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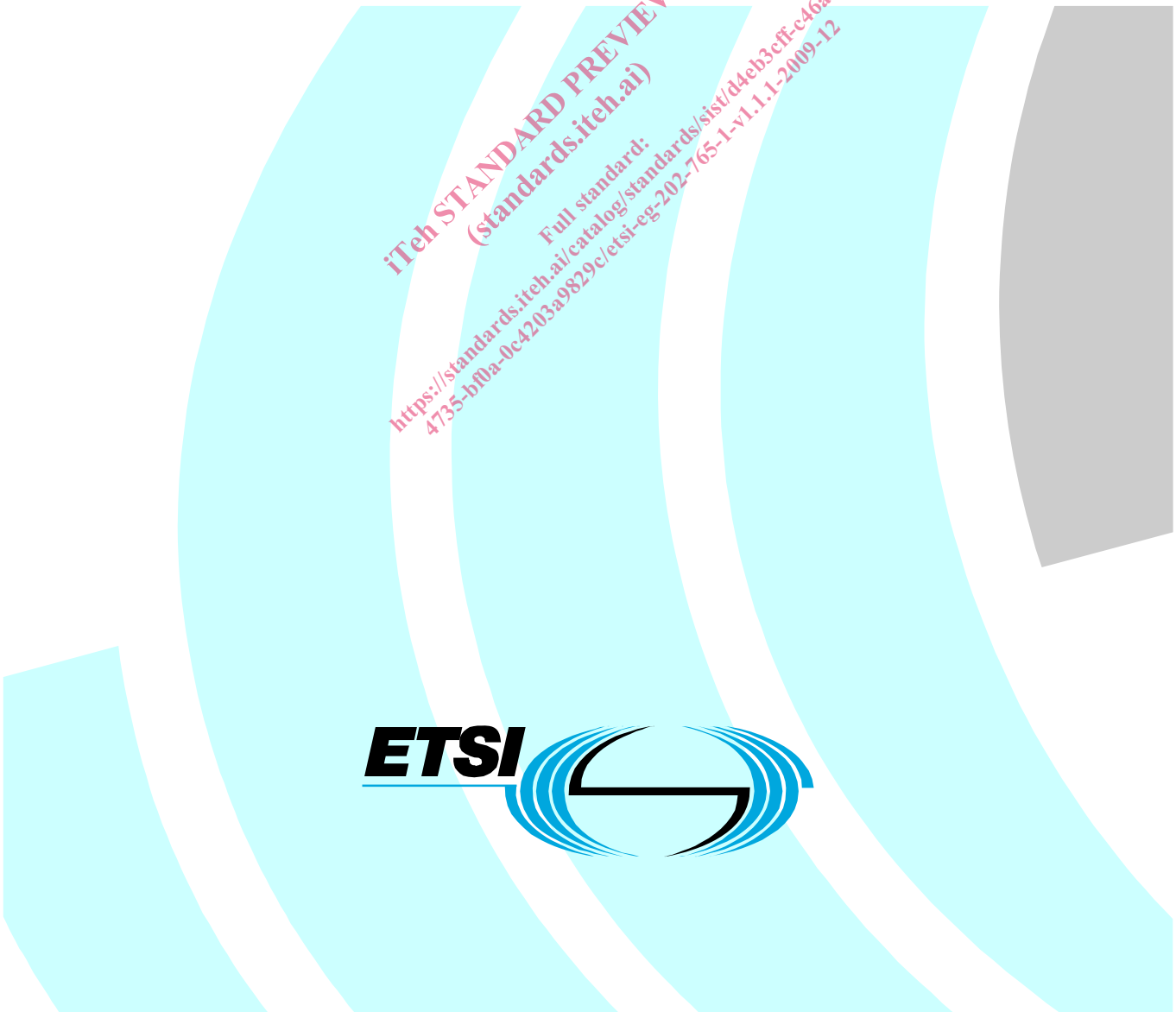
ETSI Guide

Speech and multimedia Transmission Quality (STQ); QoS and network performance metrics and measurement methods; Part 1: General considerations



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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Speech and multimedia Transmission Quality (STQ), and is now submitted for the ETSI standards Membership Approval Procedure.

The present document is part 1 of a multi-part deliverable covering the QoS and network performance metrics and measurement methods as identified below:

Part 1: "General considerations";

Part 2: "Transmission Quality Indicator combining Voice Quality Metrics";

Part 3: "Network performance metrics and measurement methods in IP networks";

Part 4: "Indicators for supervision of Multiplay services".

Introduction

The QoS definition of ITU-T Recommendation G.1000 [i.1] gives criteria for judging the quality of the communications functions that any service must support. However, even this definitional matrix can be viewed from different perspectives:

- customer's QoS requirements;
- service provider's offerings of QoS (or planned/targeted QoS);
- QoS achieved or delivered;
- customer survey ratings of QoS.

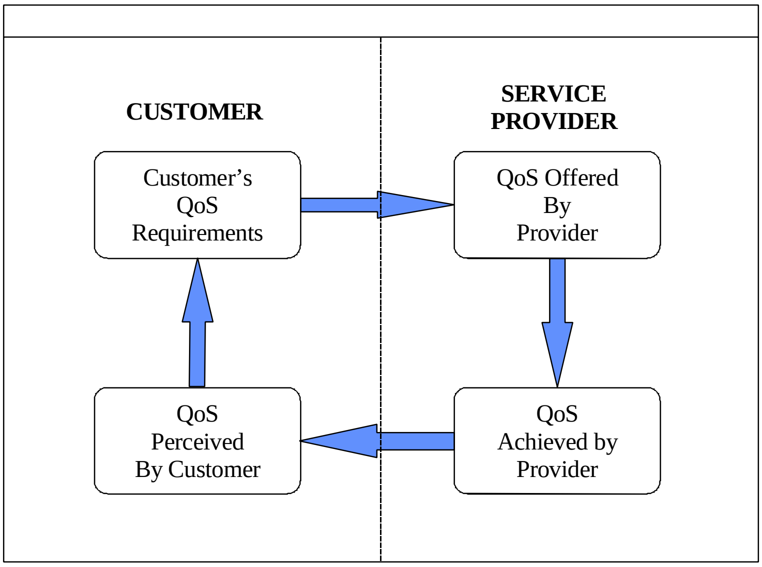

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Figure 1: The four viewpoints of QoS

Under this angle of view the different parts of this multipart deliverable are positioned at different places in the matrix above:

Part 1 (the present document) provides the umbrella for the different parts of this multi-part document as these are service specific (e.g. voice) (i.e. relevant and perceivable by the end-user) on the one hand and transport network specific (e.g. IP) (i.e. relevant to the network itself and thus important to the network operator) on the other hand.

Part 2 [i.4**]** is identifying and defining indicators and methodologies for a use in a context of end-user quality characterisation and supervision of voice telephony services.

In this context the measurements and metric determinations are performed by analysing signals accessible on user-end services (end-user terminals and interfaces) and not on the network (network elements and interfaces within the network). In order to map the reality in terms of access to the services at the user-end side, measurements and analysis are performed on electrical signals that exclude the electro-acoustic part of the end equipment. However, the probe adaptation to electric interface of the end user equipment takes much into account the electro-acoustic characteristics of this terminal.

Part 3 [i.6**]** gives a survey on the existing network performance-related IETF standards and how these standards can be applied to end-to-end network performance measurements. The scope of this work is also to discuss the relationship of those standards to those of ITU-T and ETSI.

It discusses and compares definitions of metrics used to specify and assess performance in IP networks. The metrics addressed in this document are those defined by the IETF IPPM working group and ITU-T Study Group 12. Besides comparing the different definitions this document gives applicability guidelines on which metric is more appropriate for a particular application, configuration or scenario.

Part 4 [i.5**]** aims to identify and define indicators and methodologies for a use in a context of end-user quality characterisation and supervision of Multiplay services concerning IP access, voice messaging service, IPTV and as possible VoD.

In this context the measurements (intrusive and non intrusive) and metric determinations are performed by analysing signals accessible on user-end services and not on the network.

1 Scope

The present document provides the umbrella for the different parts of this multi-part document as these are service specific (e.g. Internet access, voice, IPTV and VoD) on the one hand and transport network specific (e.g. IP) on the other hand.

The service specific part(s) are considered to be suitable for the quantitatively characterization of the dominant technical QoS aspects that have a direct influence on the QoS as experienced by the end-user. Thus these technical parameters can be taken as a measure to estimate the end-user quality perception and to benchmark services subsequently.

The transport network specific(s) are considered to be suitable for the quantitatively characterization of the performance of the network as a whole and single network elements/functions. These parameters are used by the network operator to monitor the network performance, make a fault analysis and decide whether network upgrading/reconstruction, etc. needs to be undertaken.

The quality of modern terminals and network equipment is characterized by numerous quality parameters. A subset of them, those which are found to be the most important ones (KPI _ Key Performance Indicator) are measured during their lifetime and under real traffic conditions. These measurements guarantee the best possible assessment of quality problems that may occur during real use of the corresponding telecommunication device.

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:
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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.

Not applicable.

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] ITU-T Recommendation G.1000: "Communications Quality of Service: A framework and definitions".

[i.2] ITU-T Recommendation P.505: "One-view visualization of speech quality measurement results".

[i.3] ETSI ETR 003: "Network Aspects (NA); General aspects of Quality of Service (QoS) and Network Performance (NP)".

[i.4] ETSI EG 202 765-2: "Speech Processing, Transmission and Quality Aspects (STQ); QoS and network performance metrics and measurement methods Part 2 : Transmission Quality Indicator combining Voice Quality Metrics".

[i.5] ETSI EG 202 765-4: "Speech and multimedia Transmission Quality (STQ); QoS and network performance metrics and measurement methods; Part 4: Indicators for supervision of Multiplay services".

[i.6] ETSI EG 202 765-3: "Speech and multimediaTransmission Quality (STQ); QoS and network performance metrics and measurement methods; Part 3: Network performance metrics and measurement methods in IP networks".

3 Abbreviations

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

QoS	Quality of Service
QoE	Quality of Experience
VoIP	Voice over Internet Protocol

4 Determination of communications QoS criteria

Quality criteria of a telecommunications service may be derived from a matrix shown in figure 1. Considerable thought has gone into its construction and has proven to be useful in identifying QoS criteria for customers before launching a new service (see ETR 003 [i.3]).

		Service Quality Criteria						
		SPEED 1	ACCURACY 2	AVAILABILITY 3	RELIABILITY 4	SECURITY 5	SIMPLICITY 6	FLEXIBILITY 7
Service Function								
SERVICE MANAGEMENT	Sales & Pre-Contract Activities 1							
	Provision 2							
	Alteration 3							
	Service Support 4							
	Repair 5							
	Cessation 6							
CONNECTION QUALITY	Connection Establsh. 7							
	Information Transfer 8							
	Connection Release 9							
Billing 10								
Network/Service management by customer 11								

Figure 2: Matrix to facilitate identification of communications QoS criteria

This matrix may be used for any telecommunications service to determine the requisite QoS criteria. After determining the quality criteria, parameters can be defined and performance objectives set.

5 Presentation of indicators

The visualisation of indicators is an important issue, as the guidelines presented in the documents EG 202 765-2 [i.4] and EG 202 765-4 [i.5] may be used for benchmark or supervision of VoIP or Multiplay services.

It is very important to present the quality indicators in a relevant way. This presentation allows us to make our own judgement of the global performance of the evaluated object. There is a great temptation to try to give one unique note which aggregates all quality items. Through its uniqueness, this note approaches the concepts of global evaluation and more generally of global satisfaction. But there are two problems of doing this aggregation.

First, there is a gap between technical aspects and perceptive aspects. The links between these two aspects are not trivial. The second problem is that overall satisfaction or overall quality can hardly be modelled. Satisfaction and even quality strongly depends on expectancy levels and environment circumstances. As an example, you will be happy to call your wife/husband at the top of the mountain you climb, even if quality is poor and your QoE would be great. But with the same quality, if you call your wife/husband from your office, you will not … and your QoE will be bad.

Therefore it is difficult to evaluate quality using one unique note. It is recommended to visualise all indicators at the same time.

6 One-view visualization

Obviously it is possible to represent every metric separately but it seems more convenient to visualise all indicators (or at least all mandatory indicators) using the same and unique figure. This is described in ITU-T Recommendation P.505 [i.2].

The ITU-T Recommendation P.505 [i.2] specifies a graphical visualisation called "Pie diagram". This particular representation of indicators shows at a glance a global view of results obtained while characterising or analysing a service. It is easy to read as various indicators are represented on each spoke of the circle.

This type of graphic is relatively flexible to employ. It is possible to choose the number of parameters to visualise. However for intelligibility reasons it is not recommended to exceed twelve indicators. For telephony service the indicators for both directions of transmission can be visualised on the diagram. "Pie diagram" also allows the comparison of obtained results with acceptability thresholds. The result will be represented with green colour when the performance in above acceptability level. Otherwise, if the performance does not attain acceptability threshold the result will be drawn in red.

An example of a "Pie-Diagram" is shown in figure 3.

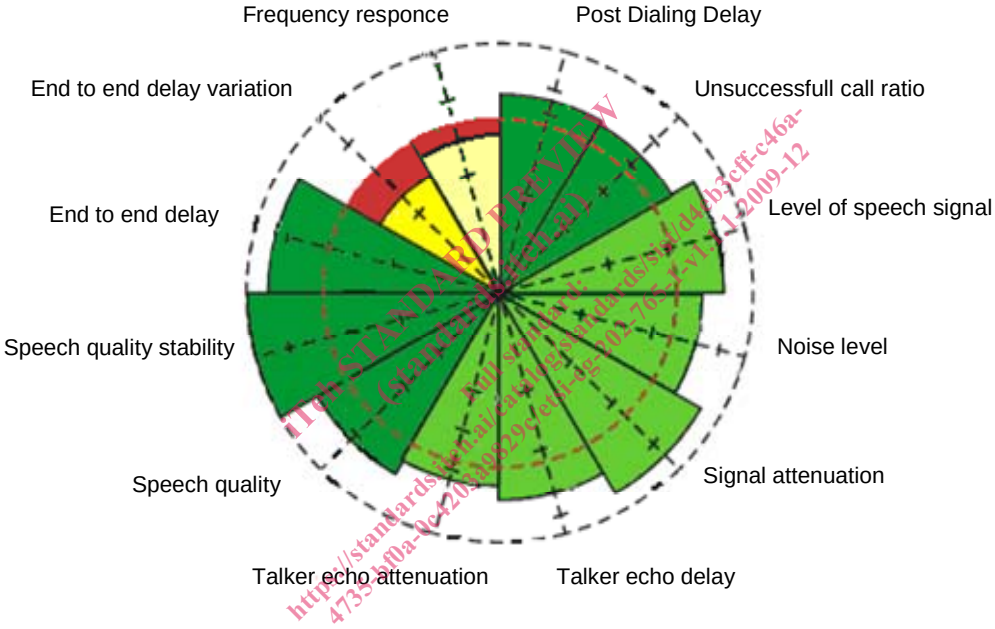

Figure 3: Example on Pie-Diagram

The ITU-T Recommendation P.505 [i.2] enables a global vision of the complete set of indicators. It outlines the strengths and weaknesses of analysed service in a fast and convenient way.

In order to recognise the benefits of the ITU-T Recommendation P.505 [i.2] for the visualisation of indicators, one should contact ETSI to obtain the report from the 5th ETSI Speech Quality Test Event. This document presents the results of analysis of several gateways and IPphones. The ITU-T Recommendation P.505 [i.2] "Pie-Diagram" allows not only the identification of strengths and weaknesses of every tested equipment but also the comparison of results between different equipments.