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Speech and multimedia Transmission Quality (STQ);
QoS aspects for popular services in GSM and 3G networks;
Part 7: Network based Quality of Service measurements

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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 7 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 criteria";

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 quantitative 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 three parts: the abstract definition which contains a generic description of the parameter, the abstract equation and 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 and 3G networks, 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. These profiles are necessary for comparing "like-for-like" performance in case that a specific set of tests is carried out by different customers.

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

Introduction

Measurements of service performance can be done either with an end-point test measurement tool, ether stationary or mobile drive test, or inside the network itself. The measurements should always be done from an end-user perspective, independent of the measurement point. Obviously a measurement done inside the network might not give exactly the same result as a measurement done in the end-point with a test tool.

However, also the network measurement can give valuable information about service performance as the end-user perceives it. It is also possible to take more samples of the service performance with a network based measurement than with an end-point test tool. The service performance measurements discussed presented in the present document shall all be based on standardized protocols and interfaces.

The quality of service parameters in TS 102 250-2 [1] are initially specified for an end-point test tool measurement scenario. However, the parameters can be reused for network based measurements with some limitations and minor changes.

1 Scope

The present document specifies how the quality of service parameters, listed in TS 102 250-2 [1], should be used for measurements done inside a network, in contrary to measurements done in the end-point with a test tool. A test tool can be either stationary or a drive test tool. The measurements of the QoS parameters according to the present document should be done using standardized interfaces and protocols. This is done to ensure that all measurements in a multi-vendor network can be compared.

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.
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  - for informative references.

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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] 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] Void.

[3] ETSI TS 126 234: "Universal Mobile Telecommunications System (UMTS); LTE; Transparent end-to-end Packet-switched Streaming Service (PSS); Protocols and codecs (3GPP TS 26.234)".

[4] ETSI TS 126 346: "Universal Mobile Telecommunications System (UMTS); LTE; Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs (3GPP TS 26.346)".

[5] ETSI TS 126 114: "Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS); Multimedia telephony; Media handling and interaction (3GPP TS 26.114)".

[6] ITU-T Recommendation P.564: "Conformance testing for voice over IP transmission quality assessment models".

[7] ITU-T Recommendation P.862.1: "Mapping function for transforming P.862 raw result scores to MOS-LQO".

[8] Void.

[9] 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 Release 8)".

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.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

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

drive test tool: end-point test tool which is designed to be moved around, i.e. by walking or driving a car

end-point test tool: typically especially designed mobile which uses active test calls to collect measurements

stationary tool: end-point test tool which is installed in a fixed location

3.2 Abbreviations

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

3G	3rd Generation
3GPP	Third Generation Partnership Project
ACK	Acknowledgement
FTP	File Transfer Protocol
Gn	Interface between GSN nodes
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
GSN	GPRS Support Node
Iub	Interface between RNC and Node B
MO	Mobile-Originated
MT	Mobile-Terminated
PCO	Point of Control and Observation
PoC	Push to talk over Cellular
POR	Point of Recording
QoE	Quality of Experience
QoS	Quality of Service
RNC	Radio Network Controller
RRC	Radio Resource Control
SGSN	Serving GPRS Support Node
TCP	Transmission Control Protocol
UE	User Equipment

4 Network Measurement Basics

4.1 Point of Control and Observation (PCO)

The Point of Control and Observation (from now on called "point of observation" or PCO) is the location where the measurement is actually performed. The location can be either inside the network or in the end-point. The measurements should be done using standardized interfaces and protocols.

Possible points of observation for QoS parameters covered in the present document are:

- Inside nodes in the network (RNC, base station, switch, etc.)
- Observations in the terminal:
  - End-point test tool; or
  - Measurements that are reported back from the terminal to the network

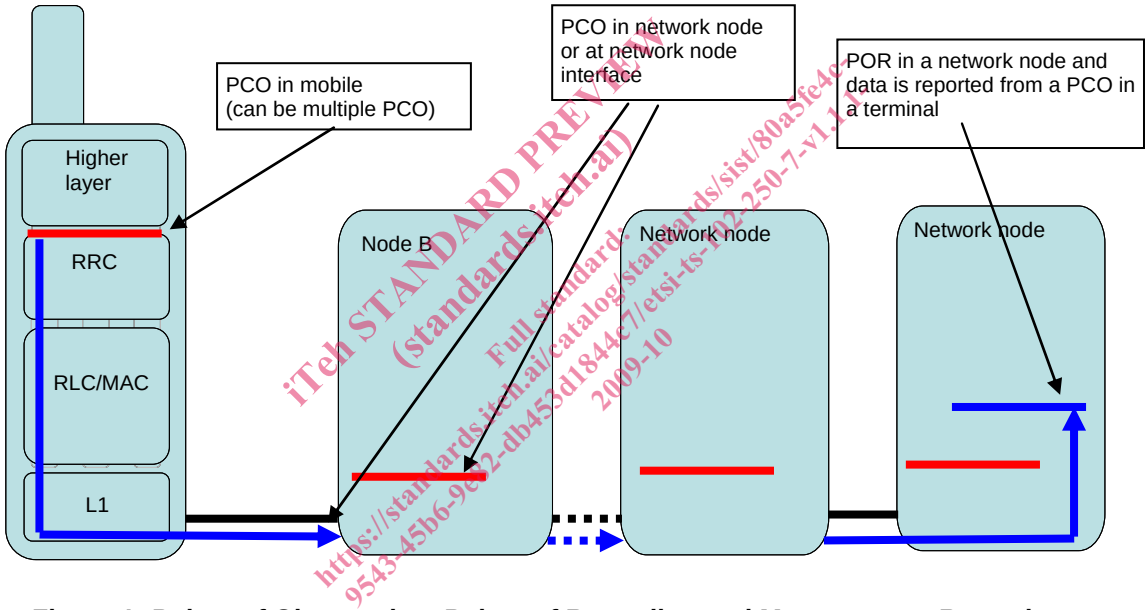

Figure 1: Points of Observation, Points of Recording and Measurement Reporting

4.2 Point of Recording (POR)

The point of recording (POR) is where the QoS parameters are recorded. The POR can be the same as the PCO or another point inside the terminal or the network. If the PCO and the POR are not the same, the measurement data must be reported from the PCO to the POR. Examples of such reporting are described in annex A.

5 Measuring QoS Parameters in the Network

5.1 General Overview

The quality of service measurements should be done as much as possible in the same way inside the network as they are done in the end-point with a test tool. Many types of measurements can be done with the same trigger points (for instance, the reception of a certain protocol message) independent of the point of measurement, but the measurement result might differ slightly depending on where in the call or transmission chain the PCO is located.

5.2 Service Accessibility QoS Parameters

Accessibility QoS parameters reflects the ability to initiate or intentionally terminate a connection or a service. The parameters can be divided into the following groups:

- **Failure parameters**: Reflects the outcome of attempts to initiate a connection or a service. For mobile-originated (MO) cases the network might sometimes be unaware of some of the attempts, and network-based parameters can be expected to give a slightly more positive view of the network condition, as compared to the corresponding endpoint-test parameters.

  For mobile-terminated (MT) initiation attempts the network is normally fully aware of these, and network-based parameters should therefore correspond well to the same parameters as measured by an endpoint test tool (assuming that MT initiation attempts are known and controlled by the endpoint test tool).

  As most initiation procedures require a successful two-way communication during the initiation phase, the accessibility parameters measured for MO and MT endpoint test calls should normally not differ too much, and thus the network-based parameters for the MT case can be seen as a good approximation of the total network state.

- **Time parameters**: Reflects the time needed to initiate a connection or a service. As these parameters are only defined for successful attempts the network can see the message flow, and can measure the time elapsed to initiate the connection or the service.

  The difference in parameter values as compared to the corresponding endpoint test measurements depend on where in the network the time measurements are done, but normally the time elapsed in the radio link and the processing time in the mobile are not included in the network-based parameters, making them more optimistic.

  If the excluded radio delay is stable or small compared to the total delay, the network-based measurements can still give a good picture on the state of the network.

  The estimated value of the excluded delay parts (for instance the radio delay) should be added to (or noted together with) the measured time parameter.

5.3 Service Retainability QoS Parameters

Retainability QoS parameters reflect the ability to retain, or keep a service up and running. Typical examples of retainability parameters are cut-off ratio and session failure ratio. Retainability parameters can be measured on the end-point but in general also inside the network. Measurements inside the network do not in general need any additional measurement data from the end-point.

5.4 Service Integrity QoS Parameters

Service integrity QoS parameters reflect the quality of a service that has been successfully set up and is in use. As the integrity parameters are only measured for successfully connected services, the network will always be aware of the ongoing service, and can measure its performance.

Depending on the type of service used different types of integrity parameters are calculated:

- Media quality parameters
- Response time parameters
- Data rate parameters