



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

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Foreword

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

The present document is part 3 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.

The present document 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.

Part 5 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.

Modal verbs terminology

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Introduction

The present document describes the measurement procedures needed to perform the measurements of QoS parameters in line with the definitions given in part 2 [i.5], applying the test profiles defined in part 5 [3].

The aim of standardization of QoS measurements is to ensure that measurements done at different times and with different equipment produce comparable results. To reach this goal, not only computation rules have to be standardized. Since the result of measurements will depend on the way these measurements are performed, well-defined procedure definitions are also required to ensure comparable data.

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1 Scope

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

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

2 References

2.1 Normative 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.

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

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

- [1] Recommendation ITU-T P.56: "Objective measurement of active speech level".
- [2] Void.
- [3] ETSI TS 102 250-5: "Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in mobile networks; Part 5: Definition of typical measurement profiles".

2.2 Informative 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.

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

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.

- [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".
- [i.4] IETF RFC 1939: "Post Office Protocol - Version 3".
- [i.5] ETSI TS 102 250-2: "Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in mobile networks; Part 2: Definition of Quality of Service parameters and their computation".
- [i.6] ETSI TS 100 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

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 text message 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: time within a message has to 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
DRM	Digital Rights Management
FR	Failure Rate
FTP	File Transfer Protocol
GC	Group Call
GGSN	Gateway GPRS Support Node
GSM	Global Mobile System
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transfer Protocol

ICMP	Internet Control Management Protocol
IP	Internet Protocol
MEDT	Maximum Expected Delivery Time
MMS	Multimedia Messaging Service
MOF	Mobile Originated to Fixed
MOM	Mobile Originated to Mobile
MT	Mobile Terminated
MTM	Mobile Terminated, originator is also a Mobile unit
MTSI	Multimedia Telephony over IMS
MTU	Maximum Transmission Unit
NAT	Network Address Translation
OMA	Open Media Access
OS	Operating System
PC	Personal Computer
PDP	Packet Data Protocol
PDU	Packet Data Unit
POP3	Post Office Protocol Version 3
PS	Packet Switched
PSD	Packet Switched Data
QoS	Quality of Service
RTP	Realtime Transport Protocol
S&F	Store and Forward
SDP	Service Delivery Platform
SDS	Short Data Service
SDS-TL	Short Data Service Transport Layer
SMS	Short Message Service
SMSC	Short Message Service Centre
SMS-MO	SMS Mobile Originated
SMS-MT	SMS Mobile Terminated
SMTP	Simple Mail Transfer Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TETRA	Terrestrial Trunked Radio
UDP	User Datagram Protocol
UE	User Equipment
URL	Uniform Resource Locator
URL/IP	Uniform Resource Location
WAP	Wireless Access Protocol
WAP	Wireless Application Protocol

4 Aim of measurement

The aim of measurements described in the present document is to assess the network under test for its Quality of Service (QoS) parameters as defined in ETSI TS 102 250-2 [i.5]. This is to determine the network quality for the respective transactions from the user's 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 at a later point in time.

As a technically usable differentiation, 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.

NOTE: e-Mail is a special case since it has both aspects of direct and of store and forward services. In the present document, it is, as in part 2 [i.5] of this multi-part deliverable, treated in the clause on store and forward services.

5.2 General structure of service descriptions

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

- A 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).
- In case there are service-dependent differences, a service-dependent part 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 realistically modelled. Parameters and settings which have substantial influence on results need to be under control of the measurement equipment.

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

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 shall 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 all QoS-relevant transaction parameters are recorded for proper post-processing and are kept constant during measurements. If a measurement 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 service measurements.

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 its QoS parameters defined in ETSI TS 102 250-2 [i.5] 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 may be further 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.

Depending on the used radio access technology the duration of required pauses may differ significantly.

However, this duration may be adjusted to local conditions or special testing goals, but this shall be reported.

If the pause duration is too short, side effects may occur, resulting in all kinds of transient effects and distortions in measurement data. It should be made certain that all the QoS parameters to be measured are not affected by the pause time.

Tables 1 to 4 void

7 Telephony measurements

This clause deals with telephony services. In general, the term "content" will be used throughout this clause for the information flow exchanged between participating users during a call. Depending on the type of service, content can be audio or audio and video.

7.1 General aspects

7.1.1 Transaction definition and transaction types

The basic transaction for telephony testing is equivalent to a single call to a counterpart extension.

7.1.2 Parameter overview

Table 5: Parameter overview for telephony measurements

Phase	Parameters
Service Access	Call counterpart. This includes the type of equipment (dedicated unit, unique identifier (e.g. called party number), automatic answer with taped message, etc.).
	Call type. Time-out value.
Service Usage	Call duration.
	Content flow direction: This is an inner parameter for a transaction. Basically, all combinations of uplink/downlink dynamics are possible: <ul style="list-style-type: none"> - Uplink only; - Downlink only; - Conversational (alternating uplink and downlink). This is the recommended standard testing mode. Other testing modes are considered to be used only for special purposes; - "Duplex" (uplink and downlink flow simultaneously).
	Codec settings. Algorithm and scale used for speech quality evaluation.
Call clear-down	Guard time.
Pause	Pause duration.

The last transaction within a measurement sequence does not require a pause.

7.1.3 Additional transaction result definitions

For call set-up assessment beyond QoS data acquisition, typically a state model driven by suitable trigger-events information combined with information from the call control engine is being used. This state model may also be used to determine timing information for each phase.

Service usability, i.e. presence of a usable two-way connection, shall be verified by a procedure based on content test transmissions within a given time window. If within this time window no connection can be verified, the setup attempt shall be considered as failed and the call attempt be terminated.

A call is active only as long as both sides consider it to be active. A call is therefore considered to be dropped if either side detects a dropped call.

Above definitions lead to the following decision tree for the outcome of a call (figure 1 includes the end-of-call cases).