2] ETSI TS 102 250-1: "Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 1: Identification of Quality of Service criteria".

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

2.2 Informative references

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

[i.1] IETF RFC 3501: "Internet message access protocol - version 4rev1".

[i.2] IETF RFC 2177: "IMAP4 IDLE command".

[i.3] IETF RFC 2821: "Simple Mail Transfer Protocol".

3 Definitions and abbreviations

3.1 Definitions

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

A party: in direct transactions, the party initiating the transaction (calling party)

NOTE: In store-and-forward transactions, the party sending content.

B party: in direct transactions, the termination or counterpart of a transaction

NOTE: In store-and-forward transactions, the party receiving content.

content: entirety of information transferred within a transaction, seen from the user's perspective

NOTE: In case of services requiring entrance procedures (e.g. server login with FTP), information flow to achieve the state of being able to transfer actual user data is not counted as content.

EXAMPLE: Single SMS in SMS service; single multimedia message consisting of video, audio, and text components in MMS service.

direct transaction: real-time transaction between two entities

maximum expected delivery time: for store-and-forward services, this defines the time span within which a message shall be received by the B party to rate the transaction successful from the user's perspective

service family: group of services having main characteristics in common

EXAMPLE: Speech and Video Telephony, as well as SMS and MMS, are assumed to form a service family.

store-and forward transaction: transaction where information is sent from one party A to another party B using an entity C to store information sent from A and attempting to deliver it to B

transaction: single, complete, typical usage of a particular service

NOTE 1: At the beginning of each clause describing a particular service or family of services, the typical transaction for this particular service is described.

NOTE 2: Each type of transaction has parameters. The sum of all parameters describes the transaction completely. A parameter set is assumed to be complete if, under constant outer conditions, all transactions using this parameter set provide the same result.

transaction result: set (list) of possible outcomes for a particular transaction

NOTE: Services belonging to the same service family share the same set of transaction results.

3.2 Abbreviations

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

AOV	Angles Of View
APN	Access Point Name
CS	Circuit Switched
CSD	Circuit Switched Data
DNS	Domain Name Server
FTP	File Transfer Protocol
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
HTTP	Hyper Text Transfer Protocol

IP	Internet Protocol
KPI	Key Performance Indicator
MEDT	Maximum Expected Delivery Time
MMS	Multimedia Messaging Service
MO	Mobile Originated
MOF	Mobile Originated to Fixed
MOM	Mobile Originated to Mobile
MOS	Mean Opinion Score
MS	Mobile station
MT	Mobile Terminated
MTM	Mobile Terminated, originator is also a Mobile unit
MTU	Maximum Transmission Unit
PC	Personal Computer
PDU	Packet Data Unit
PS	Packet Switched
PSD	Packet Switched Data
QoS	Quality of Service
SMS	Short Message Service
SMSC	Short Message Service Centre
TCP/IP	Transmission Control Protocol/Internet Protocol
UDP	User Datagram Protocol
UE	User Equipment (terminal, mobile station)
URL	Uniform Resource Locator
WAP	Wireless Application Protocol

4 Goal of measurement

The goal of measurements described in the present document is to assess the network under test for its quality parameters as defined in TS 102 250-1 [2]. This is to determine the network quality for the respective transactions from subscribers view.

5 Classification of services

5.1 Classification guidelines

For the purpose of the present document, services are classified using what is considered to be their dominating property. The first distinction is made between direct and store-and-forward services:

- Direct-transaction services are services where there is - in the user's perception - a direct end-to-end connection.
- Store-and-forward services are services where content is stored in the network and delivered to the recipient to a later point in time.

As a technically usable distinguishing question, a service is considered to be direct if it is possible to decide on end-to-end content transfer success from the initiating party (A party) of the connection within the scope of the transaction itself.

For a second classification within direct services, the typical nature of content flow is used for classification:

- In telephony services, content flow is typically symmetrical between the parties.
- In data-access services, content flow is typically - within a single transaction - unsymmetrical.

Of course there are borderline cases, such as voice mailbox services, voice over IP or messaging. Such services are, for the time being, not treated within the scope of the present document.

5.2 General structure of service descriptions

In the following, each service family description will contain the following structural elements:

- A "family general" part defining:
  - the basic transaction definition and if applicable, transaction types;
  - a description of the transaction phase combined with a table of parameters governing transaction behaviour in this phase;
  - a description of all possible outcomes of a single transaction;
  - a description of content quality measurement definitions (if applicable).
- For each service within the service family, if its respective description differs from the "family general" one, a set of descriptions for this service, having the same structure as above.

6 General aspects for all types of services

6.1 Set-up and control

Measurements should be conducted in a way that user behaviour is emulated, with a number of parameters under control of the measurement equipment.

The test case design (configuration and user profile) - to the degree necessary to fully reproduce the test - shall be part of the report.

It is assumed that for all types of services under test, a testcase consists of a number of single identical transactions. The measurement equipment and control must ensure that the starting conditions are the same for each transaction. This includes, among other things, that pause times are sufficiently long that the equipment is in a stable (idle) state again. The parameter "guard time" sets a minimum value for the pause between transactions.

It is assumed that the measurement is performed by a mobile measurement unit; depending on type of measurement, other equipment connected to the fixed network is added.

It is assumed that all QoS-relevant transaction parameters are recorded for proper post-processing and are kept constant during a test. If a test contains more than one parameter set, evaluation shall be made for each parameter set separately.

6.2 Phase and result classification

In order to ensure common wording, the following clause defines terms and definitions for services testing.

It is assumed that each transaction can be described at least by one seamless sequence of phases. There may exist several Angles Of View (AOV), each leading to a different phase description.

EXAMPLE: Internet services (as described by KPI defined in TS 102 250-2 [3] model A and B). AOV differ here by different assumptions on start of service usage. Each AOV, however, is a consistent description by seamlessly connected phases.

Phases maybe further be described having sub-phases.

Pauses between transactions are not explicitly mentioned in this picture, but are relevant with respect to parameter reporting. Typically, there is a minimum pause (guard time) ensuring that the system under test is in a stable starting condition for the next test. Values are technology-dependent.

6.2.1 Phase and result classification for direct services

A direct transaction consists of two top-level phases: Service access and service usage.

Table 1

Phase	Sub-phase	Definition
Service access		All steps leading to the technical ability to do actual user-perspective content transport between A and B party. Service access may consist of different sub-phases, e.g. Network access, IP service access and Internet access. Which sub-phases actually exist depends on the particular service.
	Network access	Basic access to the network under test. Successful network access is assumed when the UE is able to do as much basic communication with the network as is necessary to initiate the next phase in the service access procedure.
	IP service access	Basic access to the generic packet-data transfer capabilities the particular service is based upon.
	Internet access	Basic access to those internet services the service is meant to provide.
Service usage		Content transfer between A and B party.

A direct transaction may have one of the following overall results.

Table 2

Result	Definition
Failed	Phase of service usage not reached. Successful or failed service access may be broken down into diagnostic sub-categories. The general name-forming rule is: <name of sub-phase>result. Example: Network access failure; IP service access success.
Completed	Data-transfer transactions: All content intended to be transferred has been successfully transferred. Conversational transactions: The intended transaction duration has been reached.
Dropped	Service usage was ended before completion.
NOTE:	If a transaction being in the service usage phase is stopped due to some timeout or due to other criteria by the measurement system, e.g. to enhance test rate, this shall be treated as a dropped transaction. This behaviour has to be recorded by the measurement system.