

**User Group;  
Quality of Telecom Services;  
Part 1: Methodology for identification of parameters  
relevant to the Users**

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Reference

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## Foreword

This ETSI Guide (EG) has been produced by ETSI User Group (USER), and is now submitted for the ETSI standards Membership Approval Procedure.

The present document is part 1 of a multi-part deliverable covering the quality of telecom services, as identified below:

- Part 1: "Methodology for identification of parameters relevant to the users";**
- Part 2: "User related parameters on a service specific basis";
- Part 3: "Template for Service Level Agreements (SLA)".

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## Introduction

Quality in the service area can be evaluated from different perspectives and therefore using different measurement methods:

- a) a first level of quality is related to the reliability of the equipment and can be measured accurately via technical means, although these measurements might be expensive because of both the dispersion of the test and the size of the sample to be tested;
- b) a second level is related to the service provision and is closely linked to the kind of use of the service. Therefore appropriate criteria have to be defined according to this kind of use between the customer and the supplier;
- c) the last one is intended to measure the subjective satisfaction of the customer and there is often no other means than a survey or an audit to get it.

In the two first categories, technical means can be used to perform the measurements and in such cases, standards are often useful to achieve a common approach; such standards are given as references where appropriate. They include a precise definition of what is meant as a failure: total failure, poor performance, backup situation, etc.

Assessing these different aspects is of paramount importance to the provider who endeavours to improve the offered QoS. From a user viewpoint, the end-to-end QoS is the most relevant, even if objective and subjective measurements may be usefully combined for a better assessment of the QoS.

Measurements of every interesting parameter all the time might be very expensive and can even jeopardize the service performances. It is often cheaper to get them via a poll. In addition, it may be convenient to rely on a third party to carry out these measurements in order to make them more reliable and avoid any criticism from one of the involved parties.

The present document is dedicated to the methodology to analyse the users needs which is the first step in a Total Quality Management (TQM) process.

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# 1 Scope

In the current competitive world, Quality of Service (QoS) is becoming, jointly with cost, a key parameter in selling and buying telecommunications services. At the same time, technology and liberalization trends are raising new types of concerns unknown with the Plain Old Telephony Services (POTS) using switched connections provided by a single monopoly supplier.

Nowadays, there are several standards describing QoS measurements but the questions of which indicators are to be monitored and which values they should meet are still open. The present document proposes a methodology for the identification of parameters relevant to the users that can be used either to monitor the QoS of Telecom services used by the private customers or for a Service Level Agreement (SLA) between a customer and a supplier of Telecommunications services as that proposed in EG 202 009-3 [5]. It gives guidelines on how to obtain user's QoS requirements, prioritize the criteria or parameters, establish a preferred value for each of these parameters, while EG 202 009-2 [4] proposes service specific QoS parameters.

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# 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.
- For a non-specific reference, the latest version applies.

- [1] ITU-T Recommendation E.800: "Telephone network and ISDN quality of service, network management and traffic engineering: Terms and definitions related to quality of service and network performance including dependability".
- [2] ETSI ETR 003: "Network Aspects (NA); General aspects of Quality of Service (QoS) and Network Performance (NP)".
- [3] Directive 98/10/EC of the European Parliament and of the Council of 26 February 1998 on the application of open network provision (ONP) to voice telephony and on universal service for telecommunications in a competitive environment.
- [4] ETSI EG 202 009-2: "User Group (USER); Quality of Telecom Services; Part 2: Identification of Parameters relevant to the Users".
- [5] ETSI EG 202 009-3: "User Group (USER); Quality of Telecom Services; Part 3: Service Level Agreements Template".

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# 3 Definitions and abbreviations

## 3.1 Definitions

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

**assurance:** knowledge and courtesy of employees and their ability to convey trust and confidence

**empathy in the supplier-customer interface:** degree of caring and individual attention provided to customers

**Quality of Service (QoS):** collective effect of service performance which determines the degree of satisfaction of a user of the service (see ITU-T Recommendation E.800)

NOTE 1: The quality of service is characterized by the combined aspects of service support performance, service operability performance, service ability performance, service security performance and other factors specific to each service.

NOTE 2: The term "quality of service" is not used to express a degree of excellence in a comparative sense nor is it used in a quantitative sense for technical evaluations. In these cases a qualifying adjective (modifier) should be used.

**QoS achieved by service provider:** QoS achieved by the service provider is a statement of the level of quality achieved by the service provider

NOTE: This is expressed by values assigned to parameters, which are, as far as possible, same as those for the QoS offered. These performance figures are summarized for specified periods of time, e.g. for the previous 3 months.

EXAMPLE: The service provider may state that the achieved availability for a given duration (e.g. one year) was 99,95 % or unavailable for 262,8 minutes over a 365 days year.

**QoS offered by service provider:** statement of the level of quality expected to be offered to the user/customer by the service provider

NOTE: The level of quality is expressed by values assigned to QoS parameters. These parameters are usually designed to be understandable to the user/customer. Each service would have its own set of QoS parameters (see ETR 003 [2]).

EXAMPLE: A service provider may state that the availability of basic telephony service is 99,9 % in a year with not more than a 15 minutes break on any one occasion.

**QoS perceived by the user/customer:** statement expressing the level of quality experienced by user/customers

NOTE: The QoS perceived is expressed, usually in terms of degrees of satisfaction and not in technical terms. Technical terms may be expressed where the user/customer is able to understand and use these. QoS perceived is assessed by customer surveys and from user's/customer's own comments on levels of service.

EXAMPLE: An user/customer may state that on unacceptable number of occasions there was difficulty in getting through the network to make a call; a satisfaction rating of 2 may be given on a 4 point scale.

**QoS requirements of the user/customer:** requirements of QoS as expressed in non-technical language by the user/customer may be gathered for representative groupings of users/customers

NOTE: For their own use, the service provider may translate them into technical indicators easier to manage, if needed to better fulfil the requirements.

**reliability in the supplier-customer interface:** ability to provide what was promised, dependably and accurately

**responsiveness in the supplier-customer interface:** willingness to help customers and provide prompt services

**service provider:** organization that offers a telecommunication service to the customer and/or user

NOTE 1: A service provider needs not to be a network operator (see ETR 003 [2]).

NOTE 2: A service provider that is subject to the requirements of the ONP Voice Telephony Directive will in most cases also be a network operator.

**user:** individuals, including consumers, or organizations using or requesting publicly available telecommunications services (copied from Directive 98/10/EC)

## 3.2 Abbreviations

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

POTS	Plain Old Telephony Service
QoS	Quality of Service
SLA	Service Level Agreement
SME	Small and Medium Enterprise
SOHO	Small Office – Home Office
TQM	Total Quality Management

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## 4 About telecommunication service QoS

Dealing with telecommunication services QoS, assumes that, first of all, the QoS requirements are identified from the user viewpoint then a set of indicators is defined, measured and monitored with respect to reference values in order to check whether the requirements are fulfilled.

To achieve that, series of tasks have to be completed:

- Analysis of the user QoS requirements;
- Choice of the most appropriate indicators;
- Definition of the most suitable method of measurement and monitoring;
- Definition of the adequate indicator reference values.

When doing that, it should be kept in mind that a key aspect of the Telecommunication services is that two ends are needed to perform the service. Therefore both ends may influence the QoS and have to be taken into account to assess the QoS.

In addition, since Telecommunication services belong to the High Tech area and therefore are mainly seen by the users from an end-to-end viewpoint, the psychological aspects are crucial in the QoS assessment. Hence, the user satisfaction is the result of the Perceived QoS, which is the difference between the expected QoS and the achieved QoS.

Also, since different telecommunication technologies are used to provide the various services, appropriate measurement methods have to be selected for each of these services.

The purpose of the present document is to provide guidance on how to identify the parameters actually relevant to the Users.

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## 5 Content of Telecommunications Services

Telecommunications Services include several provisions:

- a) The delivery of the service itself (connection to a telecommunication system)
  - With generic and specific aspects.
- b) Several additional provisions that are more and more key parameters of the QoS:
  - Information on the service;
  - Implementation and setting up;
  - Backup in case of problem;
  - Processing of service failures (repair and setting back to working order);
  - Help desk to take the users' problems into account and report on the progress of restoring;
  - Billing and accounting media and methods;

- Statistics on operation and traffic;
- Possible up-dates;
- Documentation;
- etc.

On the first aspect, the service itself may differ considerably from one to another and therefore, it is clear that before setting the QoS requirements, the performance parameters have to be defined carefully. Then, the specific QoS criteria can be defined on a service-by-service basis as well.

In addition, it should be reminded that, as usual in business, human interface is a key aspect of the QoS, in particular reliability, empathy and responsiveness.

## 6 Methodology to identify the customer's QoS requirements

Different users may be happy with different levels of QoS as well as level of performance. Users in this aspect might be end-users or operators or service providers as well. This is why defining the user requirements is crucial to ensure an optimal quality/cost ratio.

ETR 003 [2] provides a useful methodology to capture the users'/customers' quality requirements. The matrix in the table below, if explored cell by cell, enables to consider every QoS criteria and hence to capture a comprehensive range of QoS requirements for each specific service.

**Table 1: Matrix to facilitate the capture of customer's QoS requirements**

		Service Quality Criteria	Speed	Accuracy	Availability	Reliability	Security	Simplicity	Flexibility
Service Function		Cell ref.	1	2	3	4	5	6	7
Sales		1							
Service management	provision	2							
	alteration	3							
	service support	4							
	repair	5							
	cessation	6							
Call technical quality	connection establishment	7							
	information transfer	8							
	connection release	9							
Billing		10							
Network/service management by customer		11							

Header of lines and columns of this table as well as the content of each cell are defined in details in [2]. An example on how this table can be used is given in the final report of Round Table 3 Phase I study (see Bibliography).

While roaming from one cell to another cell, the answers may be provided by various means like questionnaire, face-to-face interviews, telephone interviews, analysis of complaints or case studies.



Questionnaires are most suited for public enquiries as well as telephone interviews. Face-to-face interviews are more appropriate for surveys in business areas or to get confirmation on some specific issues.

Depending on which area the QoS in question is to be evaluated, appropriate samples have to be defined since different categories of users have often differing requirements even for the same service (some examples of such categories are available in chapter 0.10 of EOTIP V2 (see Bibliography)). Of course, the composition and the size of the sample should fit the area covered whether it is the private customer at large, a corporation, a SME or SOHO.

At this stage of the process, the purpose is to identify for each cell the qualitative user requirements, their relative priority with respect to the requirements in the other cells and, as far as possible an indication of the preferred reference values.

While doing that, it should be kept in mind that users have not the same knowledge of the technology as the providers and therefore appropriate language should be used. This is still more difficult when the issue is about a new technology not implemented yet. In such case, analogy with existing services has to be found in order to refer to current usage. In any case, users are expecting their QoS requirements be seen in an end-to-end perspective not from a narrow technical viewpoint.

Finally, it is important to remember that not every parameter will be relevant to every user.

## 6.1 Importance of deriving service specific QoS parameters

There are a number of criteria that can be used for most of the telecommunications services to assess the QoS. For the telecommunication service itself, these criteria are:

- a) Failure in setting-up the communication;
- b) Time to set up the communication;
- c) Disconnection after the communication is set-up;
- d) Defect in the communication with a different weight according to the type of use of the communication.

For failures and service breakout:

- a) Performances in back-up situation;
- b) Frequency of failures and service breakout, time to repair, cumulated time of failures (in particular total failure).

Of course, these criteria have to be adapted according to the service provided, fixed, mobile communications or Internet access and email services either to evaluate more accurately the QoS of the service considered or to replace some inappropriate criteria, e.g. time to set up the communication when it is permanently set.

It is also obvious that the same service may be used for different applications with different requirements. Therefore, in many cases specific criteria have to be defined in order to take into account any particular aspect of the application using the service considered.

Other aspects of the provision of the service itself are more generic and should fit almost all the services.

For delivery:

- a) Time to deliver;
- b) Conformance to the delivery time;
- c) Conformance to the specification;
- d) Conformance to the specification of the documentation;
- e) Etc.

For the help desk:

- a) Response time;
- b) Relevance of the answer.

For the billing:

- a) Accuracy of the counting;
- b) Exactness of the accounting with respect of the tariff;
- c) Clarity.

For the supplier-customer interface:

- a) Reliability. The ability to provide what was promised, dependably and accurately;
- b) Assurance. The knowledge and courtesy of employees and their ability to convey trust and confidence;
- c) Empathy. The degree of caring and individual attention provided to customers;
- d) Responsiveness. The willingness to help customers and provide prompt services.

## 6.2 Segmentation of the user sample.

When QoS parameters are defined or measured, it has to be done according to the target study area. Therefore, it is of paramount importance that the user sample used to carry out the user requirement analysis is chosen carefully in accordance with the aim of the study and usage of the service and the results weighted according to the type of user.

Alternatively enough information should be collected on the users' features to enable the breakdown of the results with respect to these features, otherwise it would be difficult to use them effectively. This is in principle the case for a survey among the general public.

## 6.3 Prioritization

Another purpose of the matrix in table 1 is to get an indication of the relative priority of each cell criteria. The issue is to come to a reasonable number of parameters in order to achieve the right compromise between the number of parameters and the accuracy of the QoS evaluation. Too many parameters will bring a useless management cost while a too little number may lead to miss some key aspect.

Again depending on the application considered, different criteria may be chosen as the most important for the same service.

## 6.4 Preferred values

Once the criteria have been defined and prioritized, then comes the issue of which references should be taken to decide whether the QoS is satisfying or not. The answer may be in the criteria itself: e.g. the mean opinion score for voice telephony is found "excellent". More often the QoS will be evaluated good depending on a statistical treatment of the results, e.g. > 80 % of answers states "high" or higher or alternately < 5 % states poor or less.

In some cases, the criteria is checked against a reference value e.g. call set-up time; the issue is then to define this reference value. EG 202 009-2 [4] proposes indicative values but these values have often to be adapted to take into account specific needs. Therefore, it can be useful to refer to data provided from a panel of users having the same kind of requirements, e.g. same activity sector, same size, etc. These data may be available either from some public repository or from a private contract with a consulting company specialized in such benchmarking surveys. The issue is then again to find a panel of users in the appropriate area of activity, size, etc. The reference value can be taken with respect to the results of such survey (mean value, best of breed, best practice, best in class, etc.) depending of the specific requirements.

## 6.5 QoS requirements review

Since the technology is evolving ever faster and user QoS requirements as well, the criteria should be reviewed periodically to take into account new services and user expectations for improvement.

An every year cycle is a mean value for such review depending of course of particular cases.

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## 7 Measurements

The assessment of the QoS is expected to be evaluated in checking criteria against reference values. As seen above these criteria are measured either objectively via technical means or subjectively (perceived QoS) via surveys amongst the users. Experts often agree that a mix of objective and subjective measurements is the best means to get the whole QoS picture. As stated above, both ends of the communication may influence the QoS and have to be taken into account for the measurements. In particular, the telecommunication network architecture is more and more often designed to include access networks and transport networks the influence of which on QoS has to be taken into account in a QoS measurement policy.

### 7.1 Objective measurements

Criteria like call set up time, call failures, interruptions can quite easily be measured via adequate probes in appropriate locations. Measurements can be made either on real traffic or on artificially generated traffic. This can be done either on public traffic or private networks. Again, since QoS may be different with respect to the location, the geography of the network should be taken into account for the measurements particularly if the choice is done not to monitor all the parts of the network. A compromise should be set between the wish to monitor everything all the time and the costs and the possible oversizing of the network to ensure the management traffic. Optimization of the measurements may need to focus on some key point of the network or to perform the measurements at busiest hours of the day or week.

#### 7.1.1 Intrusive measurements

This type of measurements is performed on artificially generated traffic and can provide more information since the traffic can be tailored to check almost everything. The drawback of intrusive measurements is to add traffic to the actual one and therefore to lead to additional costs and some possible disturbance.

#### 7.1.2 Non-intrusive measurements

This type of measurements is performed on real traffic conditions and therefore is expected to give a more realistic vision of the QoS but its drawback is that some deficiencies might be missed since not all the possibilities are checked.

### 7.2 Subjective measurements

Subjective measurements are the only means to assess the psychological aspects of the QoS, e.g. those aspects that cannot be measured easily by technical means or that may be missed due to a reduced number of measurement points. This is the case for instance for billing accuracy, quality of customer care or relevance of the answer of the helpdesk.

Such measurements may be carried out once a year or if a complaint is raised.

### 7.3 Who should perform the measurements

There are various ways to perform the measurements. Big corporations may have their own organization to deal with this issue or, alternatively, the task may be given to a third party. Another possibility is to entrust the provider himself to supply also the QoS information. It is expected in such case that a mechanism is set to ensure the confidence in the information provided.

Taking into account that the private users (general public) have requirements and resources different from Business users, it is expected that the measurements related to their requirements are performed by a third party, e.g. some kind of public authority, and the results made publicly available. Although, the indicators are in most cases the same as those needed by business users, clause 7 of EG 202 009-2 [4] draws the attention on the specific aspects of the private users' requirements.

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## 8 Conclusion

The ETSI User group hopes the present document provides useful guidance on how to get the users expectations on the QoS to the standard makers, regulators and providers. It is expected also that the users themselves can find here some help, e.g. private users when choosing a provider or user organizations when formulating recommendations or business users when establishing a SLA with their favourite provider. EG 202 009-3 [5] is intended to provide useful additional support on this last aspect.

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## Annex A (informative): Bibliography

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## History

<b>Document history</b>		
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