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

Reference

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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. Full details of the entire series can be found in part 1 [10].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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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 need all be based on standardized protocols and interfaces.

The quality of service parameters in ETSI 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 ETSI 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

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 referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://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.

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

[7] Recommendation ITU-T 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)".

[10] ETSI TS 102 250-1: "Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in mobile networks; Part 1: Assessment of Quality of Service".

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 referenced document (including any amendments) applies.

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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 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms 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 Symbols

Void.

3.3 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.

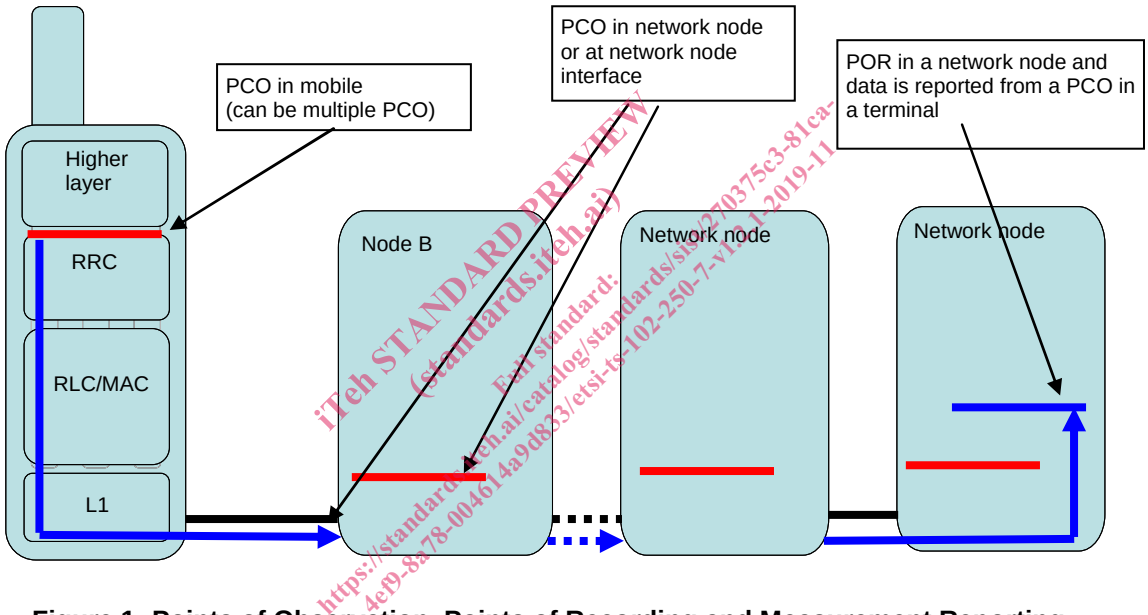

Figure 1: Points of Observation, Points of Recording and Measurement Reporting

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 shall 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

5.4.1 Overview

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

5.4.2 Media Quality Parameters

In an endpoint test scenario the media quality parameters can be measured in the mobile by using objective quality algorithms, for instance Recommendation ITU-T P.862.1 [7] for speech quality measurements. For network-based quality measurements other methods are used:

- Parameters related to the service quality can be measured at different nodes in the network, and translated to a service quality parameter by using a parametric or bitstream quality model, like Recommendation ITU-T P.564 [6] or similar model for video and multimedia service. The resulting quality parameter will reflect the state at the measurement nodes, and be an estimate of the end-user quality.

- Parameters related to the service quality can be measured in the mobile, and reported back to POR in a node in the network (see annex A). The calculation node combines the reported parameters with other relevant information collected from the network about the ongoing service, and calculates the service quality parameter. The resulting quality parameter will be closely correlated to the end-user experience.

5.4.3 Response Time Parameters

Some services are characterized by real-time events or real-time interaction between the users, and the response time needs to be short enough to provide a good service experience. A typical service example is PoC which is dependent on short delays between user input and system acknowledgement.

The time elapsed between certain protocol events can normally be measured in different network nodes. Some parts of the response time (typically the radio part) will not be included in the network-based measurements, so the resulting response time parameters will only be an estimate of the end-user experience.

However, if the radio delay is stable or small compared to the total delay, the network-based measurements can still give relevant information about the end-user experience. It might also in some cases be possible to make a separate measurement or estimate of the radio delay.

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

5.4.4 Data Rate Parameters

Data rate parameters, for services such as FTP, web browsing and email, can be measured at different nodes in the network. Normally these services are using acknowledged radio bearers, and the network-based data rate measurements should thus be closely correlated to the corresponding endpoint test measurements.

6 Comparing Network and End-point Test Measurements

Except for the differences due to different PCO for end-point tests tools and network measurements also other factors will affect the result. For instance the customer behaviour might not be the same, as in the following example:

There is a radio network coverage problem for a series of tunnels in a newly built motorway area. Mobile users will frequently get their calls dropped when they pass this area on the motorway. Initially when the motorway opened the call drop rate measured in the network was high, since most of the calls are dropped. However, after some time the mobile users frequently passing this problem area will learn that the call will drop, and starts to avoid making calls when passing that point. The drop rate in the network will go down but the problem has actually not been solved.