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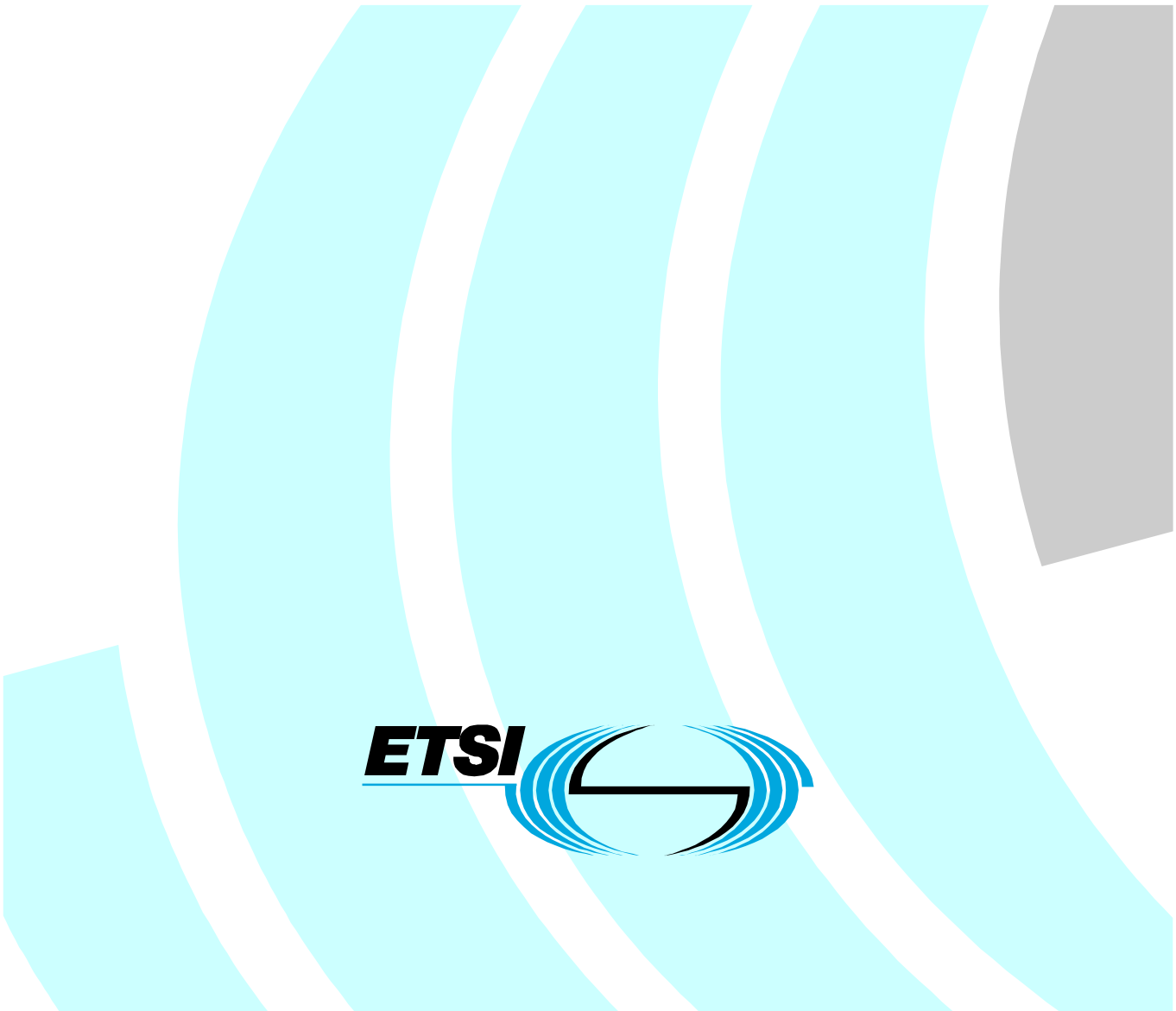
Technical Specification

Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 1: Identification of Quality of Service aspects



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Foreword

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

The present document is part 1 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 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.

Introduction

Measurements of the parameters defined in the present document can only be made using special test equipment and the results obtained may depend to some extent on the design of this test equipment. The QoS experienced by users will also be influenced to some extent by the design of their terminals and therefore may differ somewhat from the results of formal tests.

There are several factors that could affect the comparability of measurements of different networks:

- use of different measurement equipment;
- use of different design settings in the networks that deliberately trade one aspect of quality against another;
- the locations where measurements are made;
- the time when measurements are made (for example the performance of the radio access will be affected by weather conditions, seasons (extent of tree foliage), and recent weather history (wetness of the ground and foliage).

Consequently any measurements that are intended to compare the quality of different networks should use a common measurement system and the different networks should be sampled simultaneously from the same locations, and the number of different locations should be sufficiently large to provide some statistical averaging to take account of the different locations of the base stations.

It is important to understand the interaction between:

- network accessibility;
- service accessibility; and
- voice quality.

Each network can set its own value of the threshold for radio signal strength for accessing its network, ie the network will only allow access if it estimates that the radio signal strength is above this threshold. When the threshold is exceeded the network identity is displayed on the mobile. The network will not allow access at lower radio signal strengths even if the mobile is capable of operating at such strengths. Network accessibility, which is the basic estimate of radio coverage, is based on the display of the network identity and is therefore influenced by the level of the threshold set by the network.

Service accessibility is the accessibility to a service when there is network access. Where there is network access, service access may not be possible because:

- There are no available radio channels to support the service.
- There are no available transmission links between the base station and the mobile switching centre.

The availability of a service is therefore a combination of network accessibility and service accessibility.

Measurements of voice quality on a Public Land Mobile Network (PLMN) will be influenced by both the transmission capabilities of the network and the state of the radio access. A network with a higher access threshold will support better speech quality but poorer network accessibility in an area of weak coverage.

1 Scope

The present document identifies QoS aspects for popular services in GSM and 3G. 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.

The indicators are described by their name and a short description from the customer point of view.

Wherever possible existing ITU-T or ETSI definitions are referenced. If ITU-T or ETSI definitions do not exist or are considered as too generic, a more service and mobile network specific definition is made.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- 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.
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[1] ITU-T Recommendation E.800: "Terms and definitions related to Quality of Service and network performance including dependability".

3 Abbreviations

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

3G	3rd Generation
AD	Access Delay
CCR	Call Completion Ratio
CCR-CS	Call Completion Ratio Circuit Switched
CNCR	Call Non Completion Ratio
CR	Completion Ratio
CS	Circuit Switched
DT	Delivery Time
GSM	Global System for Mobile communications
MO	Mobile Originated
MM	Multimedia Message
MMS	Multimedia messaging Service
NA	Network Access
NNA	Network Non Accessibility
NP	Network Performance
PLMN	Public Land Mobile Network
QoS	Quality of Service
SA	Service Access
SA-T	Service Accessibility Telephony
SMS	Short Message Service
SNAT	Service Non Accessibiltity Telephony
SpQ	Speech Quality
ST-T	Setup Time Telephony

4 QoS Background

4.1 Background on QoS

For a common understanding of QoS and Network Performance (NP) the main principles are reflected in the present document as follows:

- ITU-T Recommendation E.800 [1] definition of **Quality of Service**:

  "The collective effect of service performance which determine the degree of satisfaction of a user of the service".

- ITU-T Recommendation E.800 [1] definition of **Network Performance**:

  "The ability of a network portion to provide the functions related to communication between users".

The relationship between customer satisfaction, QoS and NP is shown in figure 1. The present document has its focus on the technical aspects related to customer satisfaction.

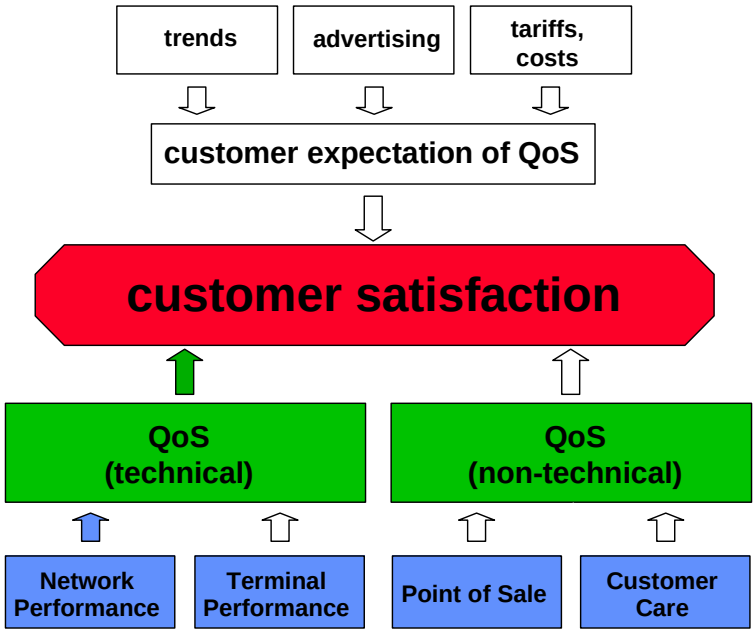

Figure 1: Relationship between customer satisfaction, QoS and NP

4.2 Objective of the list of indicators

The objective of the indicator list is to have an agreed set of QoS indicators. They should allow easier external and internal benchmarking.

The services chosen are considered to be of an high relevance to the end-customer in an national and international market and are common for most of the network operators.

The selected indicators are considered:

- to have main influence on the customers satisfaction with regard to the service;
- to identify technical QoS aspects, which can be influenced by the performance of the network or the terminal;
- to be measurable by technical means;
- to be relevant for network operator's national and international benchmarking.

There is the need to specify independent QoS indicators for each service.

5 QoS Indicator List

5.1 Overview

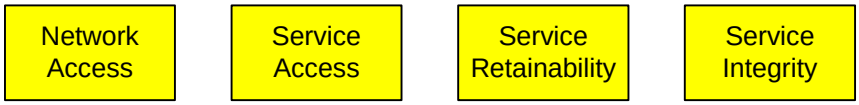

Figure 2: Phases of service use from customer's point of view

Figure 2 shows the different phases (Quality of Service aspects) during service use from the customer's point of view. The meaning of these QoS aspects are:

1) **Network Access:** The network indication on the display of the mobile is a signal to the customer that he can use the service of this network operator (see note).

2) **Service Access:** If the customer wants to use a service, the network operator should provide him as fast as possible access to the service.

3) **Service Integrity:** This describes the Quality of Service during service use.

4) **Service Retainability:** Service Retainability describes the termination of services (in accordance with or against the will of the user).

NOTE: The network indication to the customer is still under discussion, because the display message depends on mobile implementation etc. It is not recommended to use this parameter without other QoS indicators.

For each of the QoS aspects service specific indicators are defined in the following clauses.

5.2 Service independent

5.2.1 QoS Aspect: Network Access

5.2.1.1 QoS Indicator: Network Accessibility (NA)

Probability (see note 2) that the Mobile Services are offered to an end-customer by display of the network indicator (see note 3) on the Mobile Equipment (see note 4).

(ITU-T Recommendation E.800 [1]: The probability that the user of a service after a request receives the proceed-to-select signal within specified conditions.)

NOTE 1: The proceed-to-select signal is that signal inviting the user to select the desired destination.

Complementary QoS Indicator: Network Non-Accessibility (NNA).

NOTE 2: The statistical significance that a service can be used for a given confidence level.

NOTE 3: The network indicator may distinguish among circuit and packet switched network.

NOTE 4: See note in clause 5.1.

5.3 Telephony

5.3.1 QoS Aspect: Service Access

5.3.1.1 QoS Indicator: Service Accessibility Telephony (SA-T)

Probability that the end-customer can access the Mobile Telephony Service when requested while it is offered by display of the network indicator on the Mobile Equipment.

(ITU-T Recommendation E.800 [1]: The probability that a service can be obtained within specified tolerances and other given operating conditions when requested by the user).

Complementary QoS Indicator: Service Non-Accessibility Telephony (SNAT).

5.3.1.2 QoS Indicator: Setup Time Telephony (ST-T)

Time between sending of complete address information and receipt of call setup notification.

(ITU-T Recommendation E.800 [1]: The expectation of the time duration between an initial bid by the user for the acquisition of a service and the instant of time the user has access to the service, the service being obtained within specified tolerances and other given operating conditions).

5.3.2 QoS Aspect: Service integrity

5.3.2.1 QoS Indicator: Speech Quality (SpQ)

Indicator representing the quantification of the end-to-end speech transmission quality of the mobile telephony service per call.

5.3.3 QoS Aspect: Service retainability

5.3.3.1 QoS Indicator: Call Completion Ratio circuit switched (CCR-CS)

The probability that a service, once obtained, will continue to be provided under given conditions for a given time duration.

Complementary QoS Indicator: Call Non-Completion Ratio circuit switched (CNCR-CS).

5.4 Short Message Service

5.4.1 QoS Aspect: Service Access

5.4.1.1 QoS Indicator: Service Accessibility SMS MO (SA SMS MO)

Probability that the end-customer can access the Short Message Service (SMS) when requested while it is offered by display of the network indicator on the Mobile Equipment.

Complementary QoS Indicator: Service Non-Accessibility SMS-MO (SNA SMS-MO).

5.4.1.2 QoS Indicator: Access Delay SMS MO (AD SMS MO)

Time between sending a Short Message to a Short Message Center and receiving an acknowledgement of the Short Message Center.

5.4.2 QoS Aspect: Service integrity SMS

5.4.2.1 QoS Indicator: End-to-end Delivery Time SMS (DT SMS)

Time between sending a Short Message to a Short Message Center and receiving the Short Message on another target. It is assumed that the SMS receiving target is ready to receive a SMS.

5.4.2.2 QoS Indicator: Completion Rate SMS circuit switched (CR SMS CS)

The probability that the SMS-messages will be delivered to the target destination under given conditions. It is assumed that the SMS receiving target is ready to receive a SMS.

6 Multimedia Messaging Service (MMS)

6.1 Void

6.1.1 Preconditions

The preconditions are equal for all MMS indicators. The following table shows them in detail.

Precondition	Covered by
GPRS available	KPI GPRS Unavailability
GPRS Attach successful	KPI GPRS Attach Failure Ratio
Mobile set to automatic download of MMS	Measurement instruction
MT memory sufficient	Measurement instruction

6.1.2 Overview of indicators for QoS measurement of MMS

To get a better overview of the following parameters, figure 3 shows all steps of a Multimedia Message (MM) from sender to receiver, and the related QoS parameters.

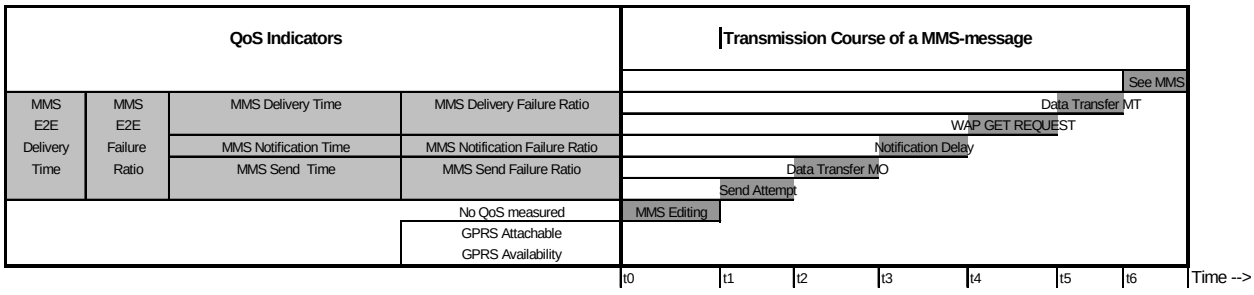

Figure 3: Overview of QoS Indicators for MMS

6.1.3 QoS Aspect: Service Access

6.1.3.1 QoS Indicator: MMS Send Failure Ratio (MO) [%]

The parameter *MMS Send Failure Ratio (MO)* describes the probability that a MMS-message can not be send by the subscriber, although he has requested to do so by pushing the "send button".

6.1.3.2 QoS indicator: MMS Send Time (MO) [s]

A subscriber uses the Multimedia Messaging Service (as indicated by the network ID in his mobile phone display). The time elapsing from pushing the send button after the editing of a MMS-message to the completion of the data transfer is described by this parameter.

6.1.3.3 QoS Indicator: MMS Retrieval Failure Ratio (MT) [%]

The parameter *MMS Delivery Failure Ratio (MT)* describes the probability that the MMS-message can not be downloaded by the MT mobile, which received a MMS Notification before.

6.1.3.4 QoS Indicator: MMS Retrieval Time (MT) [s]

The reception of a MMS-message works as follows: A push-message is sent to the receiver's mobile. In automatic mode (the default setting in the VF D2 network), the push-message initiates a WAP-connection to download the MMS from the MMS-C. The initiation of the WAP connection is called the WAP GET REQUEST (WGR). The time elapsing between the WGR and the completion of the download of the MMS will be described by the parameter *MMS Delivery Time (MT).*

6.1.4 QoS Aspect: Service retainability

6.1.4.1 QoS Indicator: MMS Notification Failure Ratio [%]

The parameter *MMS Notification Failure Ratio[%]* describes the probability that the Multimedia Messaging Service (MMS) is not able to deliver the Notification of a MMS-message to the b-parties mobile.

6.1.4.2 QoS Indicator: MMS Notification Time [s]

A subscriber uses the Multimedia Messaging Service. The time elapsing from the complete submission of the Multimedia-Message to the MMSC to the reception of the Notification (MT) is the *MMS Notification Delay.*

6.1.4.3 QoS Indicator: MMS End-to-end Failure Ratio [%]

The parameter *MMS End-to-end Failure Ratio* describes the probability that the Multimedia Messaging Service (MMS) is not able to deliver a MMS-message after the "send button" has been pushed or the MO party has not received an ackknowledgement of the successful transmission from the MMSC.

6.1.4.4 QoS Indicator: MMS End-to-end Delivery Time (MO/MT) [s]

A subscriber uses the Multimedia Messaging Service (as indicated by the network ID in his mobile phone display). The time elapsing from pushing of the "send button" to the reception of the MMS by the b-parties mobile is the *MMS End-to-end Delivery Time MO/MT.*

This parameter is not calculated if the MO party has not received an ackknowledgement of the successful transmission from the MMSC.

The size of a MMS varies. In comparison to SMS, the size has noticeable impact on the submission time. So, a typical sized MM is used for this measurement.

History

Document history		
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